

FOREST BIOENERGY IN THE PROTECTED MEDITERRANEAN AREAS

FOREST BIOMASS AS A RENEWABLE ENERGY SOURCE

FORBIOENERGY

Interreg 
Mediterranean

 ForBioEnergy

Project co-financed by the European
Regional Development Fund



The project in brief

The forestry sector is of strategic importance for most of the Mediterranean countries. Most of the Mediterranean forests are included in the protected areas, so they represent a great opportunity to produce a sustainable energy from biomass as an inevitably relevant economic resource. The energy production from forest biomass represents a new business and work opportunity for rural areas, thereby increasing the energy production from the local RES.

However, the current regulatory restrictions as well as the lack of appropriate plans impede and slow down the forest biomass exploitation.

In Europe, the current average level of energy from RES is around 12.5%. The Mediterranean area recorded a higher deficit since many countries are below this threshold. In the protected areas of the Mediterranean region there is often a lack of coherence between the strategies and objectives of European policy and concrete actions are conducted at regional and local levels.

In this regard, ForBioEnergy analysed the main criticalities that characterize the current Mediterranean involved regions in order to identify common solutions to increase the energy use of biomass in a transnationality context. Transnational cooperation among the involved partners was needed to highlight the most significant gap of administrative systems that prevents the use of biomass for energy purposes in the participating regions, to identify

and analyse the best practices to enable the regions to remove barriers and overcome obstacles, that have not yet been resolved within its borders.

ForBioEnergy is the acronym of the project “Forest bio-energy in the protected Mediterranean areas”. The initiative is funded by the programme Interreg Med 2014-2020 under Priority Axis 2. Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas. ForBioEnergy started in November 2016, concludes in June 2019 after 32 months of execution. The overall project budget totals 2,048,847.48 EUR.

In this field, the ForBioEnergy project provided tools and models to use the full potential of biomass while at the same time preserving the biodiversity of natural areas. That is exactly in line with the project primary objective and that is fostering bioenergy production in the protected areas, providing transnational solutions for reducing barriers that hinder the development of the sector among the project partner countries: Spain, Slovenia, Croatia and Italy.

This objective was achieved through the development of:

- an Action Plan for shaping new regulatory framework and permit route aimed at removing technical and administrative barriers that hinder the energy use of biomass;
- a multi-level planning process: regional, local and operating;
- a set of sustainability requirements and quality standards of forest biomass.

Project activities were implemented through a transnational process for highlighting the most significant gaps as well as the best practices. Furthermore, key actors (who propose/change norms, regulations and plans, and who deal with bioenergy and biodiversity issues) were actively involved.

2.

ForBioEnergy partners

The project is developed by 9 partners and 4 associated partners from 4 different EU Member States: Italy, Spain, Slovenia and Croatia.

**Sicily Region Council-
orship for Agriculture,
Rural Development and
Mediterranean Fishing
Regional (ITALY):** Man-
aging Body of all state-
owned forests of Sicily
(250,000 hectares) and
of as many as 27 Nature
Reserves, among which
Nature 2000 areas are in-
cluded. The Sicily Region is
the Lead Partner of ForBio-
Energy project, managing
financial and administra-
tive issues as far as coordi-
nating the work plan and
procedures.

**Municipality of Petralia
Sottana (ITALY):** is located

in this rural forest area and
owns the woods included
in its territory. The munic-
ipality is strongly commit-
ted in the socio-economic
development of its territory
and encourages efficient
use of local resources
which are environmentally
compatible.

EnviLand Ltd (ITALY): is a
company of professionals
who have been carrying
out projects for years, as
well as studies and re-
search on local develop-
ment oriented towards
environmental sustaina-
bility. The members of En-
viLand developed a wide



Fifth Steering Committee in Portorož, Slovenia. Photo by Slovenian Forestry Institute

experience on territorial
planning, environmental
analysis through the use of
indicators, procedures for
Evaluating Environmental
Impact.

**Slovenian Forestry In-
stitute (SLOVENIA):** is
the main Slovenian forest
research institute; follow-
ing the development of
modern forest techniques
and efficient technologies
appropriate for geographi-
cal and socio-economic
conditions

**Regional Development
Agency Green Karst Ltd
(SLOVENIA):** regional
co-ordinator of interests
on the local as well as the
national level in the fields
of regional development,
economy, human resourc-
es, environment and natu-
ral resources management,
and rural development.

**The Forestry Municipali-
ties Association of Comu-
nitat Valenciana (SPAIN):**
The aims of the association
are to emphasize environ-



Third Steering Committee in Valencia, Spain



Forth Steering Committee in Zadar, Croatia

mental protection and nature conservation in forest areas in harmony with their people, to promote the structuring of the forestry sector at all levels and contribute to the improvement of forest culture and rural development.

Valencia Official Chamber of Commerce, Industry, Services and Shipping (SPAIN): The main experiences of the Valencia Chamber are related to the communication, promotion and transfer of renewable energy resources among the SMEs, as well as the creation of new SMEs and the analysis and simplification of the administrative burden.

Zadar County (CROATIA): responsible for affairs of regional importance on its territory,

including agriculture, education, health, development, economy, transport and environment.

Public institution Nature Park Velebit (CROATIA): has competences on the protection, research and analysis and monitoring of the state of protected areas in the Park, aiming to support the tourism sector and forest management.

Madonie Natural Regional Park Authority (ITALY), Savjetodavna služba (CROATIA), Natura Jadra (CROATIA) and Italian Agriforestry Energy Association (AIEL) act as associated partners in order to facilitate the achievement of project goals.

3.

ForBioEnergy transnational approach

ForBioEnergy is aimed at identifying preliminarily major strengths and weaknesses of the environmental and socio-economic context of each region involved in the bioenergy sector in the protected areas.

Common challenges have been addressed through a participatory and shared process involving institutions and social and productive organization at a regional and local levels. The approach to address the common challenges of the partners was the establishment of a permanent technical panel with the aim of encouraging the exchange of knowledge and information with and between private and public key actors that operate in the bioenergy field. The technical panel has had a key role in the identification of technical and operational solutions during the project life.

The added value for the Mediterranean area was the transnational cooperation that covered a dual function indispensable for the implementation of the planned activities: (1) highlight the most significant gap of administrative systems that prevent the use of biomass for energy purpose in the participating regions; (2) identify and analyze the best practices to enable the regions to remove barriers and overcome obstacles that have not yet been resolved within its borders.

Planning system

The added value for the partner countries was the multi-level planning process approach of the use of forest biomass. The project included a three-level detailed planning system:

sub-regional,

useful for the connections with the large scale energy planning;

local,

useful for the development of the best practices for sustainable forest management;

operational,

useful for the planning and management of forest-wood-energy supply chain.

The added value for the Mediterranean area was the transnational cooperation that covered a dual function indispensable for the implementation of the planned activities: (1) highlight the most significant gap of administrative systems that prevent the use of biomass for energy purpose in the participating regions; (2) identify and analyze the best practices to enable the regions to remove barriers and overcome obstacles that have not yet been resolved within its borders. The most effective solutions to overcome the technical and administrative barriers emerged through the analysis of the context of each participating region; they were identified through a shared participatory process to analyse and compare procedures, technologies and best practices existing in

In particular, the contribution of the transnational cooperation in ForBioEnergy allowed addressing the challenges in a synergistic way, more importantly, to launch an effective regional and local policy for the energy use of forest biomass in the context of the protected areas of the Mediterranean regions and in particular:

- adjust the regulatory framework, planning tools and permit a route for the implementation of local forest-wood-energy supply chains, while maintaining the shared prescriptions system necessary to safeguard forest ecosystems in the protected area;
- promote common forest planning processes, able to reconcile the demands of socio-economic development of the rural areas and the sustainable management of forest resources which enhance their ability to supply ecosystem services and increase their resilience to climate change;
- identify common innovative technologies in the bio-energy sector replicable in the Mediterranean basin.

each involved region. In this way the best practices already existing in the more “virtuous” region were taken as a model for overcoming obstacles to the development of bioenergy in the other regions involved in the project and will provide a set of rules and procedures replicable in other MED regions.

ForBioEnergy allowed to:

- define new regulatory framework and permit route aimed at removing technical and administrative barriers that hinder the energy use of biomass;
- select best common practices of energy oriented management of Mediterranean forests in order to update the current practice, primarily oriented towards passive conservation; for this purpose the planning tools for the design of forest-wood-energy supply chains were realized in compliance with requirements of protection and conservation of natural habitats;
- Identify innovative common management and governance standards with the involvement of public and private stakeholders in the planning and management of forest-wood-energy supply chains.

4.

The testing activities

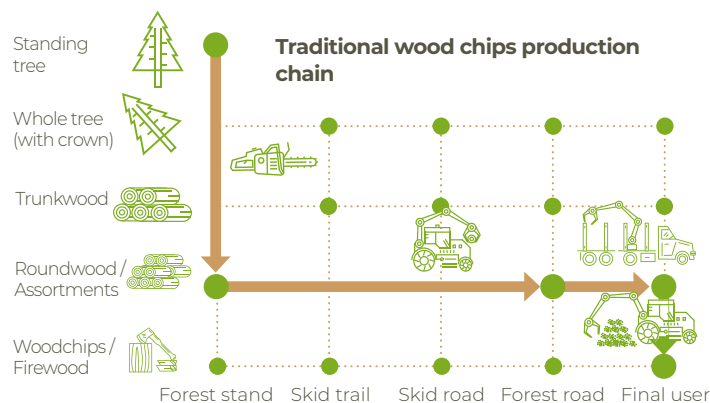
WP3-Testing is the heart of ForBioEnergy since the implemented activities contribute to achieving the strategic objectives of the project. WP3 aims to identify, together with local actors, and develop concrete joint actions in the involved regions to promote the use of biomass for energy in the protected areas. The activities of the project have provided operational tools for planning at different scales of detail, so as to facilitate the implementation and management of the forest-wood-energy supply chains in the Mediterranean protected areas in accordance with the policies of biodiversity conservation. The activities of the WP have been identified considering the characteristics of the regions involved and the profile and specific competences of each partner used to reach synergistically strategic objectives of the WP.

Most of the forest within pilot areas are part of the protected areas, and they represent a great opportunity for the production of sustainable energy from biomass. But the current regulatory restrictions as well as the lack of appropriate plans impede and slow down the forest biomass exploitation.

The overall objective of the WP3 is connected with this issue: fostering bio-energy production in protected areas, providing technical solutions for reducing barriers that hinder the development of the sector and planning models in order to exploit the full potential of biomass and at the same time to preserve the biodiversity of the natural areas.

To achieve this objective, each country involved in the project has contributed their part, which concerned the situation in their country. The following main project outputs were generated:

- **An Action Plan for shaping new regulatory framework and the permit route concerning biomass use in the protected areas** (D 3.6.1), which aims to remove technical and administrative barriers that hinder the energy use of biomass.
- **A Plan of biomass-based energy production at a sub-regional level in the protected areas** (D 3.4.1 and D 3.4.2) which allows assess to the biomass available in the protected areas and determine its energetic potential. Furthermore, a decision support system tool to help assess biomass energy potential was created.
- **Energy-oriented Forest Plan of the biomass district in the protected areas** (D 3.7.1). Forest Management plans of the biomass districts were developed for each country. These plans identify best forestry practices for the different forest types and the assessment of biomass available for energy purposes;
- **A Plan for sustainable forest-wood-energy supply chain in the protected areas** (D 3.8.1) provides indications of technical and organizational aspects, both in the start-up and operating phase.



Project activities have been implemented through a transnational process with highlighting the most significant omissions as well as the best practices. Furthermore, key actors identified were actively involved in the preparation of the results.

Before achieving A.3.3, a description of the current regulation framework and the current environmental and energy aspect of the study areas was done within A.3.2 (D.3.2.1 Baseline review of the study areas).

Activity 3.3.

Deliverable D.3.3.1. Administrative and technical barriers to the production of biomass in the protected areas

Activity 3.6

Regulatory framework and permit route concerning biomass use in the protected areas

The activities A.3.3 & A.3.6 identify and analyse the key barriers (legislative, administrative, technical, social and economic) which impede and slow-down the development of the forest-based bioenergy value chain, specifically in the protected areas. Therefore, the study contains useful solutions and operational recommendations for the key actors involved (public and private forest owners, forest enterprises, bioenergy companies, final users, administrations etc.). In addition, an Action Plan at the regional level in particu-

lar and at the MED partner area is proposed to implement a new regulatory framework and permit a route based on the whole study area to enhance the integral use of forest biomass for bioenergy purposes.

Key priority barriers identified in A.3.3

1. The long time and complexity of authorization for the extraction of biomass in protected areas.
2. The fragmented ownership of private forest, the inadequate organization and the lack of interest in biomass production.
3. Reticence to use biomass in protected areas: the production function is not balanced with the conservation function.
4. Low profitability in biomass production, especially in the protected areas.
5. Poor integration of local stakeholders across the forest-based bioenergy value chain.
6. Lack of synergies and coordination among the administrative levels (local, subregional, regional and national) in the territories included in the protected areas

Methodology

Identification and analysis of the barriers across the forest-based bioenergy value chain

Slovenian Forestry Institute



FOREST MANAGEMENT

Legislative, administrative, technical, social and economic barriers



FOREST HARVESTING AND LOGISTICS



BIOFUELS INDUSTRY



WOODCHIP



PELLET



FIREWOOD



DISTRIBUTION



THERMAL / ELECTRICAL ENERGY CONVERSION



DISTRIBUTION TO PUBLIC CONSUMPTION

MED partner area report
4 regional reports



CROATIA



ITALY (SICILY)



SLOVENIA



SPAIN (VALENCIAN COMMUNITY)

Barriers and potential solutions for increasing biomass production in the protected areas (D.3.3.1)

MED partner area Action Plan
4 regional Action Plans



Action Plan for a new regulatory framework and permit route in the Mediterranean protected areas (D.3.6.1)

Action Plan

The Action Plan aims to increase the socio-economic and environmental activity in rural protected areas through the valorization of the forest resources. To achieve it, one of the main objectives of the project is the removal of the barriers and proposing improvements in procedures, processes and legislation to achieve a faster, simpler and more cost-effective chain in protected areas, in addition to involving land owners and motivating them to mobilise wood biomass, having the support of the local community and promote use of wood fuels in public buildings.

Concretely, 9 Specific objectives, 10 barriers, 17 specific barriers, 22 actions, 45 specific actions and 2 representative case studies have been analysed. The barriers are classified in 4 groups - social barriers, economic barriers, legislative-administrative barriers and technical barriers, being addressed as the following:

Barrier • Specific barrier • Why • Solutions • How to tackle it • With who

Specific objective • Specific barrier • Action • Specific actions • Terms • Responsible to face the costs • Expected result • Indicator

Time frame



Short-term

(ST): the action has to be achieved in 2019 (1 year).

Medium-term

(MT): the action has to be performed between the period 2020-2025 (2-5 years).

Long-term

(LT): the action is foreseen to be achieved in 5 years (>2025).

Specific objectives in the Action Plan at Med partner area

- SO1:** Enhancement of the planning of forest resources, both at the territorial and local level, through the drafting of the forest management plans based on standardized Technical Instructions with a normative character able to match the productive function of forests with the conservation of forest ecosystems and the landscape in protected areas.
- SO2:** Establishment of a local/short biomass production for energy purposes in a circular economy, promoting the cooperation between private and public actors.
- SO3:** Improving the forest ecosystem quality and stability in the protected areas.
- SO4:** Simplification of the administrative procedures to elaborate and approve forest management plans in the Natura 2000 protected areas.
- SO5:** Increasing the skills and technical capacity of forestry companies/enterprises operating in the Natura 2000 areas.
- SO6:** Re-establishing agricultural land and cultural landscape to protect and preserve specific habitats and species of Natura 2000 sites.
- SO7:** To increase the awareness of the local community about the economic and environmental benefits that can derive from the sustainable management of forest areas in the protected areas.
- SO8:** Elaboration and implementation of a communication plan that serves as a basis to quantify the benefits of the use of biomass to prevent forest fires, to improve ecosystems quality and resilience and to mitigate climate change.
- SO9:** Establishment of a local forest owners' association that will develop further in more market oriented legal form of cooperation.

Activity 3.5

The threats and benefits of the increase the biomass use in the protected areas –

Deliverable 3.5.1

Impact assessment of the increase of biomass use in the short, medium and long term in the protected areas

In the framework of the project a methodology for risks and benefits assessment deriving from the biomass production in the protected areas has been defined. This methodology has been produced to provide the decision makers and the operators with an appropriate tool to assess and monitor the impacts determined by the extraction of biomass in the protected areas, taking into account the social and economic factors characterizing the areas.

The impacts assessment concerns the environmental (biotic and abiotic) and the socio-economic components and the ecosystem services. For each component a set of suitable indicators have been selected for monitoring and evaluating the potential impacts. These indicators have been chosen among the most effective for evaluating the potential impacts deriving from the forest operations in the short-medium and long periods, recognized by the international literature, easily quantifiable and that can be monitored over a period of time. The indicators were defined based on common technical and scientific documents and comply with the EU directives and guidelines. Therefore, the adopted methodology guarantees a wide flexibility as well as the transferability in the whole MED area.

The methodology has been applied to the project study areas through assessment matrices arranged by a panel of experts in the fields of flora and vegetation, animal communities, abiotic components, and socio-economic status. Matrices focus on threats/benefits that the operations for the extraction

Example of matrix for evaluating the potential impacts on plant communities

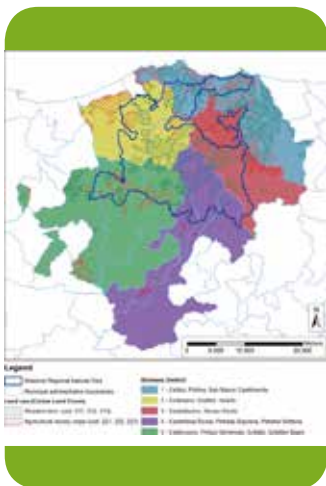
Natura 2000 Habitat Code:		9380: Forests of <i>Ilex aquifolium</i>												
THREATS	OPERATIONS											INDICATORS		
	Silvicultural and harvesting practices (high forest and coppice)													
	Thinning/ Shelterwood cutting/Salvage cutting			Crown pruning		Clear cutting			Post harvesting management					
	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	
direct removal of natural vegetation		I	I	I	I			III	II	I	I	I		vegetation sampling
alteration of floristic composition		I	I	I	I			III	II	I	I	I		life-form spectrum/ diversity indices
reduction of protected and endemic species population		I	I	I	I			III	II	I	I	I		presence of protected and endemic species
introduction of synanthropic species	I	I	I	I	I	I	I	III	I	I	I	I		presence of synanthropic species
introduction of alien species	I	I	I	I	I	I	I	III	I	I	I	I		presence of alien species
reduction of natural regeneration		I	I	I	I			III	II	I	I	I		presence of natural regeneration
damage to natural regeneration		I	I	I	I			III	II	I	I	I		presence of damages to natural regeneration

of biomass in forest areas could generate. The potential impact linked to the threats/benefits was assessed according to two factors: magnitude (estimation of the damage that a given operation will cause to the habitat with regard to the threat considered) and reversibility (estimation of the amount of time the community and the habitat will need to return to its previous state after impact takes place; it depends on impact type, impact magnitude and the community's resilience).

Activity A.3.4

Planning biomass based energy production at regional and sub-regional level in protected areas.

Deliverable 3.4.1 Geographical identification and description of biomass districts in the protected areas



The project partners identified and characterized specific “Biomass Districts” (BDs) for each pilot protected area, with the aim to plan short biomass supply chains for energy use, capable of ensuring environmental sustainability as well as promoting socio-economic development of rural communities. The BDs within the protected area represent the administrative units for the purposes of forest planning at the company level, homogeneous

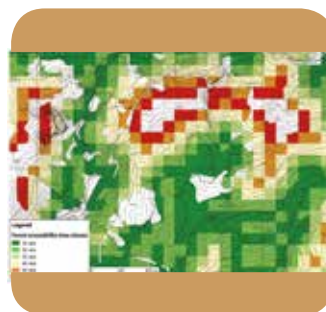
in terms of availability of agroforestry resources (potential biomass supply for energy use), and the distribution of the road network and local energy needs (energy demand).

Activity A.3.4

Planning biomass based energy production at regional and sub-regional level in protected areas.

Deliverable 3.4.2 DSS for planning biomass-based energy production in the protected areas

The project partners developed and implemented a Decision Support System (DSS) for planning biomass-based energy production for each pilot protected area. The DSS will support the Authorities responsible for simplifying, speeding up and standardizing land monitoring and strategic planning procedures. The DSS will be used by the decision-making bodies to assess the impacts of various scenarios, as well as the costs and benefits of the production of energy from residual agroforestry biomass in the public administrations. The DSS will also be used as a support for determining the optimum plant size (and power) for energy and heat production and the relative biomass supply area. All functionalities have been devel-



oped on a GIS platform, both ArcGIS and open-source QGIS software were used. The model implementation includes the input dataset definition, algorithms selection and output return: the model itself is an algorithm. The main output were: a) Cost map, that is a raster layer containing information

regarding the time of pixel crossing within 60 minutes; b) Forest accessibility map, that is a vector layer containing information regarding the forest type, the access time classes, biomass districts, municipalities, park zoning.

Activity A.3.7

Biomass oriented forest planning at local level in the protected areas. Deliverable 3.7.1 Forest Management Plan of the Biomass district in the protected areas

An important result of the project was the drafting of Forest Management Plan (FMP) of a pilot biomass district for each pilot protected area. Each Forest Management Plan has been drafted up according to the national and regional regulations in force in each country/region of involved partner. The best management practices for each forest type have been identified in order to preserve and conserve forest ecosystems and to assess the biomass that could be available for energy purposes. The exploitable biomass for energy purposes deriving from other forest-wood supply chains has also been evaluated, following the concept of the cascade use of biomass. In each FMP, the connections with the other planning tools (Landscape, Natura 2000 Network, Fire prevention and fire-fighting, hydrogeological risk, desertification risk, etc.) have been described. In the presence of Natura 2000 habitats, the assessment of the impacts of the silvicultural interventions has been provided too. Each management unit includes information about ownership, municipality, biomass district, surface area, main dendrometric parameters (e.g., basal area, density), structure, growing stock, yield, biomass, timber assortment, silvicultural treatment, management horizons.

Activity A.3.8

Even though more specific details are given in the results of local testing activities, in A.3.8 (D.3.8.1 Plan-

ning of sustainable forest-wood-energy supply chain in the protected areas) has been designed a sustainable supply chain within the biomass district (A.3.4) through:

- identification of a low environmental impact work systems (cutting, extraction) for the production of forest biomass;
- identification of efficient biomass production and extraction systems in agricultural areas inside or close to protected areas;
- establishment of efficient and sustainable management models of forest-wood-energy supply chains;
- definition of technical criteria for identifying the most suitable sites for the storage of biomass and the location of processing power plants;
- identification of power plants with technical characteristics appropriate to ensure the environmental sustainability of the biomass transformation.

Activity 3.9

Quality requirements for the biomass from the protected areas

Within the activity regarding quality requirements the possibilities of using existing traceability protocols for forest management certification system and standards for the solid biofuels to be used in the foreseen or existing district biofuels heating systems are described within a chosen quality assurance and control system, to supplement the planned sustainable wood-energy supply chain. The partners were invited to do an overview of the available possibilities for their pilot area, and the respective country. The case study contains applicable possibilities for the standards which are or can be implemented for the wood and solid biofuels from the chosen biomass district.

The sustainable forest management concept was developed and synthesized in the Pan-European criteria, and is comprised in the two wide spread chains of custody certificates, namely, FSC and PEFC certificates.

The FSC Chain of Custody Certification standard version 3-0 became effective on the 1st of April 2017. The ten FSC principles for responsible forest management must be met in order to obtain certification. These rules apply to all forest types and were set to ensure environmentally appropriate, socially beneficial, and economically viable forest management.

The Programme for the Endorsement of Forest Certification (PEFC) covers the entire forest supply chain under the standardisation umbrella, and promotes good practices for forest management and ensures that timber and non-timber forest products respect ecological, social and ethical standards. PEFC is the certification system commonly chosen by small, non-industrial private forests and family- and community-owned forests. PEFC offers the possibility of group and regional certification, which makes small land owners able to obtain recognition in the market. Solid biofuels' properties and quality standards are listed, along with the information how they can be acquired in the field of exploitation of the biomass for energy purpose. There are basically three different origins and sources of wood fuels: wood from forests and plantations, used timber and by-products and residues from the wood processing industry. And also, there are three trade forms of wood fuels that are most commonly used – firewood, wood chips and wood pellets.



For firewood, the most common standard used is the EN ISO 17225-5: 2014 standard, which defines 3 quality classes for the non-industrial usage. Furthermore, the standard EN ISO 17225-4 classifies wood chips into two groups and wood pellets quality is also standardised by EN ISO 17225-2 quality standard which classifies the pellets into three classes.

End user requirements about the quality level and its constancy vary considerably according to scale of the heating system. For small-scale end users the required fuel specifications are stricter or narrower, according to the combustion device specifications. Large-scale end users with wider furnace adaptability can accept also lower quality wood fuels.

A simplified QA/QC system was proposed to be adopted by the single stages in the established wood biomass energy production chain, in order to follow and assure the implementation of the sustainability, operation standards, storage and compliance with the end users' quality requirements. Commitment of producers, suppliers and end users is essential in order to assure the requirements are known, respected and so that the end product is in compliance with the installation and end user quality requirements.

5.



The Results of Local Testing Activities in The Case of Pilot Areas – Slovenia

Current bioenergy status and its potential in pilot areas in Slovenia

Slovenia is the third most forested country in Europe. Forests cover more than half of the country (58 %). According to the data of forest management plans from the Slovenia Forest Service (SFS), the growing stock of Slovenian forests for the year 2015 amounts to 348.203.000 m³ or 295 m³ per hectare. In addition to extensive forest coverage in Slovenia, there is a lot of tree and bush wood also on the non-forest categories of land, especially on abandoned farmlands (e.g. meadows and pastures) which are being overgrown by the forest vegetation. Rich wood resources are rather badly exploited in Slovenia, since logging in forests, as the most important wood resource, does not reach even half of their increment. According to the study done by SFS, the potential of outside the forest wood biomass usable for energy purposes is approximately 300.000 m³ per year.

Most of the Slovenian forest is privately owned (76 %), the rest is owned by the state or communities (24 %). Private forest estates are small, with an average area of only 3 ha, and even these are further fragmented into several separate plots. For the great majority of the owners these estates are not of economic interest. On the other hand, larger and undivided forest estates of state-owned forests enable good professional management.

Most of forest wood assortments (round-wood) are intended for further processing in the wood-processing industry, while approximately a quarter of round-wood from forests is used for energy purposes, mostly for heating. At present, most of the fuel wood in Slovenia is used by households for heating purposes, which provides approximately one third of the national energy demand.

In general, the most commonly used wood fuel type in Slovenia is firewood, but the use of wood chips and pellets increases rapidly. The number of households which decide to use wood fuels instead of fossil fuels for heating is increasing. The data from SFI (Slovenian Forestry Institute) for 2016 shows that more than half of the households in Slovenia are using wood biomass for heating (57 %).

Slovenia is one of the countries with the greatest biodiversity in Europe and has a long tradition of nature conservation. Close-to-nature forestry management ensures both; exploitation of forests as well as nature conservation. Two pilot areas (protected areas) were included in the Forbio-energy project activities.

THE SEASONAL LAKES OF PIVKA NATURE PARK

The seasonal lakes of Pivka Lakes Nature Park was founded by the Pivka community and covers 140 km². The protected area covers 63 % of the Pivka community area and the whole park is under Natura 2000 protection regime. There

are 11 intermittent lakes in the park, usually full for some part of the year, depending on the annual rainfall. The core area of the park is an uninhabited land with traditionally extensive farming practice. There is a mosaic of cultivated farmland, grasslands, pastures and lake basins. Also, vast

source: Pivka lakes Nature park web site: (<http://www.pivskajezera.si/pivska-jezera>)



The seasonal lakes of Pivka Nature Park,



The Seasonal lakes of Pivka Nature Park

Barriers and potential solutions for increasing biomass production in the protected areas

Through the activities performed in the frame of ForBioEnergy project, a list of barriers was developed and discussed with the main stakeholders in pilot areas. The main barriers that should be tackled for further development of wood biomass sector in the pilot areas are presented in the table below. In order to find solutions for these barriers, an action plan was developed, in which we presented the proposed solutions in more detail.

B1	Social barrier: Small forest owners are not connected/ associated and not interested in active forest management
B2	Social: Small forest and agriculture parcels, which result in higher operational costs
B3	Social and technical barrier: Poor integration of stakeholders along the biomass wood chain
B4	Legislative barrier: Goals from forest management plans are not realised
B5	Economic: High investment costs in biomass heating systems

forests cover a large part of the protected area; there are 9.659,32 ha of forests. 44% are public forests and 56 % are privately owned. Illyrian beech forests with common beech (*Fagus sylvatica*) cover a large part of the protected area and represent the main habitat type. There is also a large

share of black pine stands (*Pinus nigra*), which is a result of afforestation in the past, and some other species also occur (lime, maple, ash, elm and oak).

THE ŠKOCJAN CAVES REGIONAL PARK

The Škocjan Caves is a regional park which covers

The mobilization of forest-wood biomass and the creation of forest-wood supply chains are largely hindered by fragmented forest estates and inactive forest owners. We see the solution in establishing a local forest owners association that will develop further in a more market orientated legal form of cooperation (e.g. cooperative). Within the association, the owners would be better connected and informed about the possibilities of group forest work (harvest, building of forest roads, etc.). Therefore, they would lower the costs of forest management. Through the cooperative they would be able to sell wood together as one company and get higher prices on the market. Following this principle, the possibilities of long-term cooperation along the forest-wood supply chains in the protected area would be increased.

Furthermore, organization of the short biomass production chains would be easier if the producers of biomass were formed in a cooperation. In this way, the traders and consumers within the biomass production chain would communicate only with the representative of the cooperation and not with many small forest owners.

4,13 km² of protected area and 450 km² of the buffer zone which encompasses the entire Reka River watershed. The regional park constitutes a typical "Karst architecture" with its system of caves, collapsing valleys and individual natural monuments. The unique distribution of the flora and

fauna which co-exists in an extremely small area proves that this is a highly diverse region in terms of both biotic and abiotic parameters, and that it is also a vulnerable one. The forests cover 67 % (278 ha) of the total regional park area. The entire area of the park is dominated by thermophilic mixed deciduous forests and thermophilic oak forests. On larger areas, the thermophilic tree species, as a result of afforestation in the past, are mixed with black pine. On some areas, black pine also forms independent stands.

source: <https://www.park-skocjanske-jame.si/galerija/foto>



Škocjan Caves Park



Škocjan Caves Park



Škocjan Caves



Land use of Pivka municipal forest



Forest in the Nature Park of Pivka Seasonal Lakes



Forest work

A more active integration of the stakeholders in the forest management plan preparation would improve the forest management in line with the objectives set in the forestry management plans. Raising awareness and cooperation between the stakeholders is required. For example, park managers would be well informed about the specificities of the area and could contribute to better quality plans with their knowledge. We propose that Slovenia Forest Service organize workshops, where the representatives of the parks would be able to submit specific content proposals.

Currently there are many public buildings within the study area that are still using liquefied petroleum gas (LPG) and heating oil for heating purposes. This represents a big potential for switching from fossil fuels to local biomass. The benefits of this changes are, among others, lower emissions and the creation of new jobs. This fuel switch is also in accordance with the guidelines of the local energy concepts, where it is pointed out that a switch to alternative energy sources is needed. All the public buildings that intend to refurbish the boiler house should also consider switching to alternative energy sources (wood fuels: wood chips and pellets).

Planning a sustainable forest-wood-energy supply chain in the protected areas

Forest Management Plans (FMP) are regularly prepared by Slovenian Forest Service (SFS). Pilot areas are already included in the forest management plan for larger forest units. Due to this, we have prepared the Forest Property

Management Plan (FPMP) for forests owned by the municipality of Pivka (55,8 ha) and not for the whole biomass district. The plan is more detailed and adjusted to the local conditions than the FMP. The main part of this area is under the influence zone of the both pilot areas, and therefore social and environmental functions are emphasized.

The municipal forest area is a predominantly severely changed forest of black pine or a former agricultural area, used as pastures, that are becoming more and more overgrown with shrubs. Because of abandoned agriculture and farming, overgrowing presents quite a big problem. The share of meadows and pastures, mainly abandoned, is high - 36 % of the entire area. The average growing stock for the forest stands is low (136,6 m³/ha). This is a reflection of severely changed forests and a consequence of the ice break, which caused severe damage in 2014. In FPMP we have focused mainly on potentials from overgrowing areas (approximately 93,8 m³/ha). Clearing these areas would provide biomass for wood chips and at the same time preserve the meadows and the species protected by Natura 2000. Clearing the overgrowing areas is only reasonable if in the following years regular maintenance (mowing or pasture) of these surfaces is planned. Wood chips gained from this area would be used for heating municipal buildings. Krpanov dom, the local school and kindergarten are already connected with the district heating system running on wood chips. There is also a potential to include the other buildings nearby (an apartment complex). Wood chips from the municipal overgrowing areas and forests could be used for the production of the required wood chips.



The Results of Local Testing Activities in The Case of Pilot Areas – Croatia



Map of defined Biomass Districts within Velebit Nature Park

Testing activities/results for velebit nature park and the zadar county pilot areas

Croatia has a huge forest potential – almost 45% of the territory is covered in forests. The basic principles of the Croatian forestry are sustainable management, aiming to preserve the natural structure and forest biodiversity, as well as a continuous rise in the stability and quality of the commercial and welfare functions of the forest. All forests managed by Croatian Forests (Hrvatske šume d.o.o.) have a common certificate FSC (Forest Stewardship Council).

Velebit Nature Park is the biggest and the most complex protected area in the Republic of Croatia. With its relief and vegetation diversity it is the most important moun-

Six (6) specific objectives were determined during the drafting of the two *Action plans for a new regulatory framework and permit route in the protected areas for the pilot areas of Velebit Nature Park and Zadar County.*

1. Increase the openness of economic state-owned forests managed by Hrvatske šume d.o.o. in the area of NP Velebit and Lika-Senj County.
2. Enhance the management of private forests in NP Velebit and Lika – Senj County.
3. Increase the security of people and property, with the preservation of biodiversity in the forest areas of NP Velebit and Lika-Senj County.
4. The retention of the population
5. Raising the quality of forests, improving forest openness, purchasing appropriate mechanization, setting up an exclusive collection centre for forest and agricultural biomass, and creating an annual biomass quota by the Croatian forests that the local population / small producers can buy, possibly at a cheaper price.
6. Raising awareness of the local population about updating the state of cadastre, facilitating a simpler / cheaper process of updating the cadastre, encourage maintenance of its land and encouraging the establishment of forestry associations.

tain in Croatia and the Mediterranean. It represents one of the most impressive karst phenomena in the world. Forests occupy 110.494 ha of Velebit Nature Park area. In Zadar County there are 22 protected areas in 6 protection categories. The total surface area of state-owned and privately-owned forests in Zadar County region is 127,606.45 ha. The selected pilot areas of Zadar County within the *ForBioEnergy* project are: Nature Park Velebit (the area located in Zadar County), Nature Park Telašćica and Nature Park Vransko jezero (the area located in the Zadar County).

Administrative and technical barriers to the production of biomass in protected areas

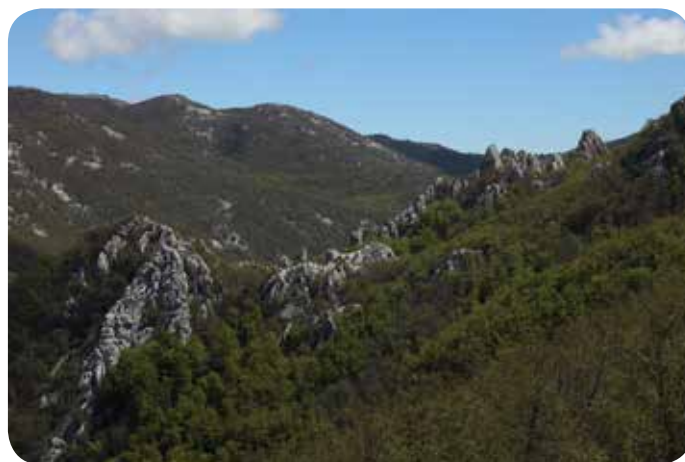
The analysis of Velebit Nature Park pilot areas indicated that it is necessary to increase the production, primarily of the state forests, to meet the future demand for biomass. It has also been determined that the production of privately owned forests should be increased and forest areas cleared of mines.

Within Zadar County pilot areas it was shown that Croatian forests (Hrvatske šume d.o.o.) play a major role in the production of forest biomass. However, they favour larger installations with multi-annual contracts. The limiting factor is the possibility of obtaining a raw material - a spatial tree, which has its own biological limitations, especially in the Mediterranean areas, where forests are mostly low-productive and degraded. The next source of biomass are private forests, but there is the problem of small particles, the uncertainties connected with the cadastre, a lack of forestry associations, a lack of adequate mechanization, all of which makes this source inconsistent and unpredictable.

The Forest Management Plan of the Biomass District

was made with the aim to increase biomass production in an economically viable way on the pilot area of Velebit Nature Park. Retention by FSC certificates and conservation of biodiversity in the area of Velebit NP were marked as very important for Croatian Forests d.o.o., as well as for the Park. In the area of selected Biomass District, the basic task is to evaluate the possibility of changing the prescribed mode of management in pre-harvest logging, which prevents the use of modern forestry machinery. The introduction of forest mechanization (harvesters, lifts, etc.) would enable the forest to be harvested or cut into the so-called strips or circles, and the exploited areas could be accessed for afforestation.

Within Biomass Districts selected for the pilot areas of Zadar County, it is possible to cut all wood mass from the burned areas in one go (4.500 m³), but for planning a sustainable wood-energy supply chains it is necessary



Public institution Nature Park Velebit, Robert Bogdanić

to ensure a constant supply of biomass. Forest stands of this management unit are special purpose forests. The main goal of the management of all stands within this unit is common, and it is to improve the structure of wood stock with conservation and improvement of forest soil. By supporting and bringing indigenous forest communities into an optimal state, we will achieve their production – wood stock and indirect role – beneficial forest function and within that, the management goals. The aim of forest management, which is bringing the stands into an optimal state on a suitable habitat, can be achieved by tending, thinning and natural regeneration in high quality stands, and conversing coppice forests and shrubbed areas into high forest stands.



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Public institution Nature Park Velebit, Robert Bogdanić



The overall objective of *Planning forest-wood-energy supply chain in the protected areas* is to define the guidelines which contain recommendations for the key actors to establish a new wood-energy supply chain within the biomass districts in the protected Mediterranean areas.

Regarding the chain of gaining biomass for the production of various energy sources such as wood, chips and pellets within Velebit Nature Park, it has been established that there is a unique supply chain stemming from the existing model of the state-owned forest management. Based on the above mentioned, a draft SWOT analysis was developed which should be discussed/supplemented with the relevant stakeholders and recommendations for improvement of the biomass supply chain.

The overall goal of the Forest Management Plan for the pilot areas of Zadar County is to promote biomass energy and encourage local households, as well as other public or private interested persons to use biomass for household heating, but also to produce new wood products. Given the large number of households that already use firewood, replacement of kilns with more modern and efficient



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biomass boilers which would allow for additional energy savings should be encouraged. The best option for the biomass district within Lake Vrana would be heating the offices of the park administration and other buildings used within the park with individual heating systems. However, the restriction is the amount of available biomass from the forests accessible within the protected area, i.e. within the identified biomass area.



The Pilot Areas and the Results of the Local Testing Activities Spain

Current bioenergy status and its potential in pilot areas in Spain

Currently, in the Comunitat Valenciana there is a low level of management plans both in public and private forests, in addition to the low profitability of the forest residual biomass use for energy purposes “high harvesting costs and lack of consolidated market at the local/regional level”.

Nevertheless, even though there is also a low demand of solid biofuels and a poor developed business fabric, it is noted that the forest biomass is a competitive resource in the renewable energy market for thermal/electrical energy. Moreover, this valorisation improves the forest conditions in terms of forest fires prevention and energy diversification.

According to the National Action Plan for Renewable Energies in Spain (*Plan de Acción Nacional de Energías Renovables de España, PANER*) 2011-2020, forest biomass will contribute 10% of the total generation with renewable energy sources. Therefore, although this resource has not yet been guaranteed in a sustainable way over time to make viable minimum-sized facilities that use forest biomass as biofuel, there is an encouraging future for the forestry sector at the local level. Biomass can occupy its rightful place in the “energy mix”, where bioenergy takes a leading role.

Given the situation regarding the accumulation of wood and biofuel that increase the risk of fires and pests, as well as putting the conservation of forests at risk, the Sustainable Forest Management (SFM) is an essential tool to face climate change and the biomass a resource to value.

Forest biomass is positioned as one of the renewable energy sources to be promoted, due to its efficiency in the production of thermal energy and its contribution to the mitigation of climate change.

Nowadays, the strategic challenge is to develop integral bioenergy projects in the rural areas in a sustainable way which can enhance the demand and consequently the silvicultural operations. Hence, scientific-technical analyses on environmental impact of forest operations for biomass mobilisation, across the entire forest-based bioenergy value chain, have to be quantified and evaluated by means of criteria and indicators.

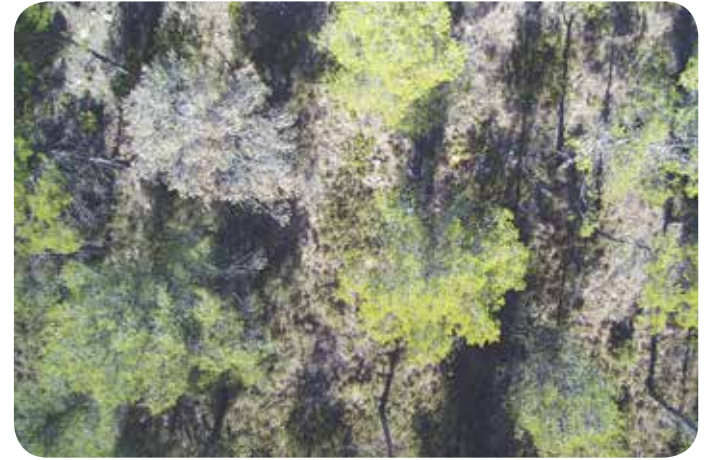
The silvicultural actions implemented under SFM criteria that favour the environmental services which motivated the declaration of the protected areas are synonymous of compatibility “management-conservation”.



Caroig massif area



Caroig massif area



Caroig massif area

Comunitat Valenciana, Caroig Massif, Enguera

Forest context of the Valencian Community

Currently, forest land represents 57 % of the surface of the Comunitat Valenciana and follows a tendency to increase at the rate of 3.000 ha/year. Specifically, there is an abandonment of agricultural crops which have been colonized by pioneer forest species. Regarding the ownership, 55% of forest land belongs to individuals, 39% are public and 6% is unknown. In fact, 76% of forest public ownership belongs to municipalities.

Pilot forest area

In the case of the Spanish pilot area, within the Comunitat Valenciana (CV) (2,325,499 ha, 39.47% protected), the study has been focused on the management area of the “Macizo del Caroig” (195,008.59 ha) in general and in the municipality of Enguera (24,175 ha, 74.55% protected), in particular; being focused on the public forest (MUP) V-074 Navalón.

Barriers and potential solutions for increasing biomass production in the protected areas

Prior to the Plan of Action, ForBioEnergy implemented an analysis of the current situation “lack of management

and socio-economic activity in the forest sector” in which it detects, together with the main actors, all the barriers of different character - legislative, administrative, technical, social and economic, in the forest-based bioenergy value chain.

Specifically, at the Comunitat Valenciana level, there is a lack of forest management and security to guarantee long-term local income. There is no awareness of the benefits derived from forestry activities and certain local conservation groups question whether these are really necessary. In addition, the intensity of the legal restrictions increases, at the same time as the area of forest stands and nowadays, it can be said that there is an excess of environmental regulations, but there is no one that regulates forest management in the region.

In parallel, the lack of empathy among the administration leads to diffused guidelines with arbitrary resolutions or an indefinite strike whose consequences are the loss of rural employment, frustration and discouragement.

The situation derived from the lack of a solid, coherent and objective basis for the technical forest management instruments leads to a decrease in the demand of forest biomass, whose situation is aggravated by the high pressure exerted during forest harvesting (extraction of biomass).

Therefore, it is necessary to establish formulas such as public-private cooperation, mobilizing biomass in a sustainable and active way, as well as promoting agroforestry cooperatives and associative management. This study contains the necessary actions to overcome the barriers and establish a new regulatory framework and permit route in relation to the use of biomass.

Specifically, the objective of the Valencian Action Plan (Action Plan-CV) is to reactivate the use of forest biomass in the region, meeting the needs of the local population, while preserving forests for future generations. It is noted the positive effects on climate change derived from the use of forest biomass as bioenergy due to the reduction of greenhouse gas (GHG) emissions, the substitution of fossil fuels, the reduction of energy dependence and the increase in energy efficiency, as well as the decrease of the risk management due to sudden emissions of carbon into the atmosphere by forest fires



Planning a sustainable forest-wood-energy supply chain in the protected areas

Study area

The MUPs studied have a well-known potential for the biomass resources that could be used for energy purposes. Concretely, Enguera could establish a 2 MW connection point for power generation (*district heating*). In a radius of 20 km it covers all of the forests under study to obtain forest biomass, in addition to the several existing rural roads that facilitate the access of the forest to the plant. According to the Integral and Sustainable Forest Management Plan of Enguera (2014-2034), there is a real possibility of 8.000 tons per year of municipal forest biomass.

The main conclusions derived from the results of the Action Plan-CV in relation to the line of actions to be developed by the key actors are:

1. Definition and professionalization of the Technical Instructions for Forest Management in the Valencian Community: Forestry professional association and public administration
2. Development of consensual and single guidelines to control quantitative and qualitative forestry activities by environmental agents in the execution of the works (clearing, thinning and final cuts): Association of environmental agents and public administration, forest public and private owners.
3. Realization of workshops of the Valencian Forestry Platform (PFV) for communication media on challenges (strengths and opportunities) of sustainable forest management: Valencian Forestry Platform (PFV) and social media
4. Development of courses to revitalize the forestry sector at the local level for forest and/or environmental technicians of the Valencian Community: AMUFOR, University Polytechnic of Valencia y professional forestry colleges.
5. To elaborate tactical level communication plan - training and awareness- based on a working group for forest owners, forest industries, biomass consumers and public entities in rural areas: PFV and specifically; private and public owners, professionals, companies and chambers of commerce.
6. To elaborate a protocol for delegation of powers of the Generalitat Valenciana to local owners' entities of Public Utility Forests: Generalitat Valenciana, AMUFOR, Provincial governments.
7. Development and definition of Models/Guidelines for the management of zones and species to be annexed to the Forestry Resources Management Plan, as a basis for management projects: Managers of protected areas, public administration, professional colleges.



Parco Madonie

The Pilot Areas and the Results of the Local Testing Activities Italy

Italy is particularly rich in forests. According to the National Inventory of Forests and Forest Carbon pools carried out by the National Forest Service, total woodlands cover 10,467,533 hectares, about 36% of the national territory. Of the total area, 83.7% is classified as forest (FAO definition) and the remaining 16,3% as other wooded lands, such as scrubs and maquis. Italy is EU's sixth country for forest area, after Sweden, Finland, Spain, France and Germany. There is a high potential for producing biomass for energy purposes deriving from the sustainable management of forests, as well as from the residuals from permanent crops (olive groves, vineyards and orchards). In Sicily, according to the most recent Regional Forest Inventory, woodlands cover 512.121 ha, 274.454 ha of which are forests (53.6%). The remaining 46,4% is classified as other wooded lands. The pilot area of the project is the Madonie Regional Natural Park, which has been established in 1989 by the Territory and Environment Regional Department. It is extended for about 40.000 ha and includes 15 municipalities. The areas with the highest protection regime (Zone A - integral natural reserve) cover about 15% of the total protected area, while the areas falling within the Zone B (general reserve) cover about 41%. The remaining areas are distributed between the Zone C (protection, only 2%) and the Zone D (development, 42%). The Natural Park also includes 10 Nat-

ura 2000 sites. The use of renewable energy sources is still limited in the protected area. According the Sustainable Energy Action Plans (2011), only 8 out of the 15 Municipalities produce electric energy from renewable sources, and exclusively from photovoltaic plants. The Park's landscape is mainly characterized by woodlands and semi-natural areas, together covering 73% of the territory, whereas 26% is covered by agricultural crops. The forest cover of the Park has over time undergone to significant changes, mostly due to human actions causing a decrease of the original forest areas. The most common forest types are oak woods (with *Quercus petraea* and *Q. pubescens*; 4.200 ha), sclerophyllous vegetation (3.800 ha) and *Quercus ilex* forests (3.790 ha), followed by *Fagus sylvatica* forests (2.670 ha), reforestations (2.214 ha), *Quercus suber* forests (1.618 ha) and mountain and supra-mediterranean shrublands (1.169 ha). The forest types where the woody biomass is mainly concentrated are natural forests dominated by *F. sylvatica* (33%), *Q. ilex* (23%), *Q. petraea* and *Q. pubescens* (20%), and reforestations (13%). In the Park, there is no active bioenergy supply chain related to use of residual biomasses resulting from forestry interventions. Locally, the biomasses resulting from interventions on small surfaces are used for firewood in private households or in the food service industry.

Identification of the barriers

The general objective of the project is the use of the woody residual biomass for energy purposes deriving from sustainable management of forests in the Madonie park. The main barriers across the whole supply chain occurring in the protected area, were identified and described. We aimed to find possible and applicable solutions to overcome the barriers and to identify recommendations for the involved key actors (forest owners, forest enterprises, bioenergy companies, final users, administrations). The key barriers identified for the Natural Park were the lack of forest management plans (FMPs), the limits to the size and typology of biomass plants for energy purposes, and the scarce acceptance of biomass plants due to the feared environmental impacts. The key barriers identified for the Natura 2000 sites were the long time to get the authorization for forestry interventions, the lack of synergies and coordination among the different administrative levels within the protected areas, and the reticence to use biomass in protected areas. For each key barrier, the regional stakeholders, the possible solutions and operational recommendations, have been provided. Through a SWOT analysis, we identified the main strengths in the availability of regional funding programs and the increasing demand for biomass for energy use and heating for domestic use and in public facilities. Among the weakness, the low number of companies operating in the biomass sector, and the lack of sufficient specialization of the forest sector at all levels. The main opportunities derive from the presence of local organized partnerships, and the availability of specific measures within rural development programme 2014-2020 to support the technological development of the forest sector. The main threats are the low awareness of the environmental, and socio-economic benefits deriving from the sustainable management of forests, and the competition for the energy supply, due to the presence of widespread networks for the supply of gas. The Action Plan (AP) has been addressed to the institutions and bodies responsible for the management of the forests in the pilot area, to the key actors for the development of short supply chains and to the whole community of the Park, which are also the main responsible for the implementation of the AP.

The main barriers which hinder the setting up of a forest-wood-energy supply chain technically efficient, and economically and ecologically sustainable, have been identified as follows:

- B1** Administrative barriers (ADM): Lack of forest planning tools;
- B2** Technical barriers (TEC): Limits and obstacles to the development of the forest sector;
- B3** Economic barriers (ECO): Forestry activity with low or null profitability;
- B4** Social barriers (SOC): Hesitancy in the exploitation of the biomass in protected areas and the unwillingness of local actors to the cooperation and association.

The main solutions for the ADM barriers are the drafting of the FMPs at territorial level, and the promotion of agreements for the establishment of associations between public and private actors. The main goal is the simplification of the authorization procedures for the execution of forestry interventions in the pilot areas. The main solutions for the TEC barriers are the dissemination activities (e.g. fair events, information meetings, technical panels), the establishment of the regional register of forest enterprises, the adoption of the standard UNI 11660 concerning the professional profile of the forest operator, and the recruitment in the staff of public and private enterprises of graduate personnel specialized in the field of forestry sciences. All these actions aim to strengthen the level of specialization of personnel and technological innovation in the forest sector. The implementation of a Decision Support System for forest planning may be used to identify the Biomass Districts, and for determining the optimum biomass plant size and power. For the ECO barriers, it is necessary to increase the economic value of forest resources. This can be achieved through the assessment of the payment of ecosystem services (PES), informative meetings to boost the participation of forest owners in the RDP calls, the simplification of the access procedures for RDP funds, the dissemination of the knowledge of the main forest certification systems and related advantages. The main solution for the SOC barriers is dissemination activities about the crucial role of the SFM

and silviculture in the conservation of forest resources and biodiversity, about the socio-economic benefits that could derive from the development of the forest-wood energy supply chains at a local level. It will be crucial also activities boosting the forest owners to establish associations/consortia, thus overcoming the major barrier of the high fragmentation of the private forest property.

The Forest Management Plan and the local forest-wood-energy supply chain

The FMP has been drawn up within the biomass district 4 (Municipalities of Petralia Soprana, Petralia Sottana and Castellana Sicula). The connections with the other planning tools (Landscape, Natura 2000 Network, etc.) have been considered, along with the assessment of the impacts of the silvicultural interventions on Natura 2000 habitats. In the BD, forests cover about 2,700 ha (9% of the total area). Forest partitioning was carried out according to topography, hence making each compartment easily identifiable for mapping and location on the ground. 29 compartments falling within the Municipality of Petralia Sottana, and 73 compartments within territories belonging to Sicily Region, were identified. Field surveys have been carried out in 54 parcels with active management to collect dendrometric data. For each compartment, the forest type, the main silvicultural purpose and the silvicultural orientation were provided. The plan of treatment types and silvicultural operations has been provided for each forest type, considering the last and future treatment, as well as the period. The potential biomass available for energy use was obtained considering species-specific diameter thresholds (Table 1); the logs exceeding the thresholds were mostly destined for firewood.



Beech stands in Madonie Park: landscape, Piano Battaglia, Mt. Etna on background

To develop a local forest-wood-energy supply chain, one cannot help but start from the current status of the biomass sector in the Madonie Park, where it is little developed, yet it holds great potential for a next progress. In the last decades, wood chips and pellets, almost all of foreign importation, have gradually become established in the local market, testifying to a growing demand for wood products for energy purposes. In the pilot area, the biomass obtainable from the SFM could feed a short supply chain providing two main assortments: firewood and woodchips. Due to the limited availability of technologically advanced forest machinery, only a simple harvesting system could be realized. The productive chain starts with felling, topping and lopping, and cross-cutting of logs by means of a chainsaw. Wood logging is carried out by means of a winch connected to a forest tractor (uphill) or with polyethylene chutes (downhill). Wood chipping on branches is carried out on tree felling sites by means of small woodchippers, whereas logs could be roadside chipped (if the available space is enough), or in dedicated logistics platforms. Chipping should be preferentially carried out as the fuel becomes necessary, so that the storage time does not exceed 3-4 months. The biomass obtainable from the SFM the pilot area can feed a short wood-energy supply chain for the swimming pool present in the Municipality of Petralia Sottana.

Table 1. The total biomass available during the validity period of the FMP.

Biomass in Sicily Region areas [t]		Biomass in Municipality areas [t]	
I period	II period	I period	II period
15,810	4,767	101	3,717
20,577		3,818	

6.

Communication activities

The communication activities under the ForBioEnergy project foresaw multiple levels of communication: EXTERNAL, which addressed specific target groups, stakeholders and the wider public whose main aim was to widely disseminate project activities; INTERNAL, amongst the PPs and Aps with the aim to guarantee a constant and correct flow of information; within the RES Community and with the MED Programme whose aim was to allow the best communication coordination.

In order to convey meaningful information flow of major stages of the project progress and the main outputs at project start up, the Communication Unit composed by each partner and led by PP7' was established.

The overall objective of the dissemination and communication actions of the project was to raise awareness of the

important role of Public Administration in fostering the development of the biomass sector and to implement a strategic, dynamic and sustainable system that has:

- **Increased the visibility of the project results;**
- **Made the general public more aware of the results and benefits achieved by ForBioEnergy;**
- **Raised specific attention of all stakeholders, specifically policy makers, to the benefits of the projects so as to increase their support for further development of regional pilot plans for protected areas/forest areas/rural areas;**
- **Attracted potential partners to set up projects at the end of ForBioEnergy.**

The communication activities concerned 8 main target groups:

1. Sectoral agencies
2. State administration/ State/Regional authority
3. Local authorities
4. Other public and semi-public bodies
5. Private sector (forest/wood sector enterprises)
6. General public
7. Other- PP, AP, horizontal projects, MED Programme bodies
8. Financial partners (banks, private foundations, etc.).

Main target groups


12
State authority


20
Local authority


32
Universities,
Research Institutes,
forest agencies


12
Sectoral agencies


36
Private sector


4000
Citizens


12
Project partners /
MED

The partners used a variety of dissemination tools/activities to reach all audiences. These included among others the website, articles, presentation of the project to workshops, training courses, events, storytelling (narrative and videos) that were presented during project meetings, and other international events when the project partners illustrated the ForBioEnergy initiative.

Communication outputs

- 2 Project brochures printed in 3200 copies
- More than 70 articles on an international, national or regional level
- 16 Mix of narrative – interviews-storytelling
- 8 roll-up & posters
- 3 Social networks – Facebook, LinkedIn and Twitter
- Press conferences – to create synergies with media representatives as a necessary step for the future sustainability of the project
- 1200 Eco USB stick with all project results and outputs
- 4 Local Community Targeted Events
- 4 Final Conferences
- 11 Attended events organized by the Programme (2) & Greencap horizontal project meetings
- Participating to 17 external events where project partners disseminated and promoted project results
- ForBioEnergy website, with released outputs, achieved results and potentially new opportunities

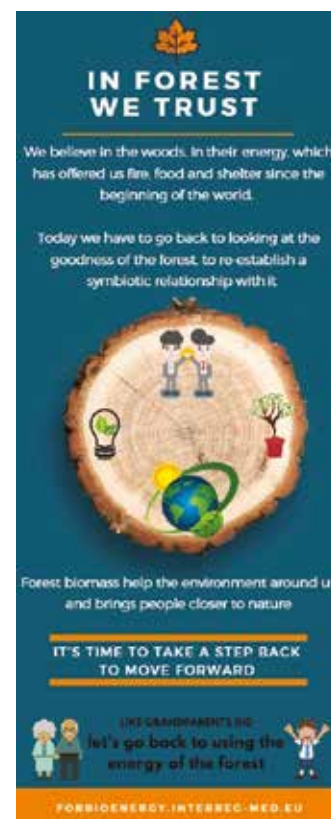
News and events were constantly published, and a colourful photo gallery was updated with relevant images of training, meetings and other project activities in which the key stakeholders participated.

ForBioEnergy organized 4 Local Community events and 4 Final conferences among their partner countries. These events stimulated exchange of project vision, activities, results and experiences in the field of biomass production and encouraged future sustainability beyond project closure.

The communication activities, framed in a communication plan, have allowed to achieve the ForBioEnergy objectives.

On the one hand, internally, it improves the coordination among the partners, as well as monitoring the impact generated by our actions. It allows both to transmit the essence of the ForBioEnergy project to the territory of the participating regions and to establish synergies with other projects through activities organized by the Interreg MED programme, the horizontal project Greencap that represents the Interreg MED Renewable Energy Community.

Therefore, communication has been essential to sensitize society about the importance of implementing an active management and joint actions to unblock the current situation in the forestry sector, both in general and in the forest-based bioenergy value chain, in particular in the protected areas of the Mediterranean.



7.

Transferring activities

The transferring activities ensured the information and knowledge exchange among the local key actors of the 4 partner countries and the transferring of the testing activities results also outside of the current partnership.

Transferring activities focused on the following topics of the testing activities:

- Assessment of threats and benefits of forest biomass harvesting/extraction;
- Action Plan for unblocking administrative barriers;
- Planning biomass for energy: Biomass oriented forest planning and planning of sustainable forest-wood-energy supply chain, policy coordination and integration;
- Planning sustainable forest-wood-energy supply chain and sustainability requirements and quality standards of forest biomass.

So, transferring activities have been coordinated with the testing and communication ones to ensure that there is no duplication/gap but rather a synergy effect.

The transferring activities provided to the key actors with suitable tools to improve biomass exploitation for energy purposes and to make possible sustainable energy models of forests through the development of policy papers and methodologies for planning and optimizing the biomass value chain in the protected areas.

Transferring activities have been addressed to the following key actors/target groups:

- authorities competent to propose/change norms, regulations and plans (policy makers, public authorities, management bodies of the protected areas, energy agencies etc);
- environmental associations;
- energy and forest enterprises;
- technicians and professional associations that deal with bioenergy and biodiversity issues.

All project partners contributed to the implementation of transferring activities according their thematic competences. Associated partners played a relevant role in testing replicability of project results as well as in transferring them in their areas/field of influence.

The aims of the transferring activities have been achieved through 3 concrete tools: Technical panels, Training courses and Agreements.

The **“Technical Panels”** ensured the information exchange and the active involvement of the regional and local key actors according their competences and capacities in the achievement of the main project results. A panel was established in each pilot area. The methodology adopted has been shared by all partners in order to ensure the comparability of the data and information and to permit the transnational transferring and the use of the project results.

In each country 6 workshops were organised: two workshops in the plenary session at the beginning and at the end of this activity and four thematic workshops. The results of the four thematic workshops were a useful reference for the implementation of the testing activities to which they referred to. For this reason the organization and schedule of the workshops was closely linked to the WP3 activities and took place during the implementation period of the testing activities to which they are linked.

Mostlyach workshop was attended by 20 to 30 participants that were selected in a careful and balanced way, involving qualified key actors, experts in the faced thematic topics,



Transferring activities

knowledgeable on the economic and social local needs, with a crucial role in the decision making process linked to the biomass chains development. Participants were invited to provide technical contributes and solutions for overcoming the criticalities identified during the specific thematic workshops, regarding the forest planning aimed at the biomass production for energy use in the protected areas.

Panels created a close and long-lasting collaboration among key actors and contributed to a better understanding of the topics treated during each thematic workshop, ensure the identification of shared and integrated actions.

The continuous comparison between partner countries' technical panels ensured the exchange of knowledge and possible solutions to the identified criticalities, facilitating the "learning from others" and enforcing the achievement of transnational processes in the project implementation.

The **Training courses** purpose was transferring and making efficient use of the available knowledge and project results, both in the framework of the project and after its end in order to make enable PPs and key actors to look at longer-term developments.

Each training course was attended by 20 to 60 participants that were selected among the key actors which can make the best use of them in the most adapted way, as policy/decision-makers, technicians and students.

Training courses were organized not only in the partner areas but also in other areas through the support of the associated partners and of the horizontal project.

In each country 6 training sessions were organized that focused on the project results and on the other relevant Eu-

ropean projects and initiatives linked to the topics of testing activities. A Technical Library was created for gathering all documents/deliverables relevant from ForBioEnergy project and the already available deliverables of other EU projects/

initiatives linked to the topics of ForBioEnergy project.

Taking advantage of the previous transferring activities (Technical panel and Training), the partners worked on setting-up and promoting two different **Agreements**, among the policy/decision makers who shape the regulatory and authorization process and the technicians who deal with plans, who were already involved in the workshops and the training courses:

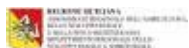
1. Agreement on the Action Plan for unblocking administrative barriers
2. Agreement on the integration of bioenergy issues in strategies/plans regarding rural areas

The aim of these agreements was to review the current regulatory framework and permit a route for the use of biomass in the protected areas and the integration of bioenergy issues in the strategies/plans regarding the rural areas in order to develop integrated and coordinated strategies for the use of the forest biomass and the development of forest-wood-energy supply chains in the protected areas.

Complying with the transnational approach of the MED Program, the agreements were conceived to be a reference document in the EU level of ensuring the transferability of project results outside the partners countries and at the end of the project.

The relationships established in the framework of transferring activities will contribute to spread the know-how and the results gained during the project implementation, not only at a local level but also at a regional and national level, in order to favour high levels of replicability all over the MED Program cooperation area.

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