



Valorisation of forest biomass for Energy production in MED protected areas

Synthesis report on the ForBioEnergy Project

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This document has been realised by

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Introduction

The overall objective of the ForBioEnergy project is to foster the **bio-energy production from forest in the protected areas** of the Mediterranean, providing transnational solutions to reduce barriers hindering 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. ForBioEnergy transnational cooperation have had a dual function:

1. Identifying the most significant gap of administrative systems that prevent the use of forest biomass for energy purpose in the participating regions
2. Identifying best practices that will enable the regions to remove barriers and overcome obstacles that to now have not found solution within its borders.

The present document has been elaborated by the Interreg MED Renewable Energy Community, in collaboration with the ForBioEnergy project partnership, to give an overview of the main results and outcomes obtained by the project in terms of technical results and also contribution to the model developed by the Community of *Ecosystemic Transition Unit or ETU*. This model has been built on the basis of the activities and results of the 6 modular projects belonging to the Interreg MED RES Community and dealing with:

- > **ForBioEnergy**: Forest Bioenergy in the protected Mediterranean areas
- > **PRISMI**: Promoting RES integration for smart Mediterranean islands
- > **COMPOSE**: Rural Communities engaged with positive energy
- > **LOCAL4GREEN**: Local fiscal policies for Green Energy
- > **PEGASUS**: Promoting effective generation and sustainable Use of electricity through microgrids
- > **StoRES**: Promotion of higher penetration of distributed PV through storage for all

An *Ecosystemic Transition Unit* is a territory implementing its energy transition taking into account an ecosystemic approach, based on the following main pillars: technological (energy facilities), social (energy community), legal (energy governance) and territorial (energy planning). As a conclusion of these 3 years of work, both for the project and for the Interreg MED RES Community, but also as a starting point for the implementation of the *ETU* at territorial level and consequently transferring and capitalisation of the results of the projects of the community, it was important to underline better the different contribution each project gave to the *Ecosystemic transition Unit* Concept.

The present document is composed by the following main sections:

1. a general section, with the main features of the project and its general outcomes
2. a technical section dedicated to the results of the project pilot activities
3. a policy section, synthetizing the main recommendations of the project
4. a section dedicated to specify the contribution of the project to the “Ecosystemic Transition Unit” model

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Title of the project: ForBioEnergy – Forest Bioenergy in the Protected Mediterranean Areas

Countries involved: Italy, Slovenia, Spain, Croatia

Partners and associated partners:

1. Sicily Region – Councillorship for Agriculture, Rural Development and Mediterranean Fishing – Regional Department for the Rural and Territorial Development (IT)
2. Municipality of Petralia Sottana (IT)
3. Enviland Ltd (IT)
4. Slovenian Forestry Institute (SI)
5. Regional Development Agency Green Kast Ltd (SI)
6. The Forestry Municipalities Association of Comunitat Valenciana (SP)
7. Zadar County (HR)
8. Public Institution Nature Park Velebit (HR)

Associated partners:

1. Madonie Natural Regional Park Authority (IT)
2. Savjetodavna služba (HR)
3. Natura Jadera (HR)
4. Italian Agriforestry Energy Association (AIEL) (IT)

Budget:

- > Project total budget: 2.048.847,48 €
- > Project ERDF grant: 1.741.520,36 €
- > Duration: 32 months

Testimony of lead partner

ForBioEnergy developed innovative planning tools and operating procedures aimed to exploit the full potential of forest biomass in protected areas reducing the barriers that hinder the development of the bio-energy and at the same time preserving the biodiversity of the natural areas. Project actions are implemented through a participatory and shared process involving the public and private key actors.



Project outcomes

Main outcomes

- > Identification of common **key administrative and technical barriers** for the production of forest biomass for all participating regions
- > Methodology for the **definition of criteria identifying and describing the biomass districts** functional to the exploitation of forest biomass in a sub-regional and regional energy planning context
- > Realisation of a tool called **Design of open source DSS for the assessment of biomass energy potential**. This tool can be used by decision-making bodies to assess the impacts of various scenarios and to review cost and benefits of decisions to be made.
- > Methodology for **risks and benefits assessment** of impacts derived from the forest biomass production. The assessment concerns the environmental and the socio-economic components and the ecosystem services.
- > **Action Plan** aimed at the setting up of a **new regulatory framework and permit route** concerning biomass use in the protected areas. This plan contained recommendations and suggestions for changing the current regulatory and simplifying the permit route for forest-based bioenergy projects, to reduce the time for the necessary permits and improve the coordination between the different involved authorities.
- > Realisation of a **tool dedicated to Forest Management Plan** of the Biomass district in the protected areas according to two scenarios: 1) current context with many barriers, 2) future scenarios without barriers.
- > Methodology for the **planning and management of sustainable agroforest supply chain** in the protected areas. The plan was developed through identification of a low environmental impact work systems 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 plant and through identification of power plants with technical characteristics appropriate to ensure the environmental sustainability of the biomass transformation.
- > Strengthening the **knowledge and competences of the key actors** in energy planning of forest biomass from the protected areas. In each study area a “Technical Panel” of local key actors was established and training courses addressed to policy/decision-makers and technicians were organised. Altogether in 4 countries 24 technical panels and 24 training courses for transferring past and current know how was organized.

Capacity of replication in other territories

ForBioEnergy has identified common innovative technologies in the bioenergy sector that are replicable in the Mediterranean basin. A set of processes, techniques, models, tools, methods through a shared participatory process as well as the best practices existing in each involved region and determined tools and methodologies can be disseminated and directly transferred into other protected areas of the MED regions.



Contribution to know how and added value

The transferring activities as well as the communication allowed to realised 24 workshops, 24 trainings, 4 local community targeted events and 4 final conferences have contributed to spread the knowhow and results gained during the project implementation not only to the local level but also to regional and national level. ForBioEnergy has produced more than 70 articles in electronic and printed versions, 16 story telling in narrative and video mix, describing project aims, implemented activities, addressed problems, targeted areas, achieved results. Gathered and shared best practices, as well as promoting and disseminating project result by participating in 28 special days, awards, exhibitions, seminars, conferences, fairs.







Pilot activity 1: Barriers and potential solutions for increasing biomass production in the protected areas

Budget: 110.185,00 €

Type of action: Study

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Spain:** Region of Valencia (Comunitat Valenciana)
- > **Croatia:** Nature Park Velebit, Nature Park Telaščica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short description: Examination of the legislative, administrative, technical, social and economic barriers and the possible solutions across the forest-based bioenergy value chain, useful to identify the recommendations for the key actors in order to implement a new regulatory framework and permit route concerning biomass use in the protected areas.

Outcomes:

6 key barriers have been identified across the forest-based bioenergy value chain:

- > 1st: Long-time and complexity of authorization for the extraction of biomass in



protected areas

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

For the common key barriers identified, for all participating regions, the regional stakeholders have been involved in working group to elaborate a proposal of possible solutions and definition of operational recommendations.

Result:

Actual mapping (general flow chart) of common key barriers across the value chain for all participating regions.

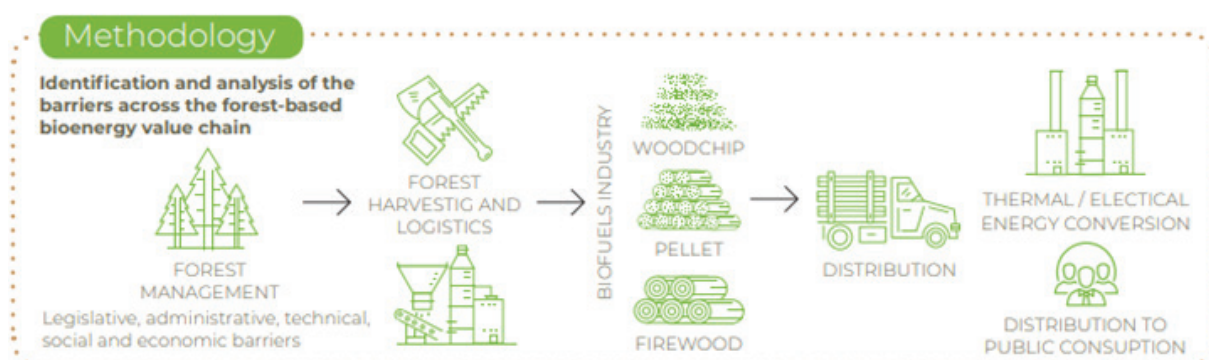


Figure 1 – Methodology for the identification and analysis of the barriers across the forest-based bioenergy value chain



Pilot activity 2: Planning biomass-based energy production at regional and sub-regional level in protected areas

Budget: 123.565,00 €

Type of action: Planning and mapping GIS tool

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Croatia:** Nature Park Velebit, Nature Park Telaščica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short Description: 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).



The project partners developed and implemented a Decision Support System (DSS) for planning biomass-based energy production for each pilot protected area. The DSS supports the Authorities responsible for simplifying, speeding up and standardizing land monitoring and strategic planning procedures. The DSS can 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 can 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 developed on a GIS platform. The model implementation includes the input dataset definition, algorithms selection and output return: the model itself is an algorithm.

Outcomes:

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





Pilot activity 3: Threats and benefits of increase the biomass use in the protected areas

Budget: 108.990,00 €

Type of action: Risks and benefits assessment

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Spain:** Enguera (Comunitat Valenciana) Croatia: Nature Park Velebit, Nature Park Telašćica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short Description: 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 pe-



riods, recognized by the international literature, easily quantifiable and that can be monitored over a period of time. Matrices focus on threats/benefits that the operations for the extraction of biomass in forest areas could generate. The potential impact linked to the threats/benefits was assessed according to two factors: magnitude and reversibility.



Outcomes and results:

Appropriate tool address to decision makers and the operators to assess and monitor the impacts determined by the extraction of forest biomass in the protected areas, considering the social and economic factors characterizing the areas.

The methodological approach focuses on the forest operations that could determine direct effects to the habitats and the species of the protected areas in order to safeguard their ecological functions. Therefore, the adopted methodology guarantees a wide flexibility as well as the transferability in the whole MED area.

The indicators set allow to assess, ex ante and ex post, the forest operations for the biomass extraction and more generally the management of the forest in the protected areas, ensuring the compliance with the conservation objectives established by the management plans of the Natura 2000 sites.

Furthermore, measures and recommendations to mitigate the impacts deriving from forest operations or improve the impact reversibility have been exposed.



Pilot activity 4: Action plan for a new regulatory framework and permit route in the protected areas

Budget: 137.510,00 €

Type of action: Governance tool

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Spain:** Region of Valencia (Comunitat Valenciana) Croatia: Nature Park Velebit, Nature Park Telašćica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short Description: The Action Plan aims to increase the socio-economic and environmental activity in rural protected areas through the valorisation of the forest resources. To achieve it, one of the main objectives 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 the 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. For each action plan, the time frame (short/medium/long), the responsible to face the costs, the estimated budget, the stakeholders to be involved and the indicators for monitoring the effective implementation of the action have been identified.



Outcomes and results:

Action plan for a review of legislation and regulations to draw up a new simplified authorization system functional to the removal of technical and administrative barriers that hinder the use of agroforest biomass in the protected areas.

4 actions plan at the regional level in particular and **1 at the MED partner area** in general have been done. Concretely, at MED partner area 9 Specific objectives, 10 barriers, 17 specific barriers, 22 actions, 45 specific actions and 2 representative case studies have been analysed. The barriers were classified in 4 groups - social barriers, economic barriers, legislative-administrative barriers and technical barriers.

The **specific objectives** of the Action Plan at the MED partner area are the following:

1. 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.
2. Establishment of a **local and short biomass production chain for energy purposes in a circular economy**, promoting the cooperation between private and public actors.
3. Improving the **forest ecosystem quality and stability** in the protected areas.
4. Simplification of the **administrative procedures to elaborate and approve forest management plans** in the Natura 2000 protected areas.
5. Increasing the **skills and technical capacity of forestry companies** operating in the Natura 2000 areas.
6. Re-establishing **agricultural land and cultural landscape** to protect and preserve specific habitats and species of Natura 2000 sites.
7. 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.
8. Elaboration and implementation of a **communication plan** 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.
9. Establishment of a **local forest owners' association** that will develop further in more market oriented legal form of cooperation





Pilot activity 5: Biomass oriented forest planning at local level in the protected areas

Budget: 150.495,00 €

Type of action: Planning tool

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Spain:** Enguera (Comunitat Valenciana) Croatia: Nature Park Velebit, Nature Park Telašćica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short Description: An important result of the project was the drafting of Forest Management Plan (FMP) of a pilot BD for each involved protected area. Each FMP 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 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 firefighting, hydrogeological risk, desertification risk, etc.) have been described. Each management unit includes information about ownership, municipality, biomass district, surface area, main dendrometric parameters, structure, growing stock, yield, biomass, timber assortment, silvicultural treatment, management horizons.

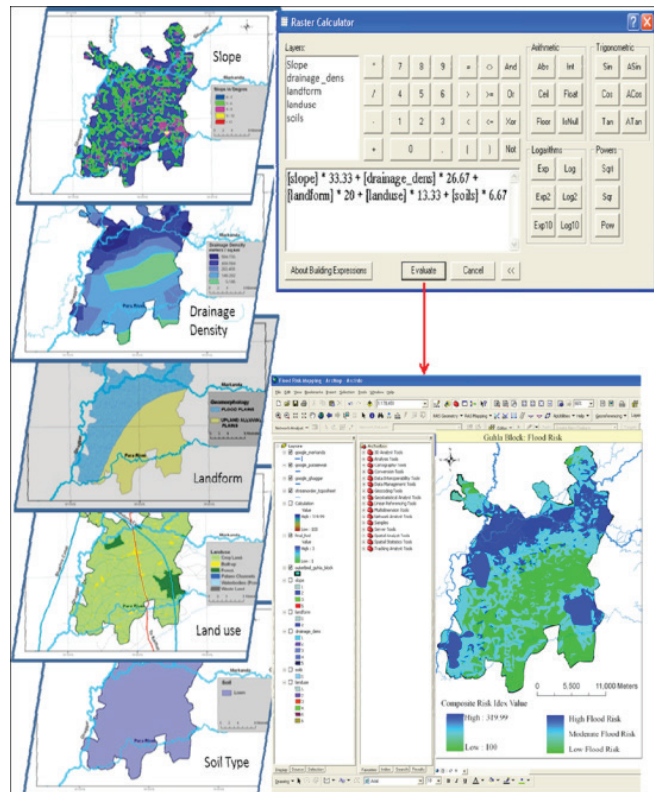
Outcomes and results:

Through the planning biomass-based energy production at regional and sub-regional level and the biomass-oriented forest planning at the local level, in the protected areas, a multi-level planning process has been developed:

1. Sub-regional, useful for the connections with the large-scale energy planning;
2. Local, useful for the development of best practices for sustainable forest management;
3. Operating, useful for planning and management of forest-wood-energy supply chain.

The planning model was defined and shared with the local key actors in the framework of technical panels and was presented to management bodies of the protected areas, bodies competent to forest planning, forest enterprises, technicians, professional association etc. during training courses. This model is now adopting also outside the pilot areas. In addition, a Decision Support System (DSS) has been developed with the aim to support the development of sustainable and short forest-wood-energy supply chain considering the factors affecting the availability of woody biomass. Two options of the DSS are available:

1. **Basic DSS**, called “Forest access”, for the identification of the accessible forest areas, according to slope and road conditions;
2. **Advanced version of the DSS**, called “Analysis”, for the assessment of the quantity and type of available biomass in a given area, the evaluation of the feasibility of the plants and the estimation of their power, analysing different possible scenarios. Since the DSS was developed as open source, it has made available free of charge.





Budget: 127.275,00 €

Type of action: Planning tool

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Spain:** Enguera (Comunitat Valenciana)
- > **Croatia:** Nature Park Velebit, Nature Park Telaščica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short Description: A sustainable supply chain was designed within the biomass district through:

- > identification of low environmental impact work systems 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.



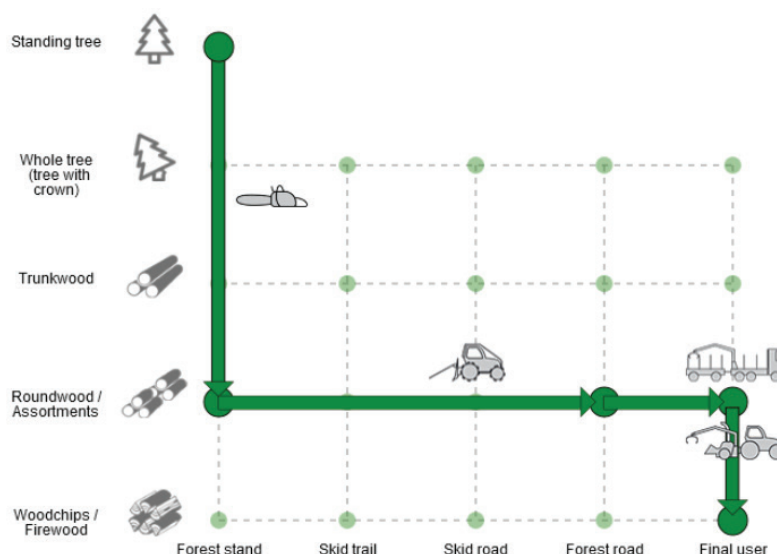


Figure 2 - Mechanized wood chips production chain;
Source: Slovenian Forestry Institute, 2018

Outcomes and results:

Drafting a sustainable management forest wood-energy supply chain within the BDs. The plan provides indications of technical-organizational both in the start-up phase and in the steady operating. Within the activity, it has been defined the criteria for planning sustainable wood-energy supply chains. Criteria are identified in relation to the main success factors registered in the analysis of best practices in the field of exploitation of the biomass for energy purpose. Low environmental impact work systems for forest biomass production, sustainable management models of wood-energy supply chains, more appropriate sites for the storage of biomass and location of processing power plant, and power plants with technical characteristics appropriate to ensure environmental sustainability of the biomass transformation was identified. A sustainable wood-energy supply chain has been planned within the selected biomass district in four countries. This activity has been implemented involving all relevant actors.

Two main outputs of this activity are:

- > **Guidelines for the planning and management of sustainable agroforest supply chain**, containing recommendations for the key actors to establish a new wood-energy supply chain within the biomass district in the protected area. These recommendations have been taken from BIOEUPARKS project guidelines and capacity building material and were adapted to the needs of MED protected area.
- > **Case study of planning a sustainable agroforest supply chain in the protected areas**. Each country involved in the project has prepared a case study for one BD in their protected area.



Pilot activity 7: Quality requirements of biomass from the protected areas

Budget: 127.275,00 €

Type of action: Planning tool

Locations:

- > **Italy:** Regional Natural Park of Madonie (Sicily Region)
- > **Slovenia:** Seasonal lakes of Pivka Nature Park and Škocjan Caves Regional Park (Notranjski krajinski park and Primorsko-notranjska region)
- > **Spain:** Enguera (Comunitat Valenciana)
- > **Croatia:** Nature Park Velebit, Nature Park Telaščica, Nature park Vransko jezero (Zadar and Zadar Ličko-Senjska županija)

Short Description: 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 case study contains applicable possibilities for the standards which are or can be implemented for the wood and solid biofuels from the chosen BD. 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. Commit-



ment 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.

Outcomes and results:

Description of the traceability standards which can be obtained. Furthermore, properties of the solid biofuels and quality standards that are in use for the solid biofuels are identified and listed, along with the information how it can be acquired in the field of exploitation of the biomass for energy purpose. In the last part the types of combustion systems are presented and European standards on biomass heating systems are defined in order to ensure the respect good outdoor air quality in areas using biomass from the protected areas.

Two main outputs of this activity are:

- > **Overview of the existing traceability protocols, quality standards for solid biofuels and combustion technologies** with recommendations for the key actors to use them when establishing new wood-energy supply chain within the biomass district in protected area.
- > **A feasibility study of the chosen wood-energy supply chain in the protected areas** in the view of the possibility to implement traceability protocols, acquire standards for the solid biofuels from the chosen biomass district and choose or propose a combustion system that is in compliance with the standards for biomass heating systems. Each country involved in the project has prepared a case study for one BD in their protected area.



Main recommendations

During the development of the ForBioEnergy project, the following barriers and solutions to overcome the latest have been identified:

Barriers	Solutions
Social barriers	
<i>B1 - High fragmentation of private forests ownership</i>	<ol style="list-style-type: none"> 1. Encourage the establishment of forestry consortiums/cooperatives for the setting up of forest-wood energy chains 2. Update the GIS layers
<i>B2 - Poor acceptance of forest biomass extraction, especially in protected areas</i>	Dissemination in public opinion about the important role of silviculture in the conservation and enhancement of forest resources and biodiversity
<i>B3 - Lack of information and knowledge about opportunities of sustainable biomass use</i>	<ol style="list-style-type: none"> 1. Establishment and consolidation of forest owner's and land owner's co-operative that would offer common forest/land management and marketing of forest/agricultural products; establishment of organisational structures, associations or cooperatives of small forest owners 2. Increase the local community awareness on the benefits of the sustainable forest management aimed at the use of biomass for the production of energy and heat
<i>B4 - Lack of integration of entire forest bioenergy value chain</i>	<ol style="list-style-type: none"> 1. Establishment and consolidation of organisational structures, associations or cooperatives of small forest owners 2. Encourage the installation of biomass boilers
<i>B5 - Overgrowing of agricultural land</i>	Development of forest owner's land and land owner's cooperative that would offer common forest/land management – lower costs of operations and higher income, including the timely update of the cadastre
Economic barriers	
<i>B6 - Low profitability in forest operations for biomass extraction and logistics</i>	Promote the spread of initiatives aimed at increasing the economic value of forest resources, reducing the cost of biomass production
<i>B7 - A high investment costs in biomass heating systems</i>	Reach 80% of the energy needs for heating covered with wood fuels by switching public building to alternative energy sources, through the promotion on the creation of PPPs for the energy needs supply and using the possibilities to receive a subsidy for switching to alternative energy sources
Legislative/administrative barriers	
<i>B8 - Excessive and complex administrative procedures for forest management plans in protected areas</i>	<ol style="list-style-type: none"> 1. Motivating forest owners for implementation of silvicultural measures 2. Establishment of local forest owner association 3. Increase of available funds for financing investments in forests 4. Promote the drafting of FMPs also through the use of RDP funds 5. Promote the drafting of FMPs at local level and strengthening the synergies and coordination among the public bodies responsible for the issue of the necessary authorizations 6. 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



Technical barriers		
<i>B9- Limited technical skills in forest SMEs for harvesting and logistics</i>	1.	Promote the dissemination of knowledge and increase the technical skills necessary for the development of wood supply chains.
	2.	Filling the training and technical skills gap of forest operators and staff.
<i>B10- Lack of clarity and harvesting operations and standardized regulation for forest management plans in protected areas</i>	1.	Elaborate Technical Instruments for Forest Management with a scientific-technical basis approved by forest experts and as an instrument with normative character.
	2.	Consensual and singles guidelines to control the forestry activities. Define criteria for sanctions and stoppages.

Table 1 – Synthesis of the main recommendations elaborated by the ForBioEnergy Project to overcome the identified barriers at social, legislative, administrative, technical and economical levels



Contributions to the Ecosystemic Transition Unit model

The *Ecosystemic Transition Unit* model has been defined by the Interreg MED Renewable Energy Community on the basis of the activities and results of the projects belonging to the community, as a capitalisation methodology of the latests. An *Ecosystemic Transition Unit* is a territory implementing its **energy transition** taking into account an **eco-systemic approach**, based on the following main aspects/pillars: technological (energy facilities), social (energy community), legal (energy governance) and territorial (energy planning).

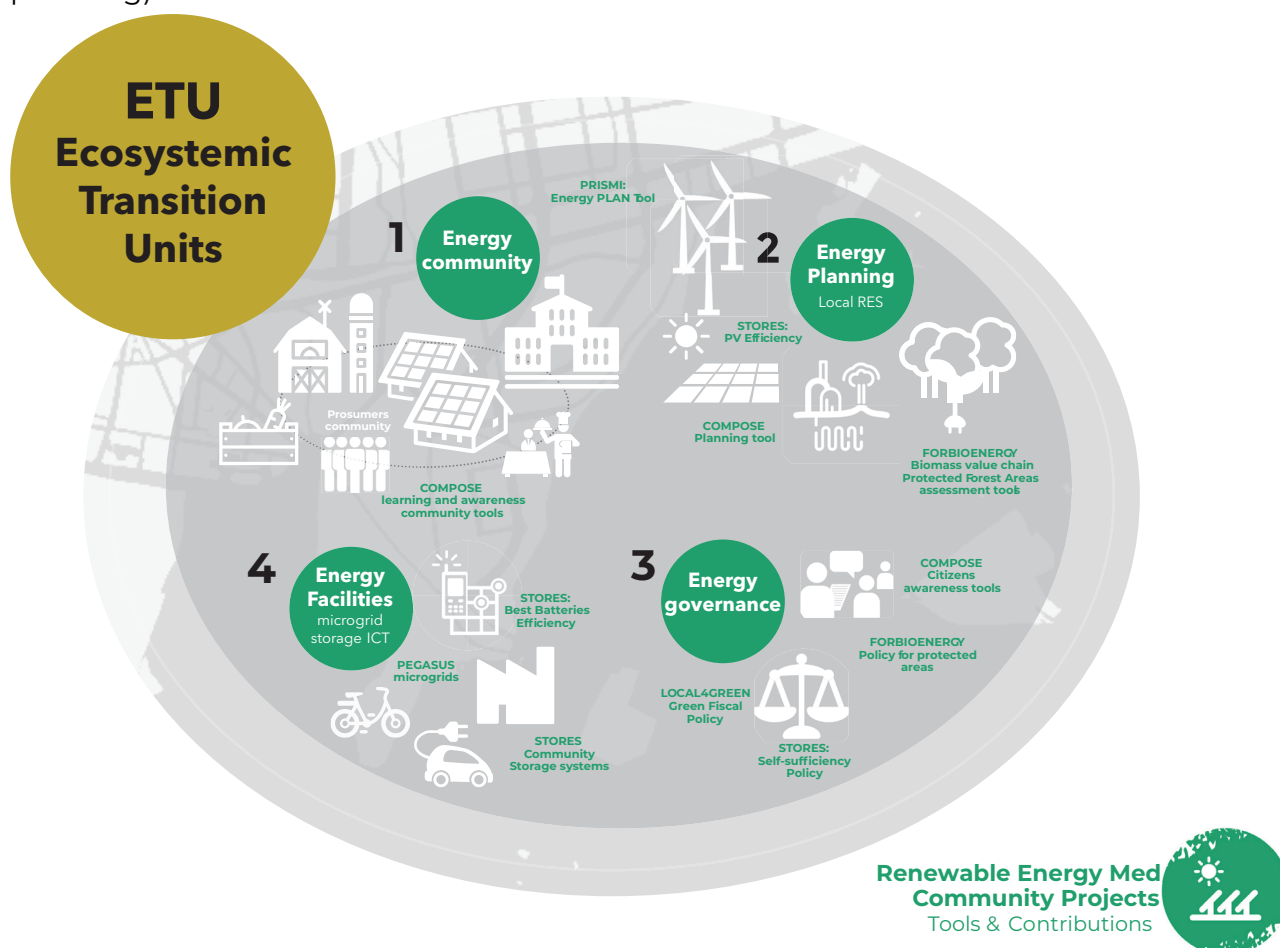


Figure 3 – Scheme representing the 4 components of the Ecosystemic Transition Unit model

In that conclusion phase of the Interreg MED RES community's projects, it is important to understand more precisely the contribution of each project to the general ETU model. Regarding the ForBioEnergy project, it is possible to underline the following impacts on the 4 main characteristics of an ETU:

Energy Community

The numerous activities organised by the ForBioEnergy project to raise citizens and local authorities' awareness on the forest management and biodiversity protection participate to the empowerment of the local communities. Moreover, the project dedicated specific activities to increase the technological innovation of the companies involved in the wood-energy-supply chain and the technical skills of forestry personnel and oper-



ators. These activities will allow to empower all the local biomass value chain, and will allow to create more efficient and innovative projects at local level, and consequently, to revitalise the rural areas involved. The methodologies implemented can be transferred to similar context, consenting to multiply the positive effects of the project at local levels in the whole MED area. The project promoted also the creation of local forest and land owners associations, allowing to improve the management of these kind of land and the empowerment of the owners.

Energy planning

The main contribution of the ForBioEnergy project in the ETU model is part of the Energy planning topic. The project team particularly worked on the sustainable use of forestry biomass in MED protected areas to produce renewable Energy. First of all, the identification of the biomass districts in protected areas and the forest management plan drawn up at the biomass district level, including best forestry practices to preserve and conserve forest ecosystems and to assess the biomass that may be available for the production of energy and heat, will allow to assess the energy potential of the latest biomass districts as one of the first step to implement in the territorial energy planning.

Energy facilities

The ForBioEnergy project dedicated specific activities to increase the technological innovation of the companies involved in the wood-energy-supply chain for more efficient and potentially innovative biomass energy facilities. Moreover, in the sustainable management forest wood energy supply chain plans, power plants with technical characteristics appropriate to ensure the environmental sustainability of the biomass transformation have been identified.

Energy Governance

In order to improve the forest management and the implementation of local project along the biomass value chain, the ForBioEnergy Project promoted and participated to the establishment of forest owner's association, forest and land owners' cooperative, generally for a better governance of the biomass districts in the protected areas.

The MED territories interested in developing their wood energy supply chain will be able to benefit from the following documents and methodologies developed by the project:

- > Action plan to be implemented by the relevant bodies for the drafting of a new regulatory framework and permit route aimed to remove administrative and technical barriers that hinder the use of biomass in the protected areas
- > Quality requirements of biomass from the protected areas
- > Overview of the existing traceability protocols, quality standards for solid biofuels and combustion technologies with recommendations to use them when establishing new wood-energy supply chain within the biomass district in protected area.
- > A feasibility study of the chosen wood-energy supply chain in the protected areas in the view of the possibility to implement traceability protocols, acquire standards for the solid biofuels from the chosen biomass district and choose or propose a combustion system that is in compliance with the standards for biomass heating systems.



Conclusion

ForBioEnergy is an innovative and ambitious project because it bet on the sustainable development of the rural areas using the forest biomass of the protected areas as driving force.

Most of the forest are included in the protected areas, so, 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. And this was exactly the overall objective of the project: fostering the bio-energy production in the protected areas providing transnational 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.

This objective was achieved through the definition of:

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

New transnational models of sustainable management of Mediterranean forests were developed with the aim to achieve the goal of local RES production complying with the biodiversity protection. ForBioEnergy also provided public authorities with planning tools for sustainable forest-wood-energy supply chains related to the use of residual biomass produced by the forest management in the protected areas.

In its final phase, the ForBioEnergy project developed several recommendations to overcome the barriers, identified in the framework of the activities, at social, legislative, administrative, technical and economical levels.

As part of the Interreg MED RES Community, the ForBioEnergy project participates mainly and in a very relevant way to the “Energy planning”, “Energy Governance” and “Energy Community” as *Ecosystemic Transition Unit* components.

As a community, our main work now is to diffuse these methodology and tools already available and tested and to support local authorities to applied it on their own territory.

This report describes very briefly the *modus operandi* of the ForBioEnergy project in order to make the methodology and tools created easily understandable for the local authorities potentially interested in applying it in their process of energy transition. For more details, it is possible to refer to the ForBioEnergy project website (<https://forbio-energy.interreg-med.eu/>) and particularly its deliverable library (<https://forbioenergy.interreg-med.eu/what-we-achieve/deliverable-library/>) and to the Interreg MED RES Community website (<https://renewable-energies.interreg-med.eu/>) and its deliverable library (<https://renewable-energies.interreg-med.eu/what-we-achieve/deliverable-library/>).



