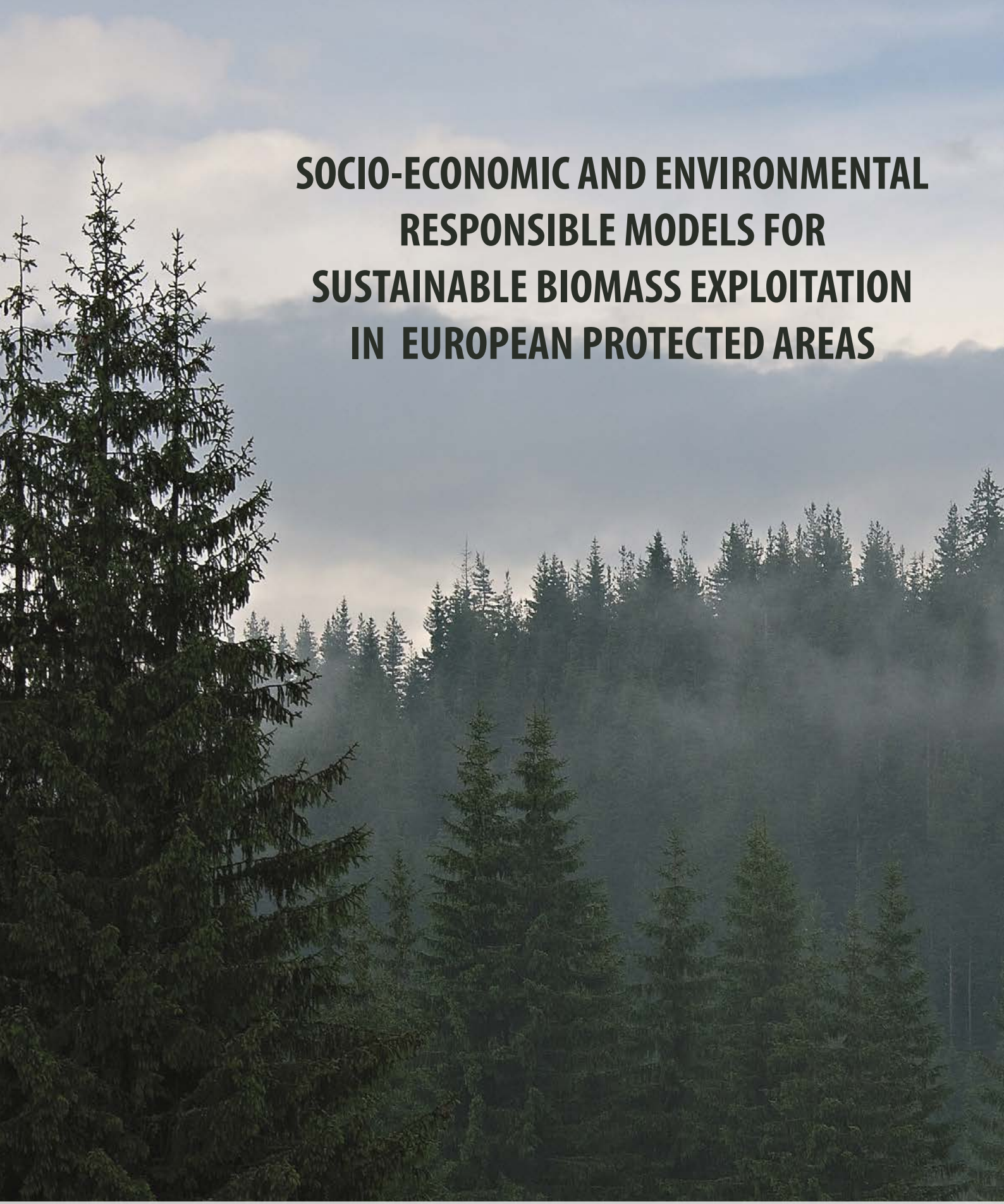

SOCIO-ECONOMIC AND ENVIRONMENTAL RESPONSIBLE MODELS FOR SUSTAINABLE BIOMASS EXPLOITATION IN EUROPEAN PROTECTED AREAS

BIOEUPARKS

BioEUParks

Exploiting the potentialities of solid biomasses in EU Parks

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BioEUParks 2016

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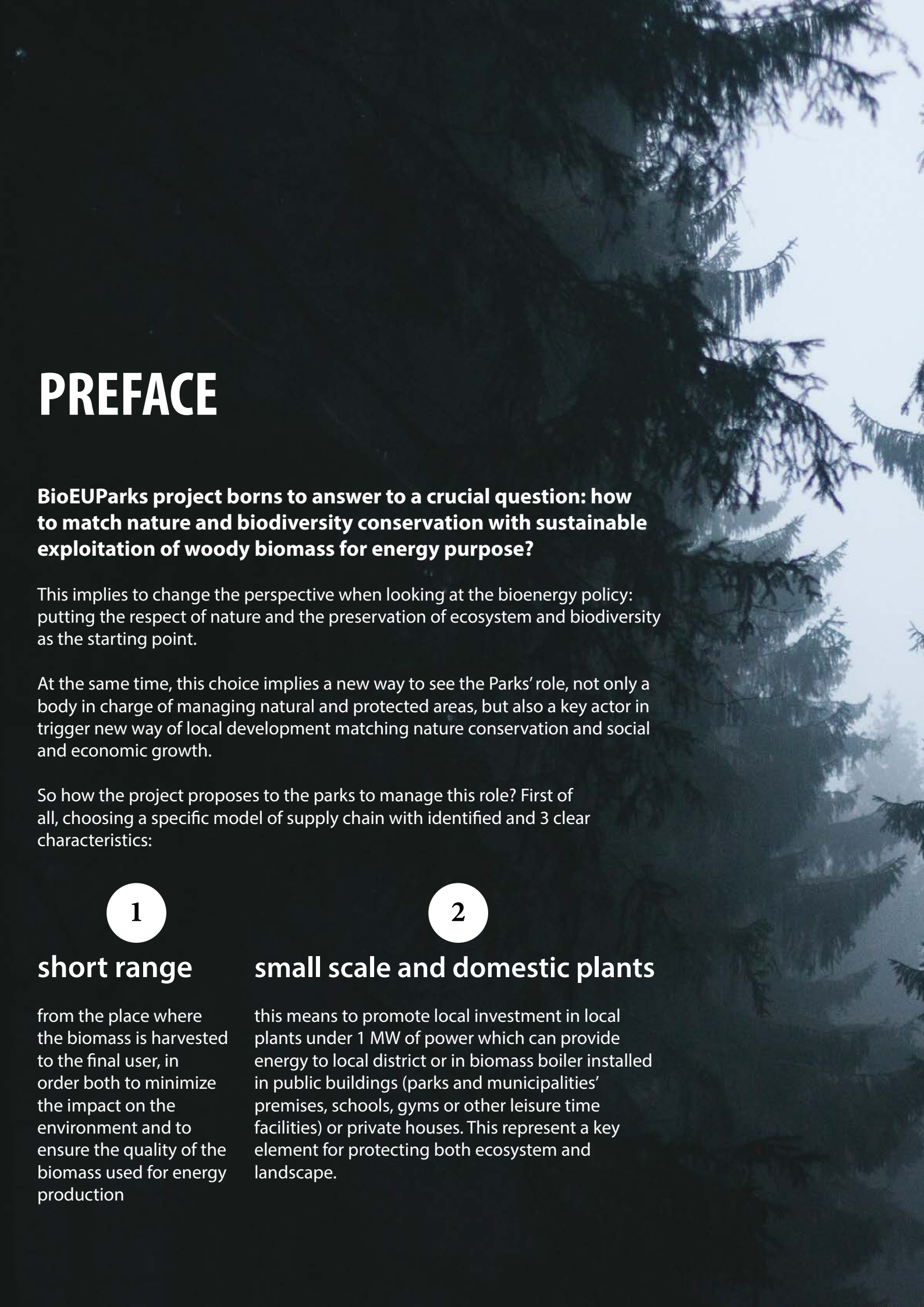


PREFACE

BioEUParks project borns to answer to a crucial question: how to match nature and biodiversity conservation with sustainable exploitation of woody biomass for energy purpose?

This implies to change the perspective when looking at the bioenergy policy: putting the respect of nature and the preservation of ecosystem and biodiversity as the starting point.

At the same time, this choice implies a new way to see the Parks' role, not only a body in charge of managing natural and protected areas, but also a key actor in trigger new way of local development matching nature conservation and social and economic growth.

So how the project proposes to the parks to manage this role? First of all, choosing a specific model of supply chain with identified and 3 clear characteristics:

1

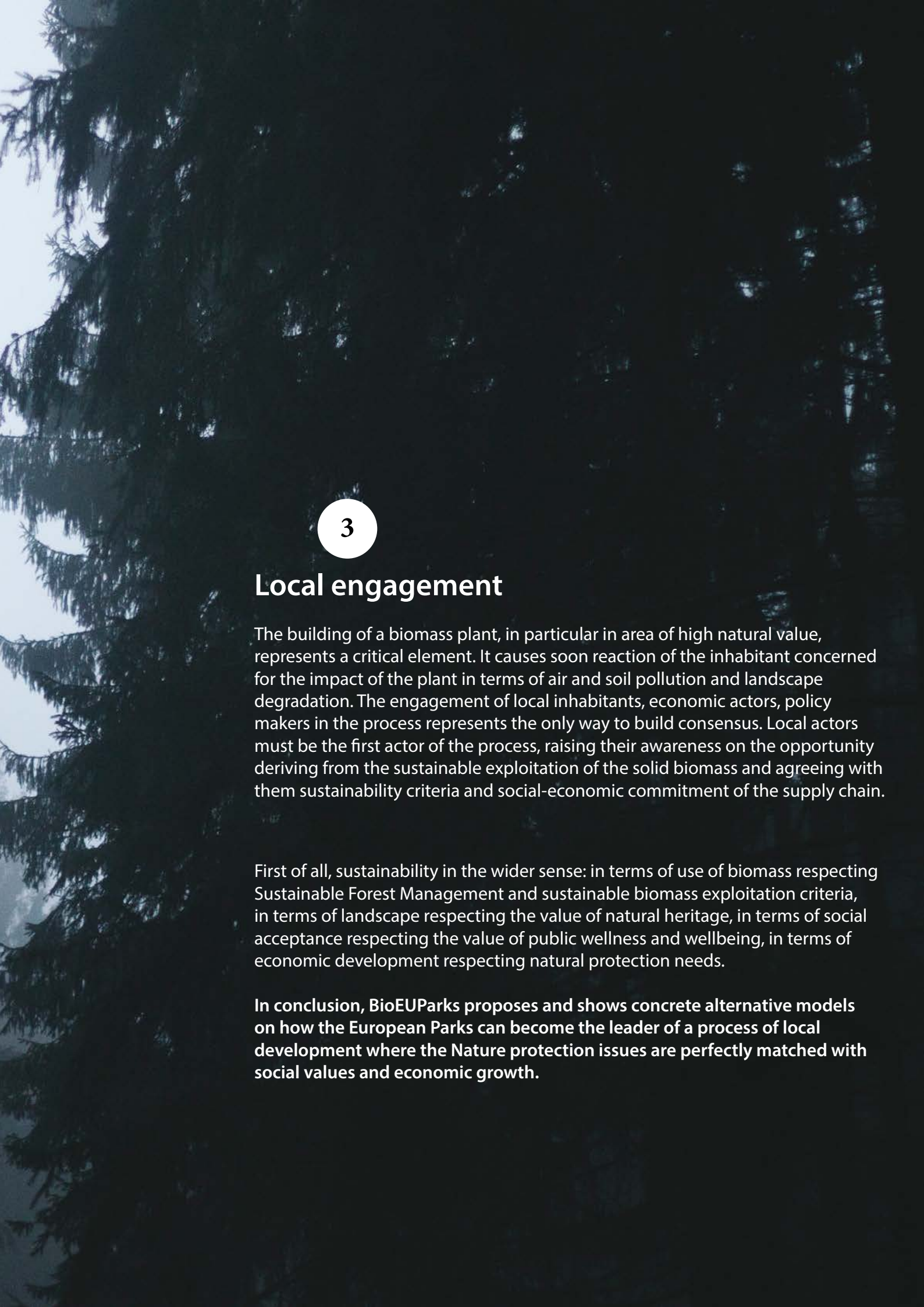
short range

from the place where the biomass is harvested to the final user, in order both to minimize the impact on the environment and to ensure the quality of the biomass used for energy production

2

small scale and domestic plants

this means to promote local investment in local plants under 1 MW of power which can provide energy to local district or in biomass boiler installed in public buildings (parks and municipalities' premises, schools, gyms or other leisure time facilities) or private houses. This represent a key element for protecting both ecosystem and landscape.



3

Local engagement

The building of a biomass plant, in particular in area of high natural value, represents a critical element. It causes soon reaction of the inhabitant concerned for the impact of the plant in terms of air and soil pollution and landscape degradation. The engagement of local inhabitants, economic actors, policy makers in the process represents the only way to build consensus. Local actors must be the first actor of the process, raising their awareness on the opportunity deriving from the sustainable exploitation of the solid biomass and agreeing with them sustainability criteria and social-economic commitment of the supply chain.

First of all, sustainability in the wider sense: in terms of use of biomass respecting Sustainable Forest Management and sustainable biomass exploitation criteria, in terms of landscape respecting the value of natural heritage, in terms of social acceptance respecting the value of public wellness and wellbeing, in terms of economic development respecting natural protection needs.

In conclusion, BioEUParks proposes and shows concrete alternative models on how the European Parks can become the leader of a process of local development where the Nature protection issues are perfectly matched with social values and economic growth.

1. BACKGROUND

What is biomass?

According to the Renewable Energy Directive "Biomass is derived from different types of organic matter: energy plants (oilseeds, plants containing sugar) and forestry, agricultural or urban waste including wood and household waste. Biomass can be used for heating, for producing electricity and for transport biofuels. Biomass can be solid (plants, wood, straw and other plants), gaseous (from organic waste, landfill waste) or liquid (derived from crops such as wheat, rapeseed, soy, or from lignocellulosic material).

Why do we use biomass?

The EU aims to get 20% of its energy from renewable sources by 2020. Renewables include wind, solar, hydro-electric and tidal power as well as geothermal energy and biomass.

The use of renewable energy has many potential benefits, including a reduction in greenhouse gas emissions, the diversification of energy supplies and a reduced dependency on fossil fuel markets (in particular, oil and gas). The growth of renewable energy sources may also have the potential to stimulate employment in the EU, through the creation of jobs in new 'green' technologies.

Among renewable energies, the most important source in the EU-28 was biomass and renewable waste, accounting for just under two thirds (64.2 %) of primary renewables production in 2013.

The biomass must be produced in a sustainable way in order t reduce greenhouse gas emissions. Biomass production involves a chain of activities ranging from the growing of feedstock to final energy conversion. Each step along the way can pose different sustainability challenges that need to be managed.

What is a biomass supply chain?

By supply chain we basically understand a sequence of organizations that are involved in different value performing processes that target to provide products or services for the customer.
Accordingly, a biomass supply chain includes forest owners, forest entrepreneurs, transport enterprises, biomass traders, and –depending on the type of wood fuel – private or public customers. The increasing complexity of biomass supply chains demands step-by-step is even higher when we are implementing biomass supply chains in protected areas.

Wood biomass production chains usually don't start from zero, but they are built from existing organisations or individuals, only identified missing links have to be newly developed.

To develop local biomass production chains inside the protected areas (in natural, regional or national parks), taking in consideration all existing limitations and local specialties, the **main steps to follow are**:

1 Analysis of present situation

or market analysis This kind of analysis gives us an insight on biomass potentials, existing producers, and existing and potential users

DEFINITION OF THE PROJECT GOAL

2 Identification of end users

analysis of end users will give the limits of biomass needed and technical requirements

FIRST PROJECT IDEA

3 Definition of biomass supply

Analysis of biomass supply (theoretical and practical biomass potentials from different sources in the region and from protection areas – taking into account all limitations for protected areas)

BIOMASS POTENTIALS

4 Economical evaluation

Economical evaluation of planned production chain

INVESTMENT COSTS OF BIOMASS PRODUCTION

5 SWOT analysis

Evaluation of possible bottlenecks (weakness, strenghts, opportunities and threats analysis)

EVALUATION OF POSSIBLE BOTTLENECKS

6 Recommendations to investors

Final recommendations for the investors and contracts between different actors in production chains

LETTER OF AGREEMENTS BETWEEN DIFFERENT ACTORS IN PRODUCTION CHAINS

2. THE CHALLENGE

Increasing demand of wood for energy

EU data shows how the consumption of wood for energy is increased in last ten years and it is likely to further increase in the period to 2020.
This represents a pressure factor for all the forest and protected area in Europe. Economic interests are asking for intensifying extraction of primary wood and/or import more wood into the EU and/or mobilise the availability of sources of other woody biomass.

How to react?

There are three main pillars to orient the protected areas managers' decisions and management strategy:

SUSTAINABLE FOREST MANAGEMENT:

An advanced system of forest management based on the concept of multi-functioning is the only way to guarantee the condition for fully exploiting forest ecosystem services. The forest and landscape management activities, also matched with intervention aimed at guaranteeing biodiversity conservation (as alien species removal) imply the production of high quantity of wood material which can represent a good source of biomass, even if frequently of poor-quality.

SOCIAL AND ENVIRONMENTAL RESPONSIBILITY:

Forest represents a key factor of local economic and social development, but the resources of the forest must be exploited according with the principles of sustainability and local communities interest. For instance, tourism could be a key lever of local economy but must be conceived in coherence with nature conservation, as well as, **forest woody resources must be exploited to create new green business opportunity, to promote public wellness and wellbeing and to secure clean and efficient energy source not jeopardizing the natural and biodiversity heritage and the value of landscape**.

CLIMATE CHANGE:

The global warming represents the millennium challenge. Mitigation and adaptation policy and actions must become a "must". These policies imply concrete actions aimed at reducing GHG emission, new development model based on the resource efficiency, circular economy, green production process.

In this perspective also the woody biomass exploitation system must be conceived according with strict sustainability criteria: investing in bioenergy production process which guarantee the higher level of efficiency in terms of energy production and lower level of emission through technology advanced plants and equipment, use biomass resources efficiently under a natural resource, material and land consumption perspective giving priority to higher value uses that allow the reuse and recycling of products and raw materials and promotes energy use only when other options are starting to run out.

This approach concretely prioritizes material use of biomass before energy use since burning implies the raw material being lost. It also prioritizes energy production combined with 'co-products' such as compost or nutrients over energy productions only (**cascading principle**).

3. BIOEUPARKS: THE PROJECT

WHY BIOEUPARKS?

Five EU protected areas decided to take on the challenge to propose their own approach to the themes of the promotion of new and renewable energies and their integration into local environment and energy system contributing to increase the local supply of biomass from sustainably managed forests and to promote its most efficient use in heating plants.

The project objective is to develop, test and transfer a methodology for designing and managing a biomass supply chain into European Protected Areas based on short chains and small-scale installations respecting environmental and socio-economic sustainability in accordance with the Sustainable Forest Management criteria.

The process is managed adopting an approach based on sharing of objectives and co-planning with local key actors which ensure the overcome of the social conflicts that can raise from significant structural interventions.

3. BIOEUPARKS: THE PROJECT

WHAT HAVE THE PARKS HAVE DONE?

The BIOEUPARKS leading principle is the Social and Environmental responsibility which implies a **model of local development made for the local communities with the local communities**.
For this reason, the starting phase of the project was based on an awareness raising and local communities' involvement process aimed at sharing the key concepts of the sustainable biomass exploitation and verifying the basic economic, social and environmental condition for the setting up of biomass supply chain.

All the key local actors were engaged in the process: foresters and farmers, associations, public planners, service providers, local inhabitants in order to obtain a deep engagement in the process.
This participated process ends with the identification of the actors which were directly engaged in the supply chain and the leading social and environmental principle which they had to respect in the development of their new business.

According with the respective background condition, each park identified its own model and directly managed or promoted the setting up of the short range sustainable supply chain.

Even if each model is attuned with specific local needs and challenges there are some key common **criteria followed by all the parks:**

- Production of thermal energy (not electric)
- Short range supply chain less than 50 km from harvesting area to consumers
- Small scale plants in particular biomass boilers with a power around 200 KW
- Direct engagement of local actors (inhabitants, municipalities, economic activities) as end users
- Promotion of local investments

3.1 How many barriers

During the supply chain designing and setting up process the parks faced different obstacles mainly related with market and economic conditions which seriously risk to threaten the whole process:

- **no market condition for setting up of new supply chain;**
- **competition of large thermoelectric plant operating nearby the park area absorbing the whole woody biomass produced in the park area;**
- **high initial investment for installing biomass boilers and plants;**
- **competition of biomass feedstock and heating products (i.e. pellets) imported at lower prices from neighbouring countries** .

3.2 Facing difficulties, finding solutions

Parks were asked to play the not usual role of key leading force of local development process identifying solutions and overcoming strategies which could create the market and economic condition for the setting up of the local supply chains.
In this new role each park, according with the specific features of its own legislative and socio-economic background, developed overcome strategy based on a win-win approach among economic, social and environmental aspects.
In the following chapters, specific focus are dedicated to spotlight the strategy developed by each Park, the respective implementation approach and the concrete results achieved. Nevertheless, it is interesting to provide an overview of the strategy and tools representing interesting solutions to be adapted in other contexts sharing similar problems.

Green Public Procurement:

In a context where all the harvested biomass is absorbed by big scale economic players which act in the framework of solid biomass exploitation model not respecting environmental and social-responsible principles the Public demand of thermal energy or biomass could represent an interesting economic leaver to orient the market toward more sustainable solid biomass exploitation model. In particular, the adoption of Green Public tender which identify strict criteria in term of quality of biomass harvested, sustainability procedures to be adopted along the entire production chain, social responsibility toward local communities, etc is a economic driver able to orient the bioenergy local market.

Leasing:

the installation of biomass boilers in public premises as well as in private firms and houses represents a basic market condition for activating a sustainable supply chain at district scale. Nevertheless, the high initial investments for these equipment represent a relevant barrier which jeopardise the supply chain start-up. A good solution is represented by a leasing scheme between equipment providers and final users foreseeing that the end users could have new pellet burners installed paying a monthly costs covering refuelling, maintenance and amortization of the investment.

Matching of nature conservation and woody biomass exploitation:

the forest must be managed according with sustainable principles which can guarantee their multifunctioning, the conservation of their biodiversity heritage, their resilience and capability to adapt and mitigate climate change, and their capacity to become a source of green development and jobs for people leaving in rural areas.

This implies the development and implementation of innovative managerial approach, which each European protected and natural area has to implement.

One of the key element of this new approach could be the sustainable re-use of the biomass deriving from nature management and conservation activities (such as alien species removal). This organic source could be used in primary production process (such as furniture and paper pulp production) and secondary production process (such as raw material for bio-based products, bioenergy, compost or nutrients) according with the cascading principle.

3.3 Results obtained

Despite the different difficulties tackled during the supply chain setting up and implementation phase, all the parks were able to set up new supply chains or impact on existing ones introducing new sustainability criteria.

The concrete results could be divided in two-folds:

1

Activation of sustainable development process based on exploitation of woody biomass harvested and processed within park area and according with sustainability criteria and respecting Sustainable Forest Management approach. **This process concretely produced:**

- **13705,75 Ton of biomass** harvested and sustainable exploited
- **31981,28 MWh of thermal energy** deriving from local biomass
- **11059,13 Ton CO2 of GHG emission reduction**

2

Development of five different interesting models of local short range biomass supply chain which could represent a reference point for adapting and transferring the approach to other protected areas interested in facing the same challenge. **Specific description of each model is presented in the following chapter nevertheless it is possible to identify three key models** (A,B,C).

A) SMALL SCALE THERMAL DISTRICTS:

This is mainly the case of Austria and Slovenia within BioEUParks project. In this case, **there is one or more small scale (<1MW) Thermal plant providing energy to the local district, municipal and park premises local schools, church, firms and private house.**

Here the challenge is to ensure the sustainability of the production chain mainly concentrating the attention to the origin of the biomass (*from harvesting to utilization in a maximum radium of 50km)* and to the respect of the Sustainable forest management approach and cascading principle.

The main problem in this case is the competition of biomass feedstock and heating products (logs, wood chips or pellets) imported at lower prices from neighbouring countries.

How to convince the plant owner to buy local biomass harvested and processed according with sustainable principles but with a cost higher than the one imported from outside park area?

The answer, identified by the project and tested both in Slovenia and Austria, is to use the lever of the **social responsibility of the local investor**. In fact, they usually belong to the territory and their main clients are local authorities and inhabitants. Thus, for them it is important to show to their clients that the bioenergy production process is based on the respect of the local environment and represents a source of local income, as the biomass produced in the supply chain is purchased by local foresters and farmers.

B) SHORT RANGE LOCAL BASED SUPPLY CHAIN:

In this case, **there are biomass supply chains already running characterized by critical aspect in terms of sustainability of the production chain and landscape and environmental impact.**

This situation could also imply problems for societal acceptance of bioenergy due to the risk for the people health and landscape degradation which it could cause. **Thus, the challenge is to create a new demand of biomass on the local market which could represent an alternative for the territorial entrepreneurs active in the field of woody biomass harvesting and processing.**

The two solutions identified in Italy and Greece within BioEUParks are mainly based on the **setting of pellet supply chains where local forest cooperatives and enterprises manage the biomass harvesting and processing and the production of the thermal energy is made by the end users** (public and private entities) which have converted their boilers from oil to biomass. The path for creating such supply chain follows a two-fold participatory process acting on:

- **Demand side** creating the economic condition for a new biomass request, raising from territorial actors both public, as municipalities or the park itself, and private, as local companies and other economic operators;
- **Offer side** showing to the biomass providers and processors the new business opportunities which can derive from the new local market.

In this process there are several difficulties to overcome mainly related to: the difficulties in aggregating a critical mass which can guarantee the economic sustainability of the new supply chains and the high initial investment cost in biomass boilers and equipment which is a precondition for the aggregating such critical mass. **The solutions proposed to overcome such barriers are:**

- to favour the access to private and public funding instruments (such as leasing scheme or public contribution for thermal plant substitution) which can ease investments in new equipment;
- to activate Green Public Procurement by all the territorial public bodies, Municipalities and Parks, aimed at purchasing local biomass respecting specific sustainability criteria;
- to promote the setting up of purchasing groups for aggregating private demand and to decrease the cost both of the equipment and of the heating products.

C) SPREAD SUPPLY CHAIN NETWORK

In this case, the ex-ante condition is characterized by a **wide forest territories where the management is partially carried out by the park authorities and partially managed by National Forest Company**, a situation quite common in Eastern European countries.

Here the problems have two main dimensions:

1. how to match the primary mission of the Managerial Bodies of forest and nature conservation with the sustainable exploitation of woody biomass;
2. how to aggregate the local demand deriving from several local communities and private households spread in a wide territory.

The solutions identified in Danube Ipoly National Park is based on the **activation of a network of 7 local based supply chains** where the Park itself and the state owned forest company (primarily) manage the harvesting, transport, storage and conversion process and the production of the thermal energy is made by the end users, namely local communities and individual households.

The biomass harvested and processed derives mainly from nature management and conservation activities (also alien species removal) and the biomass end-users aggregation is guaranteed signing cooperation agreements where are fixed long terms agreement for the supply of biomass to local communities and private households.

4. BIOEUPARKS Pilot Cases

ITALY
Sila National Park

GREECE
Rodopi National Park

SLOVENIA
Kozjanksi Regional Park

HUNGARY
Danube-Ipoly National Park

AUSTRIA
Sölktäler Nature Park

4.1 Sila National Park

Sila National Park has been set with the Regional Decree 14.11.2002 (published on the Official Journal num. 63 - 17/03/2003)) and at the same time the Management Agency has been founded. It **includes the territories formerly part of the "Historical" Calabria National Park** (1968). It protects areas of great environmental interest in Sila Piccola, Sila Grande and Sila Greca, for **a total of 73.695 hectares, in 21 municipalities, 6 Mountains Communities, 3 provinces of Calabria Region.**

Being predominantly a mountain and woodland territory, Sila has represented a valuable economic resource for populations that have settled in Calabria since ancient times. This is witnessed by the old sawmills existing in Sila forests and constituting, today, literal examples of industrial archaeology, as well as by the thousands of carbon sinks spread all over the Park, normally in beech woods, that have been used for many years to produce coal.

The present-day role of Sila National Park is to increase and make available to everybody the natural heritage of Sila highland, preserving its rich biodiversity, supporting social well-being, creating cultural added value and attracting tourists; these are all important aspects of a sound territory management.

Forest landscape, having a great biodiversity, is part of a woodland heritage of considerable commission and ecosystem value, suitably to protect and preserve. There are marginal territories too, not involved in the modern development processes, where it is still possible to find places where resources and values have been preserved in their integrity. These same territories need to be optimally exploited by local communities, in order to encourage their recovery, stability and permanence.

The economic income of wood, assured for centuries by the wood crop, has characterized life in the National Park. Locally used as the main building material for houses, the wood has been, and continues to be, the leading production in the carpentry sector of building and in the little semi-industrial and hand-crafted joinery handiworks (picture). The woody essences of larch pine and chestnut-tree are also widely used, due to their features of endurance face of parasites and durability in time; and again the beech, the maple, the oak and even the strawberry-tree and heather, these last used in the ebony field restoration.

EX-ANTE CONDITIONS

Before the project start, all the biomass harvested in the park area was sold to the big scale power plants outside park area in the Provinces of Crotone and Cosenza.
Those plants have a medium-large dimension (15MWe) and produce thermal power for the national network. Thus, the final user is GSE (national manager of energy services). As a consequence, all the energy produced from Sila National Park area biomass enters the national system with no direct advantage for the local territory. No other woody biomass production chain resulted active within the park area.
On the offer side, the forest cooperatives which operate within park area harvest biomass according with the Calabria Region permits which fix quantity of biomass according with identified Sustainable Forest Management criteria.
There was no further possibility to exploit the local woody biomass despite the increasing demand for energy purpose.

On the demand side, beyond the two mentioned big-scale power plants, there is only one small scale CHP plant within park area, in the municipality of Longobucco, which should have started to produce thermal and electric power for the local district, but due to administrative and bureaucratic reasons remained not operative.

The biomass boilers installed in public and private premises are quite few and spread throughout the whole area of the park, so no alternative market for the woody biomass that was present in the park area.

MAIN PROBLEMS AND BARRIERS

According with the situation described in the previous paragraph the main problems and barriers which can be summarized as follow:

- **Competition of medium-large**

Energy plant located outside park area which already absorb all the biomass which is possible to produce within park area according with existent regulation

- No possibility to increase the quantity of biomass yearly harvested within park area
- Most part of the local forest cooperatives (supply chain offer side) are linked with signed contracts with the running energy plant
- Unexploited potential of alternative biomass demand represented by small scale and domestic biomass plants and boilers which are not completely disaggregated
- Shortage of investments in the conversion of thermal system from oil to biomass due to high initial investment

OVERCOME STRATEGY

The parks started a process of local key-actors involvement aimed at verifying the condition for activating a new supply chain respecting the principle of social economic and environmental sustainability. The Park acts on a double dimension:

- **On offer side** it performed a participatory process with all the relevant territorial key actors: forest cooperatives, farmers, associations of category, etc aimed at showing them opportunity deriving from the activation of a new sustainable and local based supply chain and verifying their interest in be active part in it.
- **On demand side** it made a territorial analysis through the distribution of questionaires aimed at detecting the number and location of biomass plants and boilers installed in private premises, in particular in economic activities such as restaurants, hotels, farms, other leisure time structures.

The results of this first step was the following:

- **On the offer side** a group of forest cooperatives express their interest in the process and participate in specific round tables and meetings aimed at identifying the specific operative condition for the new supply chain start up
- **On the demand side** there is no a sufficient aggregated market which could guarantee the economic sustainability of the new supply chain

According with the situation, in order to overcome the problem and create the market condition for the setting up of the supply chain, the Park decided to act directly as supply chain end user and, once converted eight boilers installed in its own premises from oil to biomass, issued a restricted tender open to the local cooperatives, for the purchasing of pellet.

The public procedure to select a supplier of pellets has

been concluded with the selection of La Boschiva sas, based in San Giovanni in Fiore, and started the supply of pellet to the park in the October 2015. The object of the contract concerns the supplying and the delivering of pellets to fuel 8 boilers. The price unit is Euro 4,20 for bag (plus VAT) for the entire duration of the contract. The supplier has to ensure the continuous operation of the boilers through regular delivering of pellets. The total amount of the supply will be 245.5 ton.

In parallel, according with the results of the analysis realized, the parks contacted all the economic activities involved in order to:

- Promote, to the ones without biomass boilers installed, the public funding lines of the National Ministry and the Calabria Region ERDF Operative Programme which can provide resources for the conversion from oil to biomass of the installed thermal system
- Engage the ones which have installed biomass system in a purchasing group which should join the activated supply chain in order to increase the quantity of mobilized biomass and guarantee its economic sustainability in a long term perspective.

This process brings to the **setting up of a Local purchasing group among some economic activities.** The purchasing group, formalized in a private agreement signed in April 2016, will join in the supply chain for the winter season 2016-2017.

OBTAINED RESULTS

The results obtained must be analysed under different perspective:

- **Concrete result obtained** during the project in term of biomass mobilized in the supply chain, thermal energy produced from the new supply chain, investment triggered, Green House Gas emission reduction thanks to the exploitation of renewable energy source instead of fossil ones;
- **Project impact in a medium term scenario** in the territory which implies the possibility to increase the actors involved in the supply chain guaranteeing at the same time the economic sustainability and enforcement of the supply chain and an increasing sharing of the use of local biomass from extra-park plant to intra-park with related impact on local income, social acceptance of bioenergy and environmental sustainability of the production process;
- **Transferability of the model and tools** developed and applied as example on how to deal with the setting up of a local based sustainable supply chain starting from a critical ex-ante market situation.

CONCRETE RESULT OBTAINED	
Biomass stocked	**522 tons** of the overall quantity of wooden biomass harvested in the park area was used to produce 245.5 tons of Pellet object of the contract signed between the Park and La Boschiva sas
Thermal Energy	**1215.23 MWh**
Investment triggered	**400.000€** corresponding to the cost of the conversion of the eight boilers installed in the park premises
Primary Energy savings	**110,59 TOE** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**420.15 tons CO^2** considering a 3,8 tons CO^2 emissions reduction for each ton of oil

PROJECT IMPACT BY 2020	
Biomass stocked	**1.000,00 tons of wooden biomass** yearly harvested in the park area to produce 500 tons of pellet. It is expected to **double** the actual production assuming that at least 10 of the economic activities signatories of the local purchasing group will by yearly 25 Ton of pellet each.
Thermal Energy	**2.455,00 MWH/year** – it is expected to double the actual production assuming that at least 10 of the economic activities signatories of the local purchasing group will by yearly 25 Ton of pellet each
Investment triggered	**500.000€** Conversion of biomass boiler by privates – 10 biomass boilers on an average cost of 50,000€
Primary Energy savings	**225,23 TOE/year** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**855,86 tCO^2e/year**

TRANSFERABILITY OF THE MODEL AND TOOLS

Green Public Procurement:

In the bioenergy sector, the public demand represents a key market driver. For this reason, the widespread of the Green Public Procurement could represent a fundamental lever to ensure the sustainability of the woody biomass exploitation process and, at the same time a tool to promote a model of local development based on social and environmental reasonability.

In this perspective, the model tested by Sila National Park and the tender procedure handled for the selection of the pellet provider could represent an interesting point of reference.
The park, in order to select a pellet provider which will guarantee specific sustainability criteria, opened a restricted tender among a number of biomass providers, which were engaged in the process of local key actor involvement and which have signed a Memorandum of Understanding with the commit to respect specific environmental and socio-responsibility criteria in the whole production process.

The Sila National Park has elaborated a project for the creation of a brand certifying the environmental standards of products and services realised by enterprises in the Park territory.

Accordingly, the pellet produced and supplied to the park must comply with EN 14961-2, type ENPLUS-A1, standards. In particular, **the pellet supplied must be made of pure round wood or residues, not chemically treated by the first processing industry, composed of 70% conifer wood (corsican Pine, douglas fir, etc.) and of 30% hardwood (beech, alder, poplar) and complying with standards laid down in point 9.2 of the regulation, that is:**

- Lower calorific value > 16,5 MJ/kg,
- Water content <10%,
- Ashes <0,7%
- diameter 5-6 mm.

In order to prove compliance with standards, each supply must be accompanied by the ENPLUS-A1 certificate.

Purchasing group:

Other interesting mechanism tested within the project was the activation of a local purchasing group, which is used as **a tool to aggregate local demand of biomass on the territory**.

The purchasing group could at the same time act on both the sides of the supply chain: on the demand side it **could guarantee the reduction of market costs of the heating products** and, on the offer side, it **could contribute to ensure the economic sustainability of the supply chain,** ensuring a stable and aggregated demand of biomass.

In the case of Sila National Park, the purchasing group was promoted among economic actors because they can express a higher individual demand of biomass. Nonetheless, the tool could be used also for private households belonging to the same local communities.

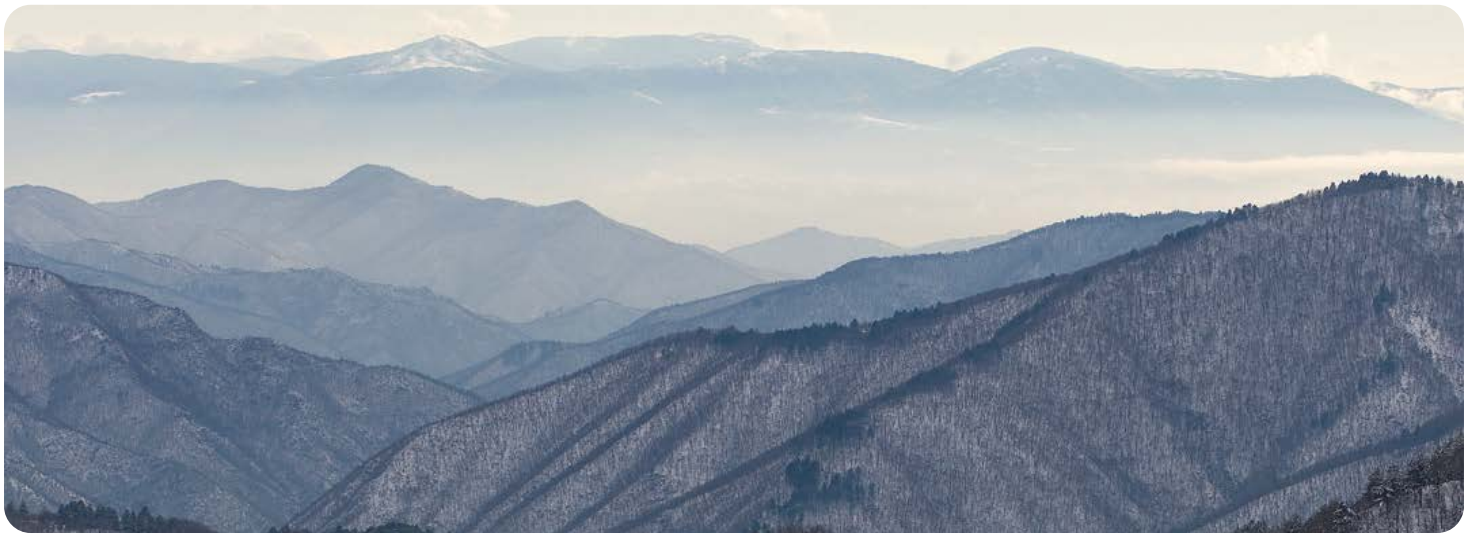
4.2 Rodopi National Park

Rodopi National Park (RNP) covers a wide mountainous area of 173,150 ha in the region of Eastern Macedonia and Thrace, along the Greek – Bulgarian borders. The protected area was established by the Law 3044/2002 and designated as a National Park by the Joint Ministerial Decision 40379/01-10-2009 (GG 445/D/02-10- 2009).

The RNP area is protected by multiple protection regimes at national and international levels: seven (7) sites of the RNP have been integrated into the Natura 2000 network according to the Habitats Directive 92/43/EEC and the 2009/147/EC (two of them being SPA and five SCI); 2 areas within RNP have been characterized as Preserved Natural Monuments, seven (7) areas as Wildlife Reserves (according to the Greek law) and three (3) areas have been characterized by the European Council as Biogenetic Reserves.

The park is one of the most ecologically significant regions in Greece, since inside it can be met all the vegetation zones of Europe, from the European mediterranean zone of the evergreen broadleaves to the zone of cold resistant conifers (Spruce, Scots Pine and Birch). The great majority (97.24%) of the park area is covered by forests and woodlands, while only 2.15% consists of agricultural lands.

Moreover, the park incorporates the most wood productive forests of Greece, included in the "sustainable usage and development" zone, where wood production is permitted through the elaboration of management plans authorized by the local Forest Service.



EX-ANTE CONDITION

In Greece, all the forest are of public ownership and managed by the Forest service. The Forest service signs yearly contracts with forest cooperatives defining the basic criteria for harvesting biomass from the forest.

At the beginning of the project, in Rodopi National Park, except for the yearly loggings in coppice oak woods for heating purposes were coordinated and implemented by the Forest Service, there was no other significant amount of biomass collection. Only private initiative and for the great part for domestic use.

As for biomass plants in the nearby area, **there were only two thermal plants that used biomass** (pellets mainly) and produce steam power for machines in industries production lines. The biggest one is established in a paper production factory in the industrial Area of Komotini named "Elina". The thermal power of this steam plant is 7.6 Mw.

In addition, there were some small heating plants which used biomass established in greenhouses with a thermal power between 0.5 and 1 Mw.

Furthermore, the biomass products market is jeopardized by a **VAT rate higher for processed biomass products** (23%) **than for fossil fuels or raw firewood** (13%) and from the competition of processed biomass heating products (i.e. pellets) imported at lower prices from neighbouring countries.

MAIN PROBLEMS AND BARRIERS

According with the situation described in the previous paragraph, the main problems and barriers can be summarized as follow:

- Total absence of any biomass product market in the area
- Absence of market demand of biomass heating products (wood chips, pellet etc)
- Price competition of fossil fuels due to the favourable VAT rate
- Price competition of biomass heating products imported from Bulgaria
- Shortage of investments in the conversion of thermal system from oil to biomass due to high initial investment

OVERCOME STRATEGY

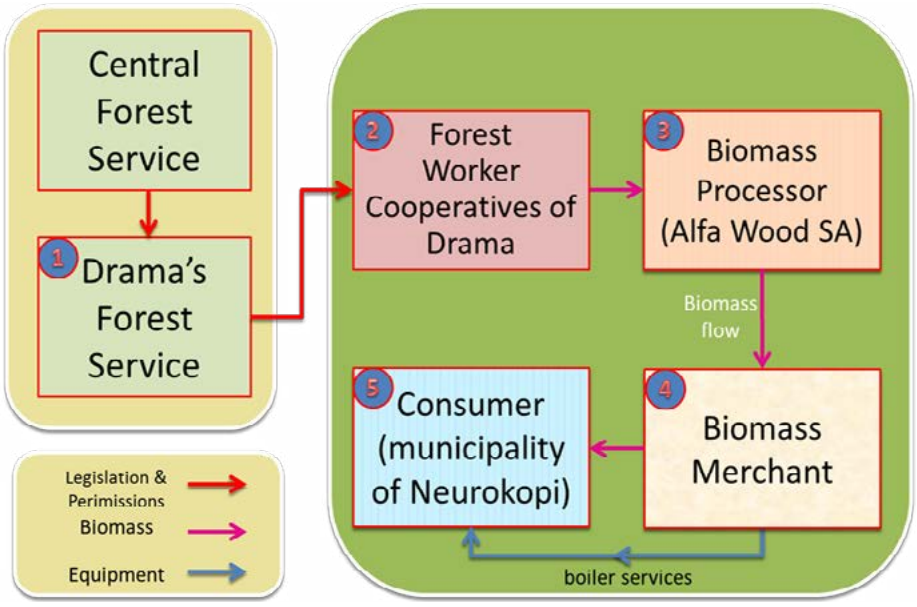
In order to overcome such barriers, **the park started a process of local stakeholders' awareness raising and engagement through the organization of several events, round tables and individual meetings which were addressed to the three main potential actors of a local based pellet supply chain**: Forest service, which is in charge of managing the harvesting permits, forest cooperatives which perform the harvesting phase, potential biomass processors, and municipalities belonging to the park territory as end users.
Thanks to this first phase, during the first heating season 2014-2015, one supply chain was activated involving the Drama Forest Service, 9 forest cooperative (harvesters) 1 Biomass Processor (Alfa Wood) and 1 small municipality as biomass end user.

The innovative solution lays mainly on the relation among Biomass Processor (ALFAWOOD) and the final user (Nevrokopi Municipality). In fact, in order to overcome the economic difficulties of public bodies to convert oil burners in biomass boiler, the biomass processor launched **a leasing program foreseeing that the Nevrokopi Municipality could have a new pellet burner installed paying a monthly costs covering refuelling, maintenance and amortization of the investment.**

In order to further exploit the potential of the new supply chain activates, the staff of the park in collaboration with the forestall department of the Democratic University of Thrace, at the end of the first heating season analysed in details the main issues emerged during the first year mainly concerning the definitive recognition of end users, the refuelling and maintenance of pellet burners, the cost of burner procurement & installation by municipalities and the high fees (imposed by the Forest Service) in forest compartment exploitation from FWC.

These issues were the object of a new phase of discussion and confront with the local stakeholders and the main criticalities have been resolved to a great extent and LSC has been fine-tuned and further exploited.

As a result, in the heating season 2015/2016, the Nevrokopi supply chain keeped on running with an increasing of the biomass mobilized and thermal energy produced. Furthermore, a **new supply chain with similar characteristics was activated in the municipality of Paranesti**.



OBTAINED RESULTS

The results obtained must be analysed under different perspective:

- Concrete result obtained in the first and second heating season
- Project impact in a medium term scenario by 2020
- Transferability of the model and tools

CONCRETE RESULTS OBTAINED	
Heating season 2014 – 2015	
Actors Involved	*Offer side*: 1 Forest Service and 20 Forest Working Cooperatives *Demand side*: 1 private company ALFAWOOD, *End user*: 1 Municipality of Nevrokopi.
Biomass stocked	21,818.80 m3 wooden biomass was harvested from the forest as result from contracts signed by Forest service and forest cooperatives regardless the type of wood product. From this amount 3,227.50m3 biomass is for energy purposes and correspond to the quantity object of the contracts among forest cooperatives and forest processor - ALFAWOOD. From those 3,227.50m3 about 80 tons of processed biomass was purchased by the Municipality of Nevrokopi, the remaining part was sold by Alfawood to the market.
Thermal Energy	396.00 MWh Thermal Energy
Investment triggered	100.000 - 4 pellet burners of an average costs of 25.000 €
Primary Energy savings	36,04 TOE assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	136.94 tons CO2 considering a 3,8 tons CO2 emissions reduction for each ton of oil

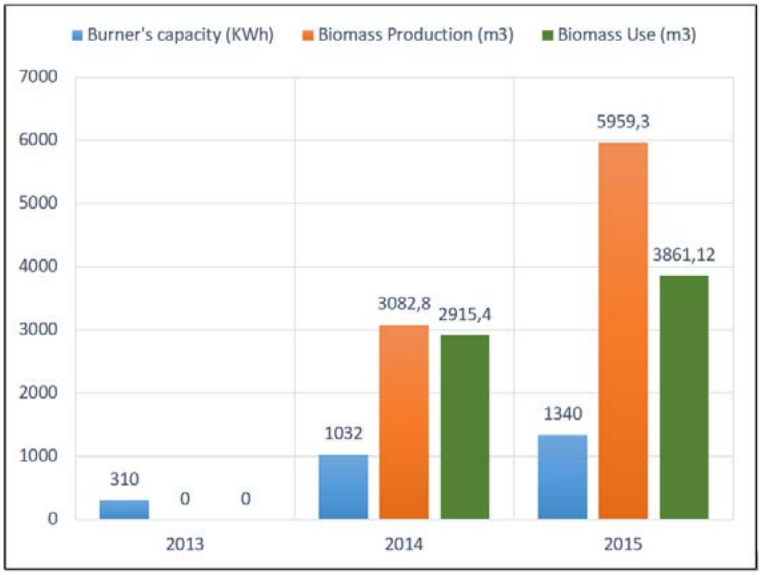
Heating season 2015 – 2016	
Actors Involved	*Offer side*: 1 Forest Service and 20 Forest Working Cooperatives *Demand side*: 1 private company ALFAWOOD, *End user*: 2 Municipalities of Nevrokopi and Paranesti
Biomass stocked	**34,225.68 m3 wooden biomass** was harvested from the forest as result from contracts signed by Forest service and forest cooperatives regardless the type of wood product. From this amount 6,219.70m3 biomass is for energy purposes and correspond to the quantity object of the contracts among forest cooperatives and forest processor - ALFAWOOD. From those 6,219.70m3, about 178 tons of processed biomass was purchased by the Municipality of Nevrokopi, the remaining part was sold by Alfawood to the market. An additional amount of 5,25 tons purchased by Municipality of Paranesti at the end of 2015.
Thermal Energy	**907.09 MWh** Thermal Energy
Investment triggered	**100.000€** - 4 pellet burners of an average costs of 25.000€ each
Primary Energy savings	**82,55 TOE** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**313.67 tons CO^2** considering a 3,8 tons CO2 emissions reduction for each ton of oil

PROJECT IMPACT BY 2020	
Biomass stocked	**445,00 tons of pellet** – Inside the RNP area there are 33 different school units, from which only 4 are participating in the LSC (2 in Nevrokopi and 2 in Paranesti municipality); assuming that 2 new school units will be engaged in the LSC every year adding an average of 2x160 Kw per year, the total burners capacity will rise to 2,580 kw by the year 2020.
Thermal Energy	**2.202,75 MWH/year**
Investment triggered	**250.000€** – Purchase through leasing of 10 pellet burners on an average cost of 25.000€
Primary Energy savings	**200,45 TOE/year** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**761,71 tCO^2e/year**

TRANSFERABILITY OF THE MODEL AND TOOLS

Despite the several barriers which at the beginning of the project made really difficult the start-up of a local based pellet supply chain, the concrete results obtained and the high increased rate from the first to the second heating season in terms of actors involved and biomass mobilized, demonstrate the economic sustainability of the activated process and its transferability and applicability in other contexts.

Two aspects in particular must be highlighted because of particular interest: **the use of the leasing scheme as a tool to overcome the barrier of high initial investment cost of biomass boiler and the local engagement process.**



Leasing scheme

Represents an interesting private business model aimed at bridging the gap represented by the big initial investments in biomass boiler and small scale plants. Alfa Wood a private company active in the market of pellet production and distribution and biomass boiler production launched a leasing program to provide pellet burners under cooperation contracts with 1 to 3 years duration and respective amortization of the investment, while the Biomass merchant provides refuelling and maintenance of pellet burners, through an extra admission on the biomass value.

Local engagement process

In order to promote the use of local pellet, the Greek partners illustrated to all involved actors in the supply chain that the biomass products from the park are different from the imported ones, in terms of environmental sustainability and regional development, emphasizing the fact that feedstock comes from sustainably managed forests, the CO2 emissions from the biomass usage are reduced, the fossil fuels can be limited and local renewable fuels can be produced and used in place contributing to the local economy. The above concept incorporates a strong rational for the adoption of the local supply chain.

4.3 Kozjanski Regional Park

Kozjanski Nature Park (KRP) is one of the oldest and largest nature reserves in Slovenia, located in the Eastern part of Slovenia, stretching 206 square kilometers. It has the status of Regional Park, and is a mosaic comprised of the sub – Alpine Posavsko Hills, wine-bearing slopes, and plains along the Sotla River. The Public Institution Kozjanski park is the manager of the protected area.

KRP is a beautiful territory of pristine nature, with a rich cultural heritage. The beech forest on Mt. Orlica, the grassy slopes of Vetrniki and Oslica, the old orchards scattered across the hillsides, the wetlands along the Sotla Rivers, the gorges and ravines are home to a multitude of plants and animal species, some of which are rare or endangered.

The isolated karst area adds a special quality to the region of Kozjansko, surprising us with sinkholes, dry valleys, spring of rivers, karst caves and chams. The well preserved countryside reflects hundreds of years of people's activities: mighty castles, ancient cathedrals and pilgrimage sites, medieval markets, and characteristic local homesteads with perfectly tilled fields.

The high rate of biodiversity ranks Kozjanski park among the most important nature reserves in Slovenia and Europe, and most of the park (69%) is protected as a special NATURA 2000 reserve. The remoteness of the Kozjansko region has created a uniquely harmonious coexistence of people and nature, of tradition and progress, both essential for modern sustainable development.

The hiking trails, cycling routes, wine routes and many local events presenting our traditional and modern products tie together the natural beauties, cultural landmarks and people.

The protected area of the park, with a wide area of influence, has the status of a biosphere reserve within the project Man and Biosphere (MAB) under the auspices of UNESCO.

EX-ANTE CONDITIONS

In Kozjanski Regional Park, in parallel with the project beginning a Biomass Thermal Plant of private ownership started its running.
The plant located in the municipalities of Kozje has the following technical characteristics:

- Boiler output: 1.5 MW
- Buffer storage tank: 50,000 l or 1 day autonomy
- Wood chip storage capacity: 500 m3
- District heating network: 1.5 km
- Annual thermal production 2,000 MW/year

The Plant provide thermal power to the following end users:

- a primary school
- a health centre
- a kindergarten,
- an agricultural cooperative
- two blocks of flats and
- fifteen individual houses.

The plant was fed by biomass coming from outside park area and in particular from Croatia due to the lower market price.

In the area of the Park there are any data regarding exploitation and consumption of biomass inside the protected area and estimation on biomass use impact on biotic diversity, furthermore there are no forest owners organised to supply biomass to the Thermal Plant.

MAIN PROBLEMS AND BARRIERS

According with the situation described in the previous paragraph the main problems and barriers can be summarized as follows:

- Lack of knowledge regarding biomass exploitation potential in the park area
- No biomass provider organized or clustered to supply biomass
- Price competition of biomass heating products imported from Bulgaria

OVERCOME STRATEGY

The park, in order to create the market condition for the setting up of a local based supply chain, based on the exploitation of woody biomass sustainably harvested and processed within park area Kozjanski Regional Park, worked along two directions:

- **on the offer side** it promotes a clustering process among the local biomass producers aimed at lowering the market price of local biomass,
- **on the demand side** it favours the adoption of a social responsibility approach by the Plant owner underlining the territorial relevance of the exploitation of local biomass both in terms of regional development and environmental sustainability.

This process was implemented through several meetings with the different actors engaged in the supply chain aimed at easing the negotiation process among the two contractual parties, forest owners and plant manager.

Thanks to the action of the Park, in the heating season 2014-2015 one local biomass producer (Damjan Božičnik) signed a contract with Topko energija (Plant owner) **foreseeing that the 70% of the biomass burned in the plant was produced within the park area according with the sustainability criteria.**

The action of the Park keeps on be effective also for the second heating season, obtaining the result to **sign three new contracts for the 2015/2016 were was agreed that 100% of the biomass burned in the Kozje thermal plant was harvested within the park area andfollowing the principles of sustainable forest management.**

In parallel, the park invested 60.000 euro for the substitution of its heating system, purchasing a new biomass boiler for the park headquarter and directly join to the local supply chain as biomass end user. In details for the second heating season three contracts were signed:

- Two for the suppling of local biomass to the Local Thermal Plant: the first among Topko energija and Damjan Božičnik covering the 80% of the biomass burned, the second among Topko energija and GOZD Ljubljana managing biomass for district heating from state forests in protected area covering the 20% of the biomass.
- One contract was signed among Kozjansko Regional Park and Damjan Božičnik (biomass supplier) for feeding the Park Administrative building

OBTAINED RESULTS

The results obtained must be analysed under different perspective:

- Concrete result obtained in the first and second heating season
- Project impact in a medium term scenario by 2020
- Transferability of the model and tools

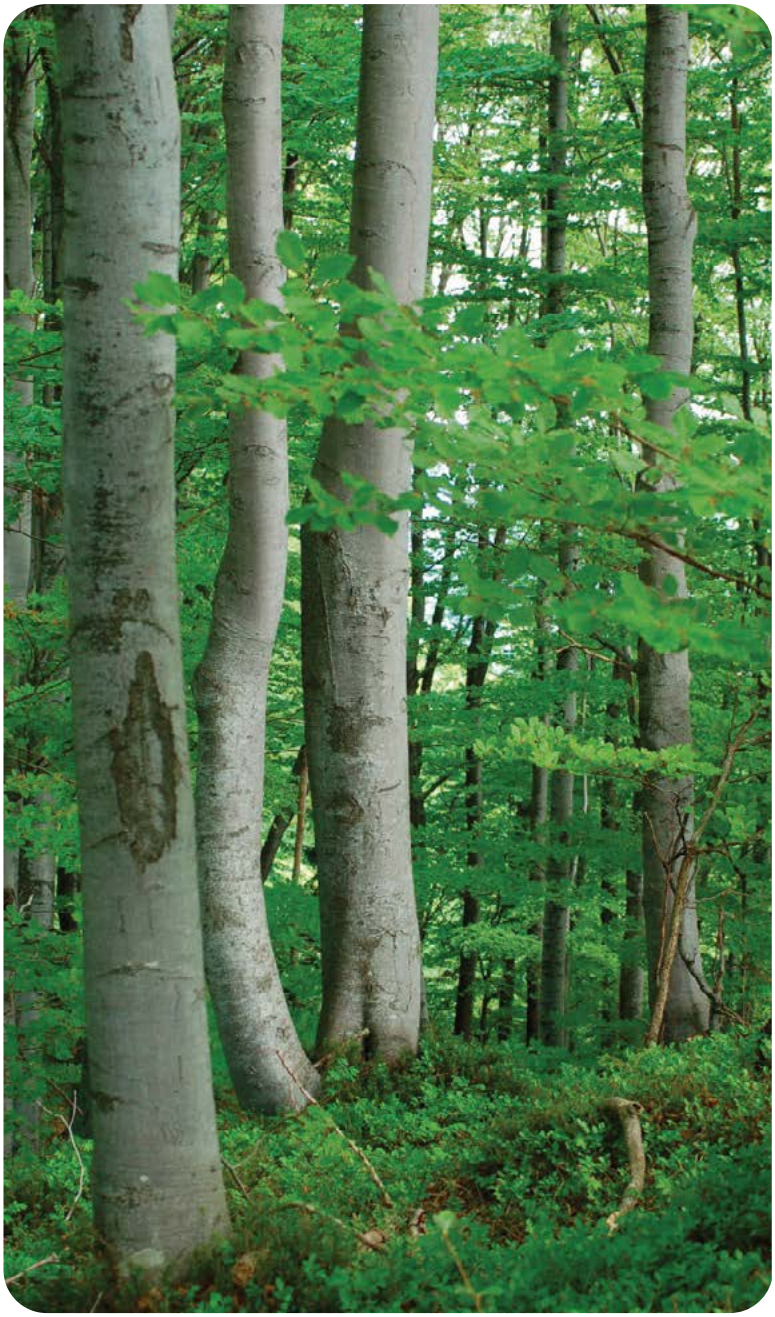
CONCRETE RESULT OBTAINED	
Heating season 2014 – 2015	
Actors Involved	*Offer side*: 1 local biomass producer (Damjan Božičnik) *Demand Side*: Topko energija (Plant owner) *End users*: 45 end users corresponding to the public and private building owners of Kozje municipalities provided with thermal energy produced in the plant
Biomass stocked	870 Ton/year
Thermal Energy	4640,37MWh/Year Thermal Energy
Investment triggered	0
Primary Energy savings	422,27 TOE assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	1604,64 Ton CO2/year considering a 3,8 tons CO2 emissions reduction for each ton of oil
Heating season 2015 – 2016	
Actors Involved	*Offer side*: 2 biomass producers Damjan Božičnik and GOZD Ljubljana *Demand Side*: Topko energija (Plant owner) and the Kozjanksi Regional Park. *End users*: 45 end users corresponding to the public and private building owners of Kozje municipalities provided with thermal energy produced in the plant
Biomass stocked	1392,00 Ton/year
Thermal Energy	7424,59 MWh/Year Thermal Energy
Investment triggered	60.000 euro for the new Park heating system.
Primary Energy savings	675,64 TOE assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	2567,42 Ton CO2/year considering a 3,8 tons CO2 emissions reduction for each ton of oil

PROJECT IMPACT BY 2020	
Biomass stocked	2.000 dry TON year – it is expected that the plant owner extends the pipe net increasing the biomass demand to an around 30%
Thermal Energy	10.667,52 MWI I/year
Investment triggered	320.000€ is the estimated investment for the Extension of the Plant pipe net foreseen by the plant owner by 2020
Primary Energy savings	970,74 TOE/year assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	3688,83 tCO2e/year

TRANSFERABILITY OF THE MODEL AND TOOLS

In the Kozjanski Regional Park, there is a key favourable condition represented by the parallel start up of a heating district, nevertheless without the strong territorial action of the Park, the bioenergy production process would have not been based on sustainability criteria:
it would have implied a higher environmental impact due to the emissions related with biomass long radium transportation, the no respect of sustainable forest management criteria in the harvesting phase and no economic benefit for the territory.

The Park was asked to play a key role in changing the market condition which at the beginning of the project didn't allow the start up of a local based supply of biomass.



The strategic lever used by the Park was the social responsibility of the Plant owner. The end users of the bioenergy produced by the plant are the local inhabitants and for the entrepreneur it is really important to demonstrate that the production process is based on the respect of the local environment and natural heritage and have positive impact on local economy.

Like in the Rodopi National Park, in Slovenia the local engagement process plays a fundamental role in easing the process.

The "hot" themes stressed during the awareness phase, both with the local inhabitants and with the Plant owner, is based on the two pillars of environmental sustainability and regional development, emphasizing the fact that feedstock comes from sustainably managed forests, the CO^2 emissions from the biomass usage are reduced, the fossil fuels can be limited and local renewable fuels can be produced and used in place contributing to the local economy.

4.4 DANUBE-IPOLY NATIONAL PARK

KThe Danube-Ipoly National Park - established on 60,314 hectares on 28 November 1997 - is the most diverse of all national parks in Hungary. In its unique diversity it unites four regions of Hungary, the Pilis–Visegrád Mountains, the Börzsöny Mountains, the Ipoly Valley as well as a part of the Great Hungarian Plain along the Danube.

The national park is destined for preserving the natural values of these mountain forests of specific beauty and habitats along the rivers. The Danube–Ipoly National Park is located in the central region of Hungary, north of Budapest and is connected in several places to the Slovakian border. Some parts of the national park are located in the direct vicinity of the capital.

This means that the area is densely populated and there is a strong need for recreational use and other land use by local inhabitants. The nature conservation manager of the national park and other protected areas in mid-Hungary is the Danube-Ipoly National Park Directorate (DINPD). The 1.354.742 ha administrative area of the DINPD includes 267.566 ha nature conservation sites of community importance (Natura 2000 sites) and areas of different national protection level: the Danube-Ipoly National Park itself, 8 Protected Landscape Areas and 35 Nature Conservation Areas and ex-lege sites.

The overall size of the areas of national importance is 135.000 hectares including a Biosphere Reserve, a European Diploma site and several Ramsar Sites and Forest Reserves of great significance.

EX-ANTE CONDITION

The Danube Ipoli National Park Directorate is the nature conservation manager of the protected sites corresponding to 15,000 hectares of which 2,700 ha forest and the remaining part is mainly grassland.

The protected area suffer conservation problems linked with invasive alien species which are object of specific intervention partially also funded through a LIFE project.

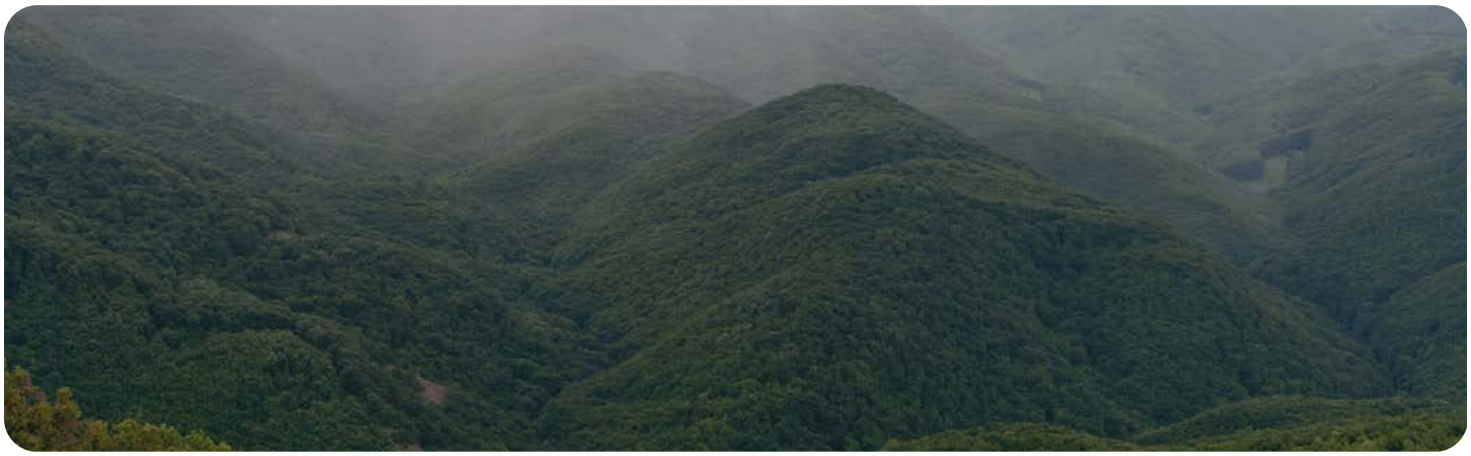
The bigger part of the forest areas are under the responsibility of the Public forestry company, Pilisi Parkerdő Zrt. which manages forests on 57,000 ha, sustainably produced 196,000 m3 wood yearly, 144,000 m3 from protected areas of 42,000 hectares. 33,000 m3 of the yearly production is industrial wood, 163,000 m3 fire wood and woodchips
In the Sas Hill Nature Protection Area there was a biomass plant which was fed by the biomass deriving from forest conservation activities based on the removal of alien species in some area of the park.

At the beginning of the project there were no active supply chains in the park area and there is a potential demand coming from local communities and private households leaving within park area.
Finally, there are any data regarding exploitation and consumption of biomass inside the protected area.

MAIN PROBLEMS AND BARRIERS

According with the situation described in the previous paragraph the main problems and barriers can be summarized as follow:

- Lack of knowledge regarding biomass exploitation potential in the park area
- The bigger part of the available biomass is managed by the Public forestry company whose involvement need time and national commitment
- There is not the legal possibility to sign contract for biomass supply of long term



OVERCOME STRATEGY

In Hungary the park selects a step by step process based on the activation of three different type of supply chains with some key common characteristics:

- **Source of biomass:** all the biomass used for the supply chain derive form from forestmanagement and nature conservation activities
- **Feedstock and harvesting** are always managed by public authority (the Park or the Public forestry company)
- **The identified area of the supply chain** can ensure: stable demand due to the existence of biomass heater and potential investment which can ensure the long term sustainability of the supply chain
- **The end users:** are local communities and private households and firms

The first step was the realization of a territorial analysis for the estimation of the amount of biomass potentially exploitable in the whole area managed by Danube-Ipoly Park and by the Public forestry company.

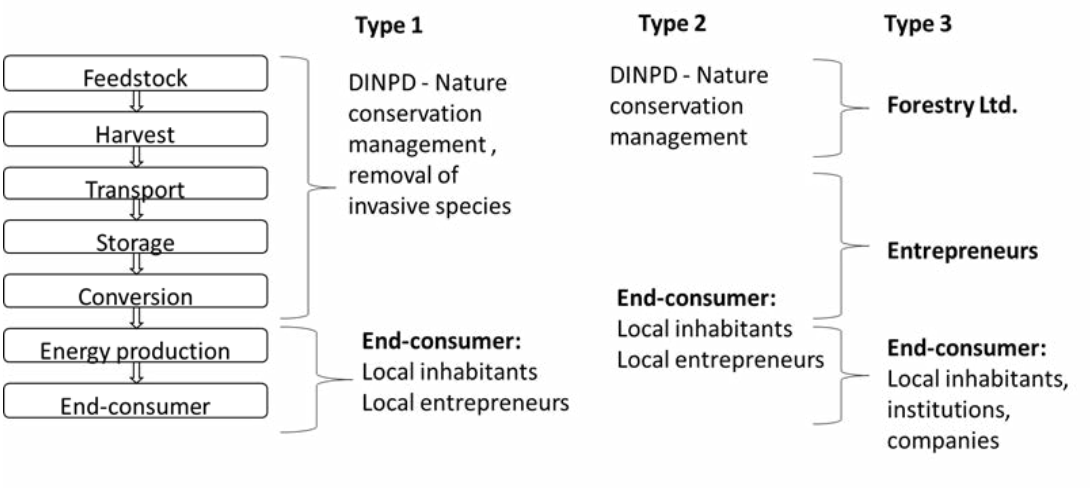
According with the gathered data, the park started with the activation of supply chains based on biomass deriving from nature conservation management directly performed by the Park.

In this case, the Park was both the owner of the biomass and the responsible for harvesting, transport, storage and conversion and the convertor/final users are local inhabitants, institutions of municipalities and DINPD itself **(supply chain Type 1)**.

The second step was the analysis of further source of sustainable harvest biomass. The result was the identification of:

- sites managed by the park but not object of alien species removal action which can provide biomass deriving from nature conservation management, maintenance and forestry management where it was activated supply chains with the same structure of the first but where the local inhabitant directly managed the transportation and storage **(supply chain Type 2)**.

- selected state owned sites in different parts of the protected areas managed by the stated owned forestry companies or privately owned where forestry companies manage the phases of harvesting, private investors and forestry companies itself manage the transport and storage and conversion and the final users are local inhabitants, companies and municipalities **(supply chain Type 3)**.



The result of this long process was the activation of seven supply chains in the two heating season of the project implementation:

- **in the first heating season 2014/2015 three Local Supply Chains (LSC) were activate**, namely, LSC1 Sas Hill (Type 1) LSC2 Ocsa Residential and LSC3 Ocsa Pasta Factory (Type 2)

- **in the second heating season 2015/2016**, beyond the consolidation of the first 3 supply chain activated, **four new were activated**. Furthermore, the amount of biomass used in LSC3 was almost doubled in the second heating season because of the increased demand of the end user after the testing period. Three out of four new supply chains are set up according to type 3 based on the involvement of Pilisi Park Forestry Ltd (PPZrt - stated owned forestry companies) for harvesting, transport and storage in order to achieve the requested volume of biomass. In details: LSC4 – for the institute of the army in Godollo, LSC5 – hotel in Visegrad, LSC6 –based upon the residential supply chain in Ocsa (LSC2) to satisfy the increasing demand of biomass coming from the local communities of the area; LSC7 -activated in Esztergom to feed the biomass boiler in the new animal farm.

During the first heating season, the park faced the problem of long term contracting: public institutions have strict regulations regarding long term contracting and the signing of yearly contract with a huge number of end-users (private households) for small amount of biomass implies an unreasonable administration load.

The solution identified by the Park administration was the use of a Memoranda of understanding signed by the local communities' representatives which fix in a long term perspective the criteria for the purchasing of biomass both for the administration itself and for the inhabitants of the area. This solution was used for all the Local supply chains activated in the second heating season.

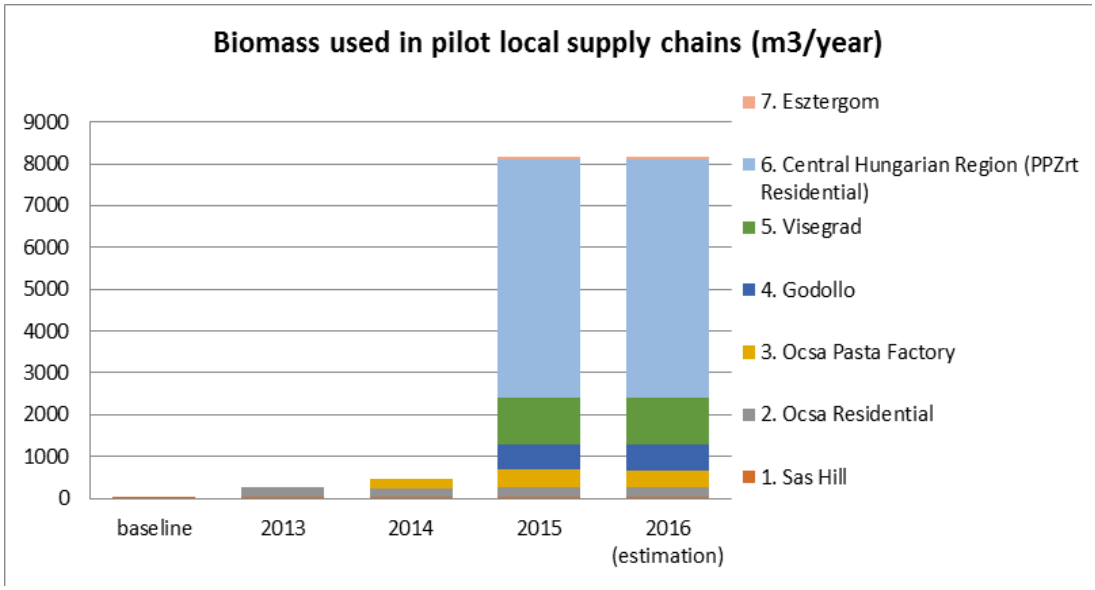
OBTAINED RESULTS

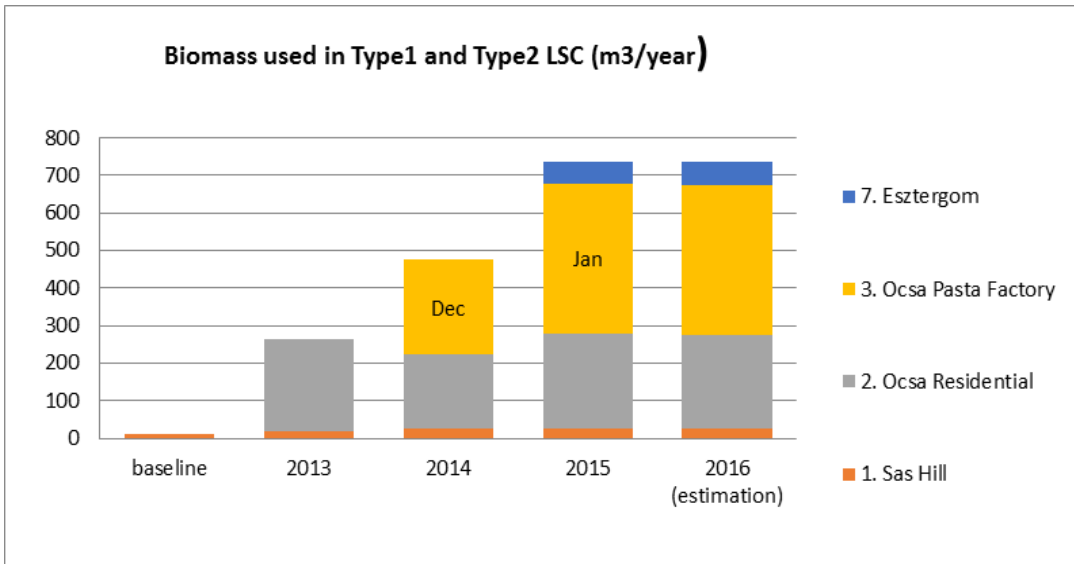
The results obtained must be analysed under different perspective:

- Concrete result obtained in the first and second heating season
- Project impact in a medium term scenario by 2020
- Transferability of the model and tools

CONCRETE RESULT OBTAINED	
Heating season 2014 – 2015	
Actors Involved	***Offer Side:*** Duna-Ipoly National Park Directorate – public ***Demand side:*** 1) Sas Hill Visitor Centre (Duna-Ipoly National Park Directorate) – public (nature conservation administration) 2) Local inhabitants of 3 settlements: Ocsa, Dabas, Bugyi – private (household scale heating) 3) Hungaropasta – private (local company in Ocsa)
Biomass stocked	**474,00 Ton/year**
Thermal Energy	**712 MWh/Year** Thermal Energy
Investment triggered	
Primary Energy savings	**64,79 TOE** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**246,21 Ton CO^2/year** considering a 3,8 tons CO2 emissions reduction for each ton of oil
Heating season 2015 – 2016	
Actors Involved	**Offer side:** 1. Duna-Ipoly National Park Directorate – public (nature conservation administration) 2. Pilisi Parkerdo Zrt. (Pilis Park Forestry Ltd.) – public (state owned forestry company) 3. Eory es Tsa – private (providing transport and conversion services + handler) **Demand side:** 1. Sas Hill Visitor Centre (Duna-Ipoly National Park Directorate)– public (nature conservation administration) 2. Local inhabitants of 3 settlements: Ocsa, Dabas, Bugyi – private (household scale heating) 3. Hungaropasta – private (local company in Ocsa) 4. Hotel Silvanus – private (local company in Visegrad) 5. HM Currus in Godollo – public (Institute of the army) 6. Local inhabitants represented by the municipalities (Inhabitants of Central-Hungarian settlements in LSC6) 7. 7) Animal Farm in Esztergom (Duna-Ipoly National Park Directorate) – public (new animal farm of the DINPD)
Biomass stocked	**10043 Ton/year**
Thermal Energy	**15914 MWh/Year** Thermal Energy
Investment triggered	
Primary Energy savings	**1448,17 TOE** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**5503,06 Ton CO^2/year** considering a 3,8 tons CO2 emissions reduction for each ton of oil

PROJECT IMPACT BY 2020	
Biomass stocked	**10067 dry TON year** – the estimation is based on the projection of the data obtained in the second thermal season plus the new supply chain already planned accounting for 5435 MWh/year
Thermal Energy	**15.952 MWH/year**
Investment triggered	
Primary Energy savings	**1451.63 TOE/year** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**5516.20 tCO^2e/year**





TRANSFERABILITY OF THE MODEL AND TOOLS

The Danube-Ipoly Park study case based on the matching of nature conservation management with sustainable exploitation of woody biomass represents a key example on how the guarantee the forest multifunctioning and the setting up of a model of sustainable supply chain within protected European areas.

In fact, the forest must be managed according with sustainable principles which can guarantee their multifunctioning, the conservation of their biodiversity heritage, their resilience and capability to adapt and mitigate climate change, and their capacity to become a source of green development and jobs for people leaving in rural areas.

The Park, during the project, developed and tested a new model of forestry management based on a win-win situation between sustainable forest management and biomass supply chain activation.

Starting from a nature conservation project based on the alien species removal, the park had the idea to change the problem into an opportunity using the organic material deriving from nature conservation as a source of biomass for feeding local heating systems. Verified the feasibility of the model, the Parks extend its application to all the other nature and landscape management activities creating a sustainable model both under economic and environmental point of view.

There are still problems related to the environmental impact of the emission deriving from the burning of woody biomass for thermal energy production which must be tackled through investments in high-efficient small scale equipment (thermal boilers, CHP plants, etc) maximizing the caloric value of low quality biomass material and minimize the GHG emissions, and incentive scheme both for public and privates easing the wide market uptake of such technology

4.5 Sölktäler Nature Park

Sölktäler Nature Park (SNP) is located in the north-western region of upper Styria in the district of Liezen and the political district of Gröbming. It involves the greater and the lesser Sölktal with the townships of Großsölk and Kleinsölk as well as St.Nikolai.
The Nature Park covers 28,824 ha and extends from the river Enns (670 m) in the north to the most southern peak, the Lachkogel. The highest summit is the Deichselspitze at 2684 m above sea level. The vegetational stages range from the montane altitude zone to the alpine, a few summits are also in the periglacial zone (Badura, 2002).

The valleys morphologies are U-shaped, they were formed by glacial movements during the ice ages – in the Pleistocene the inner alpine landscape was completely changed, the Sölk valleys were also entirely glaciated. In the lesser Sölktal, the ice thickness is estimated to have been as high as 1100 meters, which means that only peaks higher than 2100 m would have emerged trough the ice. These huge glaciers during the ice ages changed the valleys form to powerful trough-valleys (Schneider, 2002).

One of the characteristics of this are the often recurring straight-running segments of valleys. Often over-deepening occur, as seen in the outer Bräualm valley and in the cross-section of Fleiß at the Großsölk stream (Schneider, 2002).

Of geological significance is the position in the Lower Tauern, in the north-west of the mountain range described as the Muriden. The subsoil contains mostly mica slate and Ennstaler phyllite, which is classified as greywacke, both are interspersed with chalk and marble bands.

EX-ANTE CONDITION

At the beginning of the project, in the three Nature Park Municipalities there were three thermal districts supplied by four small scale biomass heating plants: 1 in Stein/Enns district (in Grosssoelk), 2 in St. Nikolai district (in Mössna and St. Nikolai) and 1 in Kleinsoelk.

The biomass heating plants in Kleinsölk, Mössna and St. Nikolai are operated by local farmers using biomass from their own forests. These biomass heating plants used already 100% regional biomass. The biomass heating plant in Stein/Enns is operated by BIOwärme Tasch and used only 20% regional biomass.

On the biomass offer side there were structured private companies which were engaged in harvesting and processing of the woody biomass within park area which in some case also directly manage the thermal plants.

On the bioenergy demand side, all the public and private buildings of the three municipalities are supplied with thermal energy produced by the running thermal plants.
This situation implies that there was an unexploited biomass potential deriving from sustainable forest management and landscape maintenance.

MAIN PROBLEMS AND BARRIERS

According with the situation described in the previous paragraph the main problems and barriers can be summarized as follow:

- Lack of knowledge regarding biomass exploitation potential in the park area
- No market condition for the activation of a new biomass supply chain
- Low oil price and high wood price
- Demographic characteristic of the territory with a population density of 5people/km^2)
- Part of the biomass used for thermal energy production was harvested outside park area

OVERCOME STRATEGY

The Park's effort was concentrated, on one hand, in the **identification of local forester and farmers which can supply local sustainable harvested biomass** for the Stein/Enns plant and, on the other hand, in **convincing BIOwärme Tasch, owner of Stein/Enns plant, to purchase local biomass**.

Thanks to its actions, SNP obtain the signing of an agreement between plant owner and the park itself on June 2015 in which are detailed some key conditions that the operator will respect in producing thermal energy for the local end user which are: municipality Sölk, Sölktäler Nature Park, elementary and middle school, residential houses.

The key provisions of the contract regard the using of biomass harvested, processed, transported and stocked according with sustainability principle and the respect of SFM criteria. **All the biomass used for the thermal year was purchased from 9 local identified forest owners.**

OBTAINED RESULTS

The results obtained must be analysed under different perspective:

- Concrete result obtained in the first and second heating season
- Project impact in a medium term scenario by 2020
- Transferability of the model and tools

CONCRETE RESULT OBTAINED	
Heating season 2015 – 2016	
Actors Involved	***Offer side*:** 9 Forest owners of the park area ***Demand Side*:** 1 /BIOwärme Tasch / Operator of the heating plant in Stein/Enns ***End Users:*** Municipality Sölk, Sölktäler Nature Park, Elementary school, Middle schools, Residential houses
Biomass stocked	**418,00 Ton/year**
Thermal Energy	**772,00 MWh/Year** Thermal Energy
Investment triggered	
Primary Energy savings	**70.25 TOE** assuming that 1 MWh of thermal energy is 0,091 TOE
GHG reduction:	**266,96 Ton CO^2/year** considering a 3,8 tons CO^2 emissions reduction for each ton of oil

TRANSFERABILITY OF THE MODEL AND TOOLS

The ex-ante situation in the park was extremely advanced in terms of sustainable exploitation of solid biomass for energy purpose. The existing model is based on small scale thermal district directly managed by the local farmers who found in the bioenergy market a complementary source of income in parallel with their traditional farming activities.

The Park supported the process guaranteeing the full sustainability of all the activated supply chains ensuring that the thermal plants use locally harvested biomass coming from sustainably managed forests, the CO2 emissions from the biomass usage are reduced and bioenergy is produced and used in place contributing to the local economy.

5. Conclusions and recommendations

The success of the European Union's renewable energy policies during the past decade is undoubtable, with an increase of over 50% share of renewable energy. Bioenergy makes up to 60% of EU's current renewable energy use and more than 90% of the renewables in the transport sector, as biofuels.

The Climate & Energy strategy 2030 aims at paving the way towards a Zero Carbon Economy, and predicts ambitious Renewables & Efficiency targets. In October 2014, the European Council agreed on the EU 2030 targets: to reduce domestic greenhouse gas emissions at least 40% compared with 1990, to increase the share of renewable energy to at least 27% and to boost energy efficiency to at least 27% compared to projections. Nevertheless, these targets are not ambitious enough to keep Europe on track for its 2050 decarbonisation objective or to drive transformational change in Europe's energy system[1].

According to the Commission's document *State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU* (EU Commission, 2014[1]), **biomass has an important role in meeting EU renewable energy targets**. Besides contributing for climate change mitigation, by avoiding the use of fossil fuels, biomass is especially important in countries were other renewable energy sources are not strong enough. The document further advances that, according to the NREAPs estimates, biomass supply is projected to increase by nearly 37% to 132 Mtoe by 2020.

Although the policy objective focus on "a sustainable use of biomass for energy purposes", the current situation is leading to unsustainable changes in land and forest management. **It is crucial to consider that bioenergy is also a source of carbon emissions and can cause a number of other undesirable environmental and social impacts, such as biodiversity loss**[3].

[1, 3] *Pitfalls and potential: The role of bioenergy in the EU Climate and Energy policy post 2020*, NGO recommendations (2016) http://www.birdlife.org/sites/default/files/attachments/Bioenergy_post_2020_NGO%20recs.pdf

[2] *Staff Working Document: State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU* https://ec.europa.eu/energy/sites/ener/files/2014_biomass_state_of_play_.pdf

Green measures

LIMIT TO THE USE OF BIOMASS AND CASCADING USE PRINCIPLE

The target 2030 should be capped to sustainable levels, fixed on the basis of the EU's maximum sustainable potential of domestic biomass supply and take into consideration competing uses in other sectors[1].

Indeed, following the cascading use principle and the waste hierarchy, biomass should be used to create, in first hand, materials and other products, and should only be considered for energy as the last possibility.
In other hand, **waste material from conservation actions** or, for example, **road constructions or maintenance; invasive species removal or any other activity where wood biomass is a sub product, should have a legal framework that enables the materials to be processed for energy production, and not considered regular waste.**

SUSTAINABILITY CRITERIA

Sustainability criteria should ensure that **biodiversity and landscape were preserved when producing biomass**, thus, **only biomass produced following the criteria should be eligible for any type of financial support**[2]. Biomass production should not cause direct or indirect degradation of forests or other ecosystems, nor prejudice species, habitats and soil. Human rights and labour protection should be considered, and local communities should benefit from the implementation of power plants in their region.

CARBON ACCOUNTING

The carbon accounting should include a full carbon footprint, namely: fossil fuel substitution, carbon debt, indirect land use change, displacement of other uses of biomass and, especially, foregone carbon sequestration[3].

Solid biomass exploitation in Protected Areas (PAs)

Biomass represents important benefits, according to the *EU Staff working document*, mainly due its possibility of storage: the capacity of being converted in the highest-peeks of energy demand. In a broader perspective, by incentivising forest management, biomass markets can also contribute to reducing fire risks, thus, helping to reduce the amount of waste being landfilled[4].

Protected Areas overlap most of the Natura 2000 network. They are the main guardians of Europe's nature and have already implemented (in some cases) forestry management actions, especially in areas there have been under some form of active land use in the past. Moreover, **the removal of invasive species can also be a source of biomass within the region, by working with close cooperation with technicians from protected areas**.

In the guidelines **Natura 2000 and Forests**[5]**,** the EU Commission refers that *"the Habitats Directive supports the principle of sustainable development and integrated management (…) by not excluding socio-economic activities from Natura 2000 sites, but rather to ensure that they are undertaken in a way that safeguards and supports the valuable species and habitats present, and maintains the overall health of natural ecosystems".*

On the level of forest management, the Commission has been proving coherent and complete framework; nonetheless, it is up to each Member State to decide the best management procedures of Natura 2000 sites, so a significant part of the procedures regarding forestry management should have been done at national level.

[1-3] *Pitfalls and potential: The role of bioenergy in the EU Climate and Energy policy post 2020*, NGO recommendations (2016) http://www.birdlife.org/sites/default/files/attachments/Bioenergy_post_2020_NGO%20recs.pdf
[4] *Staff Working Document: State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU* https://ec.europa.eu/energy/sites/ener/files/2014_biomass_state_of_play_.pdf
[5] Natura 2000 and Forests, EU Commission, http://ec.europa.eu/environment/nature/natura2000/management/faq_en.htm

BioEUParks project showcased how forest management can preserve ecosystem whilst stimulating local economy. The use of waste material arising from pruning and other field management activities is a great opportunity for protected areas throughout Europe to have smarter and efficient heating systems within the park's infrastructures.

At EU level, there should be delivered specific **guidelines for implementing resource efficient systems for energy production in and around Natura 2000 sites**, mainly fo cused on the production of thermal energy (as generating electricity requires higher volume of biomass and large-scale plants).

The document ***"Steps in setting up wood biomass supply chains in protected areas"*** is a useful tool, that provides different models of developing supply chains, according to the specificities of each protected area.

It was produced in the framework of the BioEUParks project and it is available for download in 6 languages at:
http://www.bioeuparks.eu
(developing a supply chain)

Market: price, vat and public procurement

Some of the main difficulties found by BioEUParks' partners related to the hard economic conditions on selling/buying biomass at local level. The first problem refers to the VAT implemented in biomass fuels (23% in countries like Greece), which is much higher than the 13% on thermal energy and electricity coming from fossil fuels.
Input at EU level is needed, to force national governments giving priority and fiscal benefits to energy produced with renewable energy sources: increase taxation on fossil fuels, avoid subsidies for use of fossil energy (example: subsidies to buy oil boilers),

Moreover, the VAT directive enables enterprises to sell pellets to end-consumers in neighbouring countries without VAT, providing more competitive prices when compared with the local pellet production.

Therefore, end-user clients tend to buy the product at the lowest price, compromising the sell of pellets produced locally.

Public organisations are obliged to follow public procurement procedures, meaning they need to follow the *"best value for money"*. **In the case of biomass, happens frequently that the best price comes from outside the region** (sometimes even outside the country).

In a Europe striving for circular economy, it is essential that the EU legislation on public procurement and especially on green public procurement is revised in order to give priority to local products.

Spatial planning and landownership

Excluding National Parks and specific countries, a great percentage of protected areas in Europe have private landownership, which is further aggravated, in some cases, with the unknown legal owner of the land. Moreover, the land is divided in small-scale properties, which increases the difficulty of implementing common management practices.

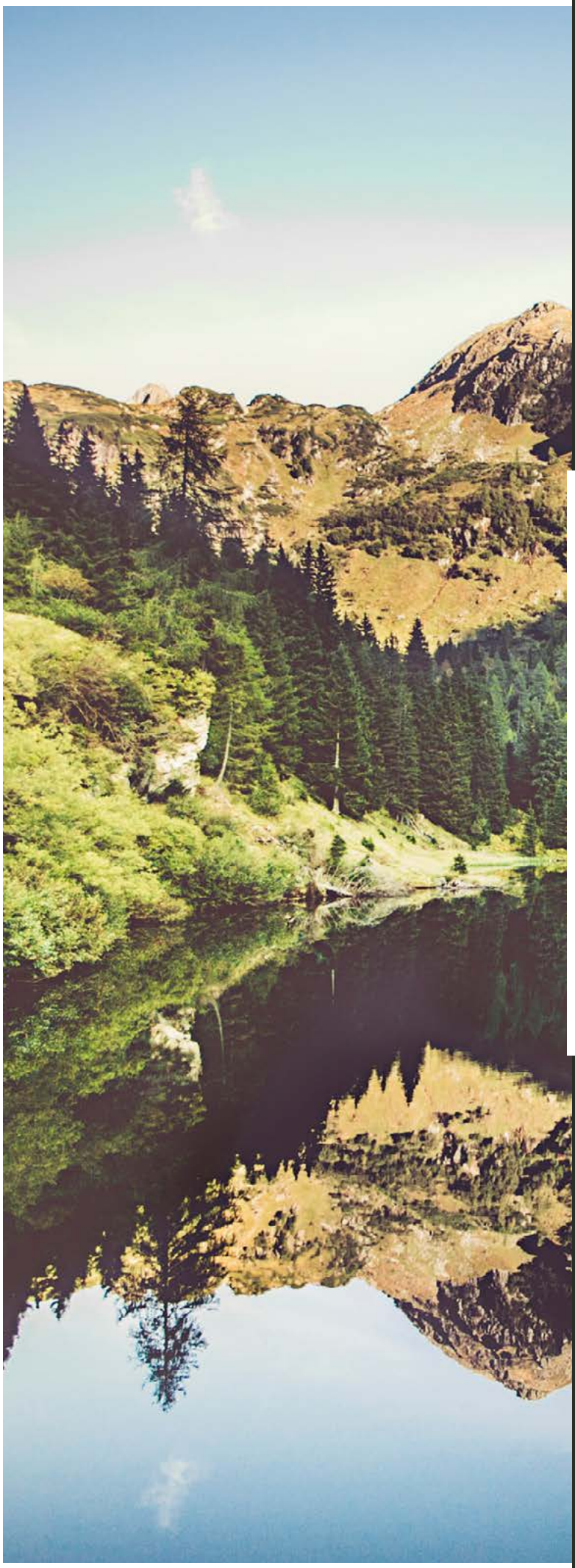
Besides, **PAs are not recognised as renewable energy sources**, thus, their management plans do not predict the use of waste material for energy production. Adding to these factors the lack of interest from small-size private forests, due to the low quantity of wood biomass extracted, the development of local supply chains in protected areas is a process difficult to implement.

Policy should recognise protected areas as renewable energy sources, with **clear limits for exploitation without compromising biodiversity and following the sustainability criteria.**

Spatial planning should then take into consideration the potential of energy production within the region, merging agro and forest potential, and guidelines should not only indicate where is it possible to create plants, but also how much power the different territories can receive, according to its characteristics.

By shifting the big-scale power plants to regional-scale, greenhouse gas emissions due to transport can be reduced and the management of local forests ensured, thus, bringing higher benefits for the environment.

On the other hand, the preference of using regional biomass would lead to a decrease of imports, thus benefiting the local economy: **providing a source of income for local foresters and farmers and delivering more accessible energy to the local community.**



BIOEUPARKS

Exploiting the potentialities of solid biomasses in EU Parks

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