Co-funded by the Intelligent Energy Europe Programme of the European Union

BIOEUPARKS – Exploiting the potentialities of solid biomasses in EU Parks

Contract N°: IEE/12/994

Fine Tuned Localized Supply Chain Plans

Deliverable 3.6

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LEGAMBIENTE Lead Partner

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Contributing Institutions:

1. Legambiente
2. Rodopi National Park, Greece
3. Kozjansko Regional Park, Slovenia
4. Danube-Ipoly National Park, Hungary
5. Sila National Park, Italy
6. Sölktäler Nature Park, Austria

This version of the deliverable is issued under the responsibility of Legambiente in the person of Project Coordinator Diego Mattioli

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1. BioEUParks: The project

Which is the park role in the European and National Bioenergy Policy?

How the park has to act locally in order to support a model of local development base on environmental sustainability, nature and biodiversity preservation and landscape protection?

Which model of sustainable biomass exploitation could be developed within European Natural and protected area respecting the key principle of Sustainable Forest Management?

These are the key challenge which 5 European Protected areas tried to give answers through the BioEUParks, a Project funded by the European Commission in 2013 in order to develop new model of sustainable exploitation of woody biomass within park area.

1.1 The Objective

More specifically, project aims at contributing to increase the local supply of biomass from sustainably managed forests and from agricultural residues and promote its most efficient use in heating and CHP installations.

This objective has been pursued through the development and testing of a methodology for designing and managing a biomass supply chain into European Protected Areas based on short chains and small-scale installations.

The whole process has been 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.

1.2 The Activities

BIOEUPARKS is based on two core actions: the supply chain setting up in the 5 pilot parks and the awareness action aimed at engaging economic actors and local communities in the process.

The awareness action started at the beginning of the project in each pilot area and was based on the organization of several events and meetings with two objectives:

1. To discuss with the communities on the model of sustainable exploitation of solid biomass which is socially, economically and environmentally adequate for the area
2. To identify the economic actors which could be involved in the supply chain as: biomass harvesters or providers, biomass converters, service providers, energy producers, end consumers.

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

The common criteria followed by all the parks in the setting up of the supply chain were:

- 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, enterprises) as end users
- Promotion of private investments

2. Objective of this document

This document describes the experience of each one of the five European protected areas involved in the project highlighting the ex-ante condition, the barriers which were risking to jeopardize the startup of the supply chain and the overcome strategy developed by each park in order to set up a sustainable short range woody biomass supply chain and its permanent running in a long term perspective.

The main objective of this document is to propose to other parks' managers and technicians, as well as to local planners, policy makers, and bioenergy sector stakeholders (such as foresters, farmers, service providers, plant owner and manufacturer, etc) some idea and concrete experience which could support them in the development of its own tailored answer to the same challenges.

2.1 Why a "Fine Tuned Localized Supply Chain Plans"

The Plans described in this document represent the last step of a long process started for each involve Park in the early 2014 where they are asked to identify an operative plan to set – up a Localized Supply Chain within park area tailored on the specific characteristics of each area.

Thus, each park, once realized a detailed analysis of the background conditions which took into account the quantity of biomass exploitable in agreement with sustainability criteria and nature and biodiversity conservation priorities, the legislative and regulatory framework and the market condition, designed its own operative plan for the setting up of the supply chain.

According with the provisions of the Plan, each park started the process of the supply chain setting up which obtain the result to activate 3 supply chains in Hungary, Slovenia and Greece for the heating season 2014-2015 and pave the way for the activation of the other two, in Italy and Austria, for the second project heating season 2015-2016.

Each Park during the first heating season has performed an ongoing monitoring action which allow to detect the key strengths and weaknesses of the activated supply chains which are used to improve their effectiveness for the second heating season.

The *Fine Tuned Localized Supply Chain Plans* is the update of the initial plan with all the key adaptation identified during the monitoring and assessment action which can improve the effectiveness of the activated process.

2.2 Key background elements

Before starting with the description of each Plan, it is important to clarify some key points which represent the basic element for understanding the key point threated by the document:

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 to 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.

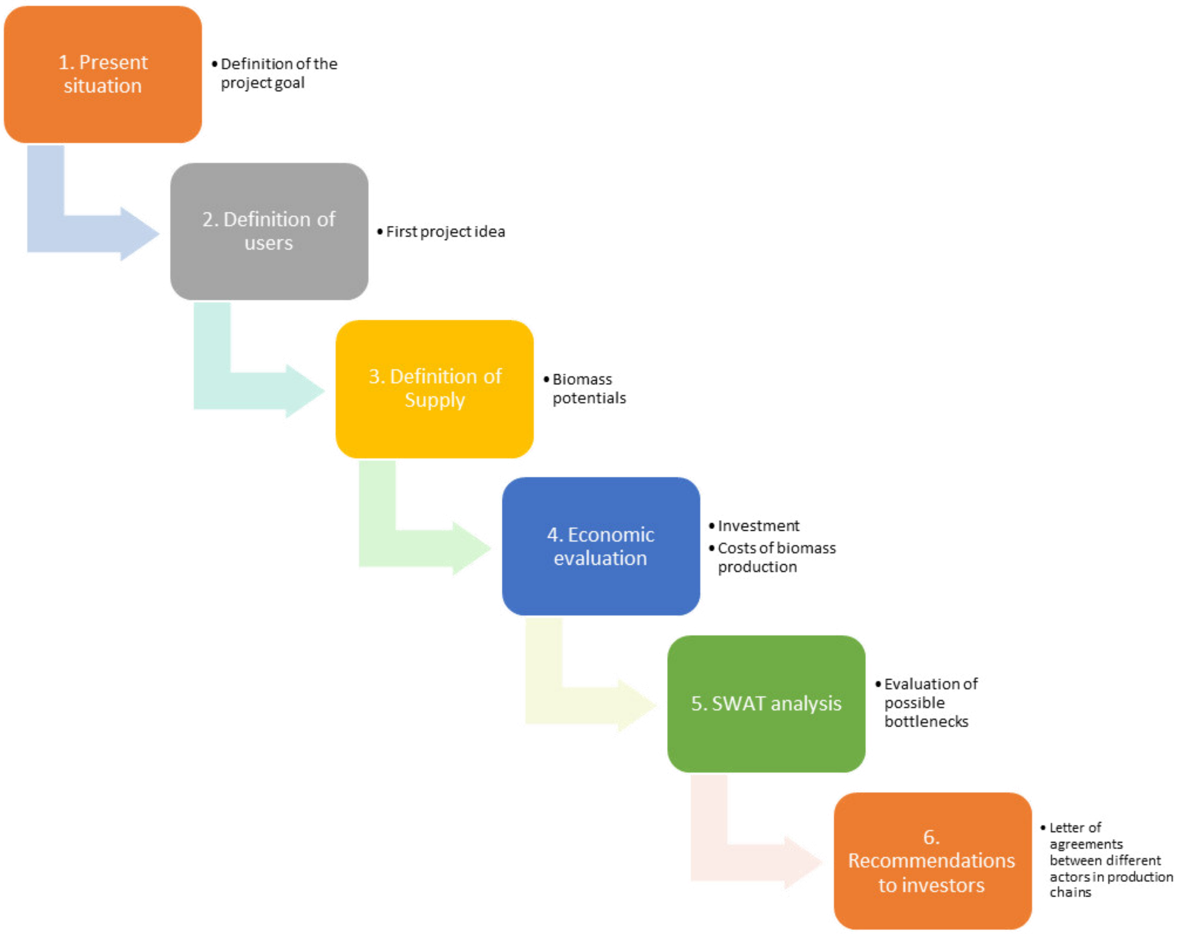
Accordingly, a biomass supply chain includes forest owners, forest entrepreneurs, transport enterprises, biomass traders, and –depending on the type of wood fuel – private or public customers. The increasing complexity of biomass supply chains demand step-by-step is even higher when we are implementing 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:

- 1st step: Analysis of present situation (market analysis) – this kind of analysis gives us an insight on biomass potentials, existing producers, and existing and potential users
- 2nd step: Identification of end user and first project idea – analysis of end users will give the limits of biomass needed and technical requirements
- 3rd step: 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)
- 4th step: Economical evaluation of planned production chain
- 5th step: Evaluation of possible bottlenecks (weakness and straightness analysis)
- 6th step: Final recommendations for the investors and contracts between different actors in production chains

Steps in establishment of biomass production chains



3. Introduction to the Fine Tuned Localized Supply Chain Plans

Before the description of each Plan it is useful to provide a comprehensive frame of the different models developed providing some input to easing their comprehension and transferability

It could be identified three different models of supply chain

1. In Greece and Italy the Plan foresees the activation of sustainable supply chains based on pellet production 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 boiler from oil to biomass.

   In the two countries two interesting experiences were developed to overcome the difficulties in tackling market related threats: in Greece the biomass processor launched a leasing program to provide pellet burners under cooperation contracts with the aim to bridge the gap of cost of high initial investment costs in a general condition of economic crises. In Italy the Park launched a restricted tendering procedure representing a reference point for public bodies interested in boosting sustainable exploitation of local supply chain as a lever of local sustainable development

2. In Hungary the 7 local supply chains activated are quite similar to the model developed in Italy and Greece but the material was primarily wood chips and logs. In this case 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 which, in this case, involve not only public and private organizations but also individual households. The key element was represented by the strict link from nature conservation activities and sustainable biomass exploitation in fact the starting point of the supply chain was the biomass harvested during alien species removal action and nature management.

3. The Slovenian and Austrian the models are based on local biomass thermal districts where small scale Plants provide thermal energy to private and public buildings of small municipalities located within park area. For both the contexts the key challenge was to ensure the use by the plant of only local biomass transported and processed according with environmental sustainability criteria and respecting Sustainable Forest Management principles.

4. Conclusions

The parks demonstrated that a different model to sustainably exploit local biomass is feasible. The Plans describe, step, by step five alternative models of woody biomass supply chain matching nature and biodiversity conservation, climate change mitigation concrete actions and local sustainable development.

These models start identifying key basic criteria which guarantee the sustainability of the whole process:

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.
4. *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 principles.

In conclusion, the Localized Supply chain plans 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.

5. Fine Tuned Localized Supply Chain Plans

Fine Tuned Localized Supply Chain Plans

D3.6

PARTNER	Rodopi National Park (RNP)
Country	GREECE

Introduction

Fine tuning task is referred to the actions undertaken after the activation of the supply chain, in order to solve problems or redirect LSC, in a way that it will optimize its permanent running.

Thus and according to the issues that were identified through awareness arousing procedures and the implementation of LSC, measures and actions are taken in order to improve its effectiveness in a long term perspective. Fine Tuned Localized Supply Chain Plan, will remain an operative and permanent tool for the steady implementation of the supply chain.

Fine tuning actions and measures are affected by the unstable economic situation in Greece and there are in direct correlation with the ability (especially of the end users) to fulfill their needs and meet their agenda.

Fine tuning actions involved the key actors of the supply chain (Forest service, municipalities, Forest cooperatives, pellet industries & merchants).

Forest Service is the sole land owner and responsible for the sustainable management of the forests. Local Forest Workers Cooperatives commissioned by law are involved in the harvesting procedures of the forest biomass.

The Forest Workers Cooperatives share the prescribed for harvesting wood volume according to annual or biennial programs, compiled by the Forest Service Offices an approved by the Prefectural Directorate. Each FWC is installed by the Forest Service in one or more forest stands inside the harvested area. FWCs have also the responsibility to sell the biomass (wood products) after payment of relevant fees to the state. In particular, 12% of the revenues derived from selling wood products are transferred to the Forest Service and to the Green

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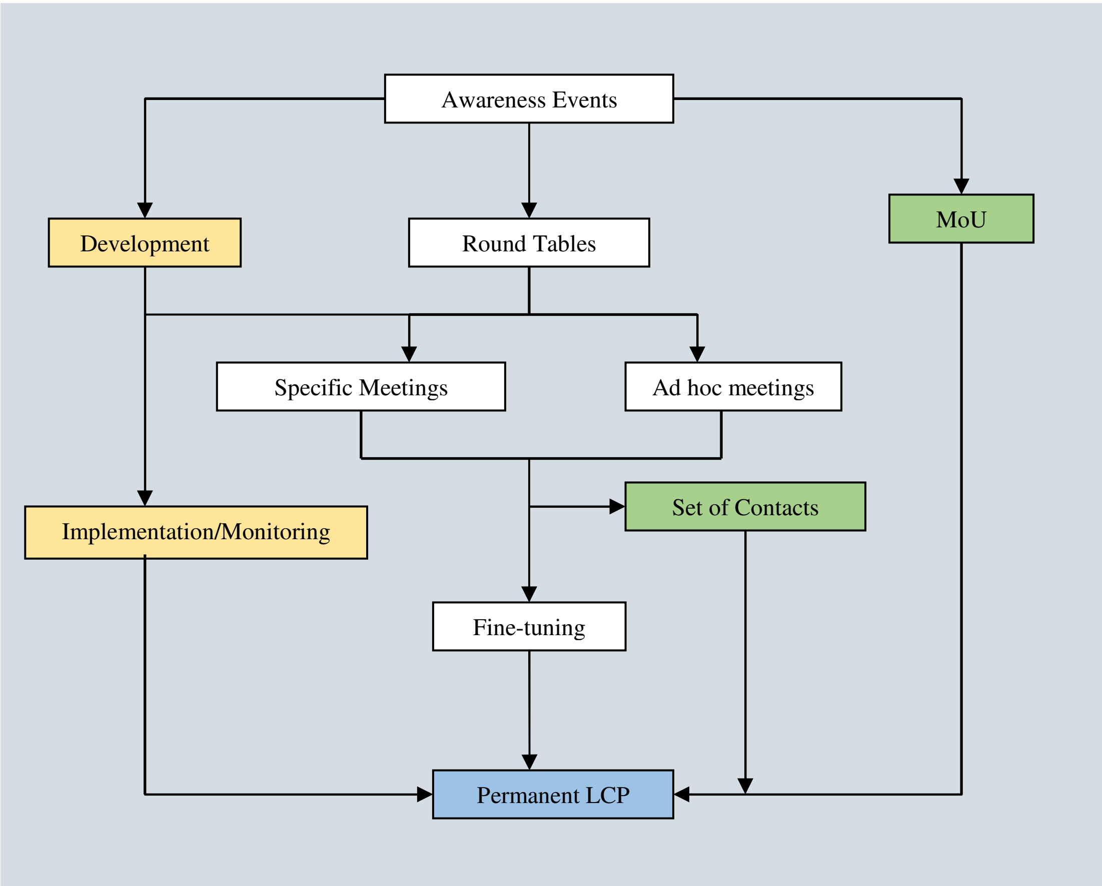
Fund and an administrative fee of 5% is paid to the municipal authority where the harvesting takes place.

Alfawood is a private enterprise and the only operable biomass processing facility in the RNP area. It was established in 2010 nearby the town of Nevrokopi. It has a production capacity of 65,000 tons per year. This facility uses 100% coniferous logs and wood residues from coniferous wood processing. The production in 2012 was about 40,000-45,000 tons, with 95% of this production was destined to the local market and only 5% was exported. Only a small portion of this production (less than 5,000 tons/year) was derived from pine wood post-processing residues.

Municipalities act as end users, through their need in heating its own buildings and facilities.

Through the following procedure RNP and DUTH conducted the fine tuning actions, that followed the awareness rising and the initial implementation of the LSC. All the procedures are permanently monitored and are implemented in parallel to the Memorandum of Understanding (ch. 3.4.2 “Annex I, Description of the action”)



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Matters Addressed in Fine tuning Procedure:

1. End users identification
2. Refueling and maintenance of pellet burners
3. Cost of burner commission & installation by municipalities
4. High fees in forest cluster exploitation from FWC, imposed by the Forest Service

Measures - Actions:

1. End users identification

The mater aroused at first at the 2nd awareness event, were it was discussed among all the representatives (key actors of the LSC), the possible end users identification. These end users (for the pilot supply chain) had to be specific, with substantial needs for biomass and with a perspective for greater biomass use and demand. There had to be organizations that intervene with public and social actors (such as citizens, students etc.).

During the LSC procedure the potential end users narrowed down to the municipalities. Municipalities gathered all the necessary features that could contribute to the implementation of the pilot supply chain, such as: buildings and facilities for establishing new burners, increased needs for biomass, environmental interest in clean energy, large interaction with citizens, students etc. and vast potential of transferring good practices to community (establishing citizens as new end users) after the end of the program.

Thus and throughout the awareness and communication procedure, RNP and DUTH teams aroused the interest of the local municipalities to be part of the project (as key actor in the LSC) and established an increased interest of municipalities to expand their needs towards the direction to clean energy solutions in contrary with fossil fuels.

2. Refueling and maintenance of pellet burners (Annex 1)

One disadvantage that municipal representatives describe as the greater barrier in biomass boiler establishment is the need for continuous feeding and cleaning of the plants. This action could not be performed successfully by municipal servants and thus the inclusion of the cost in biomass providing contracts, as an additional service, could be a possible solution. By this solution new jobs are also created in the area of the RNP.

During the Fine tuning procedure with the ad hoc and specific meetings between RNP-DUTH teams and the key actors of the supply chain (municipals and private sector enterprises), the need of including the cost of a person engaged in boilers' refueling and maintenance in contracts signed between biomass provider and end user is considered important, in terms of boiler efficiency and ease of use.

3. Cost of burner commission & installation by municipalities (Annex 1-2)

The willingness of the municipalities to participate in the LSC and even more to expand their needs in biomass (by installing new pellet burners in their own facilities) was intercepted by the increased cost of acquiring a new burner.

Along with the fact that new biomass feeding facilities, which had been adapted in old oil boilers already established in some municipal buildings were giving poor results in terms of energy use efficiency and needed frequent maintenance.

These matters were identified and discussed in Round tables 3 & 4 and at the place of the installed burners. In cooperation with the private sector (enterprises – merchants) Bioeuparks efforts were driven towards brand new facilities to be installed in other municipal buildings to give optimal results in bioenergy use, through a leasing procedure.

Thus, the private sector (ALFA WOOD) launched and communicated a burner leasing campaign towards end users in the area of the park, on the basis of a contracted period of 1 to 3 years at a fixed price of pellet supply.

4. High fees in forest cluster exploitation from FWC, imposed by the Forest Service

The fees payed by FWC for the harvesting of coniferous wood (used in pellet production) are considered very high, since they permit a narrow earning margin of 1.00€ per staked cubic meter. The matter aroused in Round table 5 and it was discussed there along with other specific meetings.

It was concluded that there is urgent need for the annual fees to be reduced. This reduction will rise the narrow earning margin for the Forest Working Cooperatives and will promote a greater wood extraction from stands that today are not preferable.

Despite the meeting of the Bioeuparks partners with the General Director of the Decentralized Administration of Macedonia and Thrace and the relative letter that the FWC have sent (Annex 3), the problem remains because the final decision is to be made by the Ministry of Environment and Energy.

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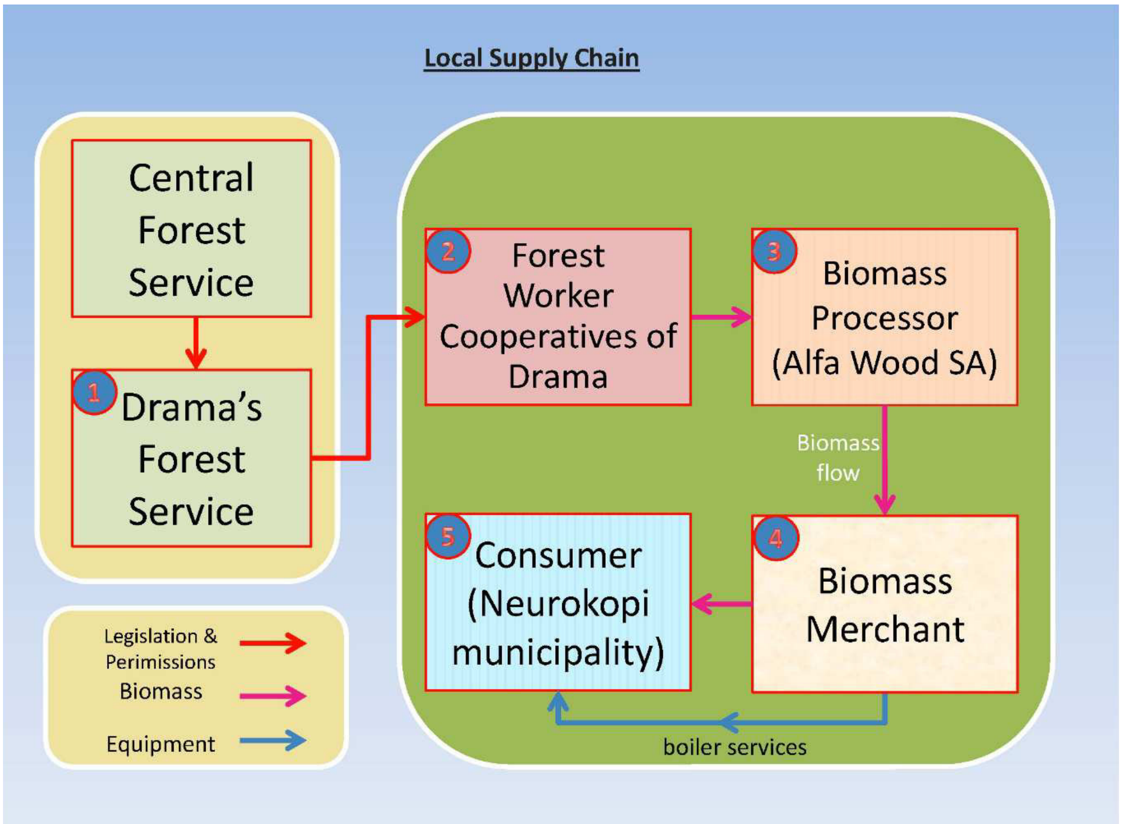
Results - Solutions:

1. Municipalities are identified as end users
2. Refueling and maintenance of pellet burners by the provider, through an extra admission on the biomass value
3. Burner procurement and installation through “Leasing” opportunities provided by the private enterprises to end users (Annex 2)
4. Suggestion to the Central Forest Agency to reduce the fees in cluster exploitation from FWC, imposed by the Forest Service (Annex 3)

The solutions that the fine tuning process brings to the Local Supply Chain, differentiate mainly the sectors 3-4, because the biomass Processor (Alfa Wood SA) has 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 refueling and maintenance of pellet burners, through an extra admission on the biomass value.



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Summary

Shortly after the initialization of the Local Supply Chain and based on monitoring and communication with the supply chain rings that are responsible for the implementation, some limit malfunctions identified therein. Immediately the Fine tuning process of the LSC was activated. This process was designed to resolve operational issues and maximize performance of LSC.

The main issues that emerged, mainly concerned the definite recognition of end users, the refueling and maintenance of pellet burners, the cost of burner procurement and installation by municipalities and the high fees in forest cluster exploitation from FWC, imposed by the Forest Service. These issues have mostly been resolved and LSC has been adjusted in order to be permanently running.

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ANNEX

1. <u>Fine Tuning Actions</u>

- Meeting with biomass merchant

- Meeting with a member of the city council of Neurokopi municipality

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- Meeting with the Mayor of Paranesti

- Meeting with the Mayor of Myki

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2. Implemented Actions (Leasing)

- Burner procurement and installation through "Leasing" opportunities provided by the enterprises (ALFA WOOD), after the intervention of BIOEUPARKS actions, through 1 – 3 years Contracts with a fixed price.

3. Implemented Actions (FWC)

- Request – Proposal of FWC for reduction of fees regarding wood harvesting.

Τμήμα Διαχείρισης
26-5-14

ΣΩΜΑΤΕΙΟ ΥΛΟΤΟΜΩΝ ΕΠΟΠΤΕΙΑΣ
ΚΑΙ ΑΡΜΟΔΙΟΤΗΤΑΣ ΔΑΣΑΡΧΕΙΟΥ
ΔΡΑΜΑΣ
Πληρ. Παπαδόπουλος Παντελής
Τηλ. 6973228686

Δράμα 06-05-2014

Αρχείο

ΔΑΣΑΡΧΕΙΟ ΔΡΑΜΑΣ
Αριθ. Πρωτ.: 7549
Ημ/νία: 26/5/2014

Προς:1.Γενικό Γραμματέα Αποκεντρωμένης
Διοίκησης Μακεδονίας Θράκης
κ Καρούτζο Αθανάσιο
2. Γενικό Διευθυντή Δασών και
Αγροτικών Υποθέσεων Μακεδονίας
Θράκης
κ Φραγκισκάκη Νικήτα
Κοιν: 1. Διεύθυνση Δασών Δράμας
2) Δασαρχείο Δράμας

Θέμα : <<Πρόταση μείωσης τιμών μισθώματος δασικών προϊόντων με παραχώρηση του 134 για το διαχειριστικό έτος 2014-2015.>>

Παρακαλούμε να εξετάσετε το παραπάνω θέμα και να προβείτε στην μείωση των μισθωμάτων των δασικών προϊόντων, διότι ο φόρος που καταβάλουμε δεν είναι εναρμονισμένος με την πραγματική κατάσταση της αγοράς, αλλά είναι αρκετά περισσότερος, με αποτέλεσμα να μην μπορούμε σε πολλές των περιπτώσεων να καλύψουμε το κόστος εργασίας.

Προτείνουμε ως τιμές στα κύρια παραγόμενα δασικά προϊόντα τα εξής:

- Καυσόξυλα δρυός από 7ευρώ/χκμ να γίνει 5,50/χκμ ευρώ
- Καυσόξυλα οξιάς από 4,50/χκμ ευρώ να γίνει 3,50/χκμ ευρώ
- Στρόγγυλη ξυλεία οξιάς από 15/κμ σε 12/κμ

Ζητούμε να κάνετε μια έρευνα αγοράς, σε τοπικό επίπεδο και να προβείτε στις ανάλογες ενέργειες.

Με τιμή

Ο πρόεδρος
Παπαδόπουλος Παντελής

ΣΩΜΑΤΕΙΟ ΥΛΟΤΟΜΩΝ ΕΠΟΠΤΕΙΑΣ & ΑΡΜΟΔΙΟΤΗΤΑΣ ΔΑΣΑΡΧΕΙΟΥ ΔΡΑΜΑΣ
ΕΤΟΣ ΙΔΡΥΣΕΩΣ 2006

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Fine Tuned Localized Supply Chain Plan

Kozjansko Regional Park

2015

List of authors:
Mag. Teo Hrvoje Oršanič
Mojca Kunst

December 2015

1. Basic information about Kozjansko regional park

Kozjansko Regional Park is 206 km^2 big area with very dispersed population.

- Population: 10.700 inhabitants
- Local authorities: 5 municipalities
- 69% Natura2000
- 48% of forest
- very high biotic diversity
- 85 natural values
- Good park practices:
  - high trunk meadow orchards
  - the Kozjansko apple festival
  - dry grasslands
  - footpaths
  - regional products: cultivation, processing and marketing
  - bio – remediation
  - environmental education
  - creative, educational, exploration workshops
  - safeguarding the cultural heritage and landscape
  - castle Podsreda
  - musical summer

Picture1: Podsreda – administration of KRP

2. Basic information about Kozje Municipality

Kozje Municipality is 89,5 km^2 big area in most part hilly mountainous area.

- Population: 3191 inhabitants
- Six local communities
- More than 80% of households are still heated by wood
- The larger settlements in the municipality are Kozje (738 inhabitants) and Lesično (195 inhabitants).


Picture2: settlement Kozje

3. Biomass supply chain

1. step

In April 2013 we began implementing our project BIOEUPARKS and we instantly connected well with the Topko energija d.o.o. company. Jože Preskar – director founded in 2012 Topko energija d.o.o. with the aim of building a multi – purpose centre for the needs of district heating in Kozje settlement.

2. step

We included the potential investor into district heating in our events, round tables and individual meetings where the topic of the conversation was how to ensure sufficient biomass from the protected area for district heating at a reasonable price.

Picture 3: Meeting with Individual Forest Owners and investor

3. step

The investor started prepared documentation. The operations was partially founded from :

- EU Cohesion found
- Republic of Slovenia
- Topko energija

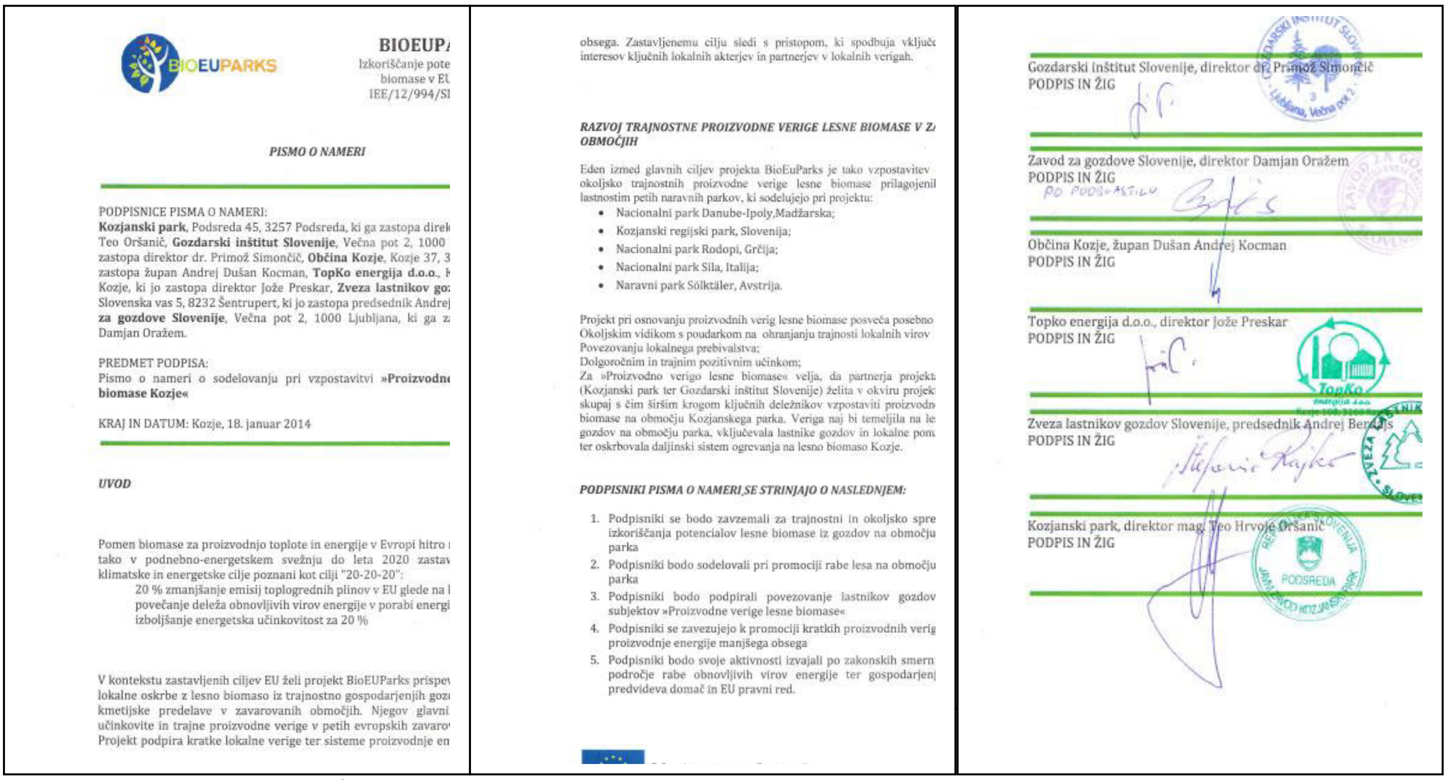
4. Step

In the end of October 2013 the district heating centre was prepared for activity. In the heating season all wood biomass (wood chips) was from Croatia – lower price.

Picture 4: District heating cente Kozje

5. Step

In January 2014 the Kozjansko Park Public Institute, The Slovenian Forestry Institute, The Slovenia Forest Service, The Kozje municipality , The Slovenian Forest Owner Association and the CEO of Topko Energija d.o.o. signed a memorandum whereby we committed ourselves to try to ensure that there will be a sufficient amount of woody biomass obtained from the protected area.



BIOEUPARKS

BIOEUP/
Izkoriščanje pote
biomase v EL
IEE/12/994/SI

PISMO O NAMERI

PODPISNICE PISMA O NAMERI:
Kozjanski park, Podsreda 45, 3257 Podsreda, ki ga zastopa direk
Teo Oršanič, **Gozdarski inštitut Slovenije**, Večna pot 2, 1000
zastopa direktor dr. Primož Simončič, **Občina Kozje**, Kozje 37, 3
zastopa župan Andrej Dušan Kocman, **TopKo energija d.o.o.**, K
Kozje, ki jo zastopa direktor Jože Preskar, **Zveza lastnikov go**
Slovenska vas 5, 8232 Šentrupert, ki jo zastopa predsednik Andrej
za gozdove Slovenije, Večna pot 2, 1000 Ljubljana, ki ga z
Damjan Oražem.

PREDMET PODPISA:
Pismo o nameri o sodelovanju pri vzpostavitvi **»Proizvodne**
biomase Kozje«

KRAJ IN DATUM: Kozje, 18. januar 2014

UVOD

Pomen biomase za proizvodnjo toplote in energije v Evropi hitro
tako v podnebno-energetskem svežnju do leta 2020 zastav
klimatske in energetske cilje poznani kot cilji "20-20-20":
20 % zmanjšanje emisij toplogrednih plinov v EU glede na
povečanje deleža obnovljivih virov energije v porabi energi
izboljšanje energetska učinkovitost za 20 %

V kontekstu zastavljenih ciljev EU želi projekt BioEUParks prispev
lokalne oskrbe z lesno biomaso iz trajnostno gospodarjenjih goz
kmetijske predelave v zavarovanih območjih. Njegov glavni
učinkovite in trajne proizvodne verige v petih evropskih zavaro
Projekt podpira kratke lokalne verige ter sisteme proizvodnje en

obsega. Zastavljenemu cilju sledi s pristopom, ki spodbuja vključ
interesov ključnih lokalnih akterjev in partnerjev v lokalnih verigah.

RAZVOJ TRAJNOSTNE PROIZVODNE VERIGE LESNE BIOMASE V Z
OBMOČJIH

Eden izmed glavnih ciljev projekta BioEuParks je tako vzpostavitev
okoljsko trajnostnih proizvodne verige lesne biomase prilagojenil
lastnostim petih naravnih parkov, ki sodelujejo pri projektu:

- Nacionalni park Danube-Ipoly,Madžarska;
- Kozjanski regijski park, Slovenija;
- Nacionalni park Rodopi, Grčija;
- Nacionalni park Sila, Italija;
- Naravni park Sölktäler, Avstrija.

Projekt pri osnovanju proizvodnih verig lesne biomase posveča posebno
Okoljskim vidikom s poudarkom na ohranjanju trajnosti lokalnih virov
Povezovanju lokalnega prebivalstva;
Dolgoročnim in trajnim pozitivnim učinkom;
Za »Proizvodno verigo lesne biomase« velja, da partnerja projekt
(Kozjanski park ter Gozdarski inštitut Slovenije) želita v okviru projek
skupaj s čim širšim krogom ključnih deležnikov vzpostaviti proizvodn
biomase na območju Kozjanskega parka. Veriga naj bi temeljila na le
gozdov na območju parka, vključevala lastnike gozdov in lokalne pon
ter oskrbovala daljinski sistem ogrevanja na lesno biomaso Kozje.

PODPISNIKI PISMA O NAMERI SE STRINJAJO O NASLEDNJEM:

1. Podpisniki se bodo zavzemali za trajnostni in okoljsko spre
izkoriščanja potencialov lesne biomase iz gozdov na območju
parka
2. Podpisniki bodo sodelovali pri promociji rabe lesa na območju
parka
3. Podpisniki bodo podpirali povezovanje lastnikov gozdov
subjektov »Proizvodne verige lesne biomase«
4. Podpisniki se zavezujejo k promociji kratkih proizvodnih verig
proizvodnje energije manjšega obsega
5. Podpisniki bodo svoje aktivnosti izvajali po zakonskih smern
področje rabe obnovljivih virov energije ter gospodarjen
predvideva domač in EU pravni red.

Gozdarski inštitut Slovenije, direktor dr. Primož Simončič
PODPIS IN ŽIG

Zavod za gozdove Slovenije, direktor Damjan Oražem
PODPIS IN ŽIG
PO POOBLASTILU

Občina Kozje, župan Dušan Andrej Kocman
PODPIS IN ŽIG

Topko energija d.o.o., direktor Jože Preskar
PODPIS IN ŽIG

Zveza lastnikov gozdov Slovenije, predsednik Andrej Bernjs
PODPIS IN ŽIG

Kozjanski park, direktor mag. Teo Hrvoje Oršanič
PODPIS IN ŽIG

Picture 5: Memorandum

Damjan Božičnik forest owner - complementary activities on the farm:
- collect waste wood from the forest owners inside of park borders
- waste wood processed in biomass
- biomass transported to wood biomass district heating system Kozje

In the 2014/2015 heating season Topko energija obtained all off its necessary biomass exclusively from the protected area.

For the heating season 2015/2016 Topko energija signed contract with company GOZD Ljubljana – biomass for district heating from state forests located within the protected area.

7. Step

Because of the involvement in the BIOEUPARKS project, we have, this year, decided to replace the old and worn-out equipment for heating the administration offices, which uses heating oil as its energy source.
During the 2015/2016 heating season the Kozjansko Regional Park administrative building was heated exclusively with biomass from the protected area. We signed the contract with local wood biomass producer.

BIOMASS LOCAL SUPPLY CHAIN

April 2013
Implementation our project BIOEUPARKS April 2013

Prepare events, round tables and individual meetings

Potential investor included in our events, round tables an individual meetings

Prepare Pilot Localized Supply Chain Plan

January 2014 – signed the Memorandum

Opening of the district heating centre in the heating season 2013/2014

All wood biomass are from Croatia

Heating season 2014/2015
signed one contract with local supplier of wood biomass from protected area

Local supplier

Collect waste wood from the forest owners inside of park borders

Waste wood processed in biomass

Biomass transported to wood biomass district heating system Kozje

Wood chip storage capacity is 500 m^3

Per year need district heating system 1500 m^3 wood biomass

The technical characteristics of the district heating system in Kozje:

- 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 end customers are:

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

Heating season 2015/16

Signed two contracts

→ Local supplier: 79 % wood biomass

→ Company GOZD Ljubljana: 20% wood biomass

→ Local individual suppliers: 1%

Kozjansko Regional Park

↓

New heating system for our administrative building

↓

Start to operate in heating season 2015/16

↓

Signed one contract with local supplier of wood biomass from protected area

↓

The technical characteristics for heating system:

- Boiler output: 75 KW
- Wood chip storage capacity: 21 m3
- Per year need heating system 100 m^3 wood biomass
- Annual thermal production 110 MW/year

BIOEUPARKS –Exploiting the potentialities of solid biomasses in EU Parks
Contract N°: IEE/12/994

DINPD Fine-tuned Localized Supply Chain Plan
(Task 3.2.1.)

by
DINPD – Danube-Ipoly National Park Directorate
based upon the Common Supply Chain Guideline Report by FNR, DUTH and SFI

19. June 2015

Co-funded by the Intelligent Energy Europe
Programme of the European Union

Table of content

Co-funded by the Intelligent Energy Europe
Programme of the European Union

1. Localized supply chain plan

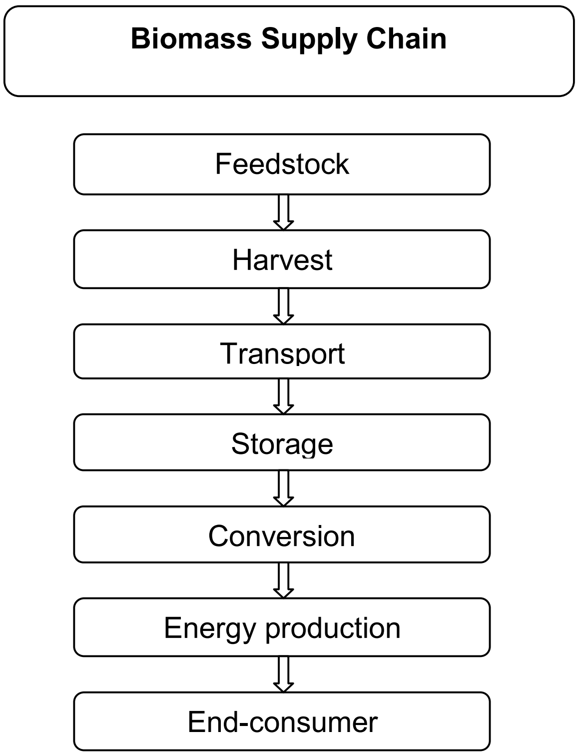
The localized supply chain plan was designed on the base of the common supply chain guidelines.

Basic characteristic of the biomass supply chains in and nearby the protected areas is that they must be small-scale, with no more than 50km between harvesting of the feedstock and consumption of the energy.

Sustainability criteria – all aspects: environmental, economical and social – were discussed with the project partners. DINPD's localized supply chain plan follows the commonly agreed sustainability criteria. Being nature conservation the main task of the DINPD (as stated in the deed of foundation) even stricter sustainability criteria are to be fulfilled regarding nature conservation aspects.
This relates to all parts of the supply chain.

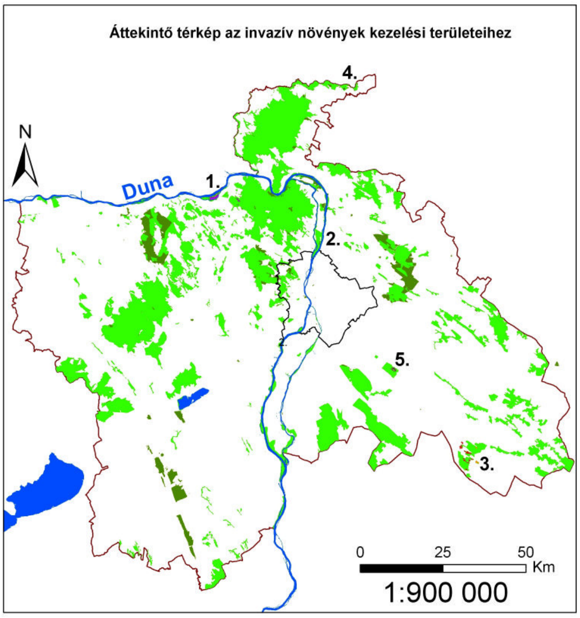
1.1 Parts of the supply chain

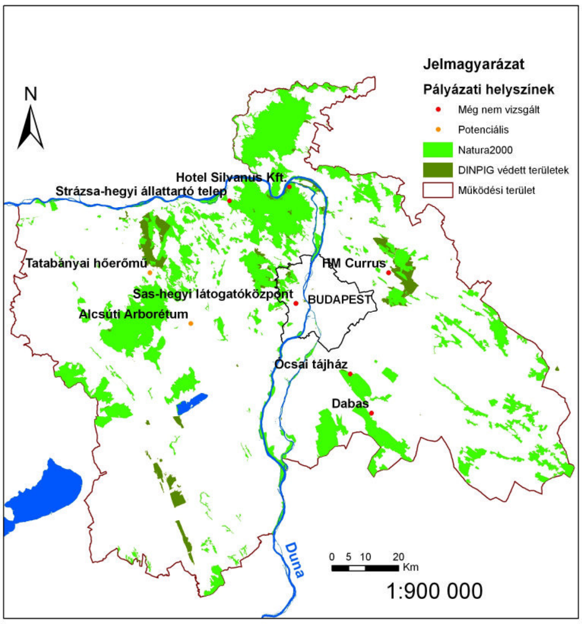
When designing a supply chain, the different steps from finding the right feedstock to identifying suitable end-consumers need to be taken into consideration.
The commonly agreed biomass supply chain scheme (below) is used when DINPD builds up or reorganizes energy production from biomass.



Planning of the localized supply chain of the DINPD was originally started from the first element of the chain: the feedstock. Although forestry management is allowed in certain zones of the protected areas, DINPD decided to focus on the biomass, which is produced during the nature conservation management of the protected areas.
To select the areas, where sustainable small-scale supply chain can be set up, the other end of the supply chain was also examined to assess the existing heater capacity and to identify

the overlap of the 50-km-diameter patches on the map. This is the starting point of the site selection and the supply chain plan.





Overview of the DINPD’s operational area with protected areas (green). Numbers indicate areas where invasive removal is ongoing.

Existing heater capacities and selected possible endusers in the operational area

Than the other elements of the supply chain and their sustainability need to be examined in the selected areas.
If this way the supply chains cannot be set up, other sources of biomass and other sites might be involved to the project.

For all steps of the supply chain the following questions were examined:

- Who is responsible for the outcome?
- Which legal frameworks are there?
- What sustainability criteria have to be taken into consideration?
- How will the compliance with sustainability criteria be monitored?
- How will the nature park be affected?
- What is the timeframe from start of harvesting to supply to end-consumer?

In the following, each step will be explained individually and in the context of sustainability.

1.1.1 Feedstock

The first step was identifying locally occurring biomass resources. The results are described in details in the bioenergy potential assessment form (data assessment). Regarding the big size of the overall area, the large number and diversity of the selected/potential project sites, additional data collection is still necessary for the areas not examined so far. Scientific research is going on to provide a practical estimation method for grassland or forest areas, where bushes should be removed to achieve nature protection goals.

Here is given a short summary based upon the data available as of June 2015.

In and nearby the protected areas belonging to the DINPD the following biomass sources are available:

1) Branches, coppice, fire wood produced by invasive removal and maintenance in woody areas managed by the DINPD;
2) Woody biomass, coarse materials, forestry residues from forestry maintenance (pre-com thinning etc.) and invasive removal (eg. Elaeagnus angustifoli) from lowland forest areas
3) Small branches, coppice from removal of invasive species and shrubs (eg. hawthorn, rosehip, blackthorn) from grassland areas managed by the DINPD or tenants of the DINPD.
4) Reed from protected areas managed by the DINPD.
5) Hay resulted from nature conservation management produced by the DINPD.
(Natura2000 sites) managed by the HM forestry company (state owned).
6) Woody biomass from forestry activities done by the forestry companies
7) Agricultural residues
8) Small branches, coppice, fire wood from maintenance produced by the local governments.

More detailed description of the biomass types can be found in the data assessment forms.

From the available options, the feedstock should be chosen which is available at the lowest risk to biodiversity and which can be harvested with the highest level of sustainability.

Invasive removal and nature conservation management serves nature conservation goals therefore this has positive impact on biodiversity. However, transporting the biomass out of the areas can have negative effects – this must be examined on a case-by-case, site-by-site bases.

Regarding the method and amount of harvesting these types of biomass sustainability is ensured by the national legislation (including also the adopted EU legislation).[1] Furthermore, stricter environmental sustainability criteria are guaranteed by the nature conservation management plans and management conceptions of the DINPD available for all protected areas.
In case of forestry management stricter requirements like those of FSC or PEFC regulations can be specified in the Supply Chain contracts because FSC Forest Management Certification hasn't been issued to any forestry company in the operational area of the DINPD and PEFC is not introduced in Hungary yet (national standards haven't been elaborated). However there are sites where the forestry management meet the requirements of the FSC principles but the managers have not applied for the certification.

1
1995. évi LIII. törvény a környezet védelmének általános szabályairól (Law about protection of the environment)
1996. évi LIII. törvény - a természet védelméről (Law about nature conservation)
67/1998. (IV. 3.) Korm. rendelet a védett és fokozottan védett életközösségekre vonatkozókorlátozásokról és tilalmakról (Gov. order about protected and strictly protected habitats)
134/2013. (XII.29.) VM rendelet a nemzeti parkok területének övezetekbe való besorolásáról és az egyes övezetekre vonatkozó általános természetvédelmi előírásokról (Min. order about the zonation of the national parks)
275/2004. (X. 8.) Korm. rendelet az európai közösségi jelentőségő természetvédelmi rendeltetésű területekről (Gov. order about Natura 2000 sites)
269/2007. (X. 18.) Korm. rendelet a NATURA 2000 gyepterületek fenntartásának földhasználati szabályairól (Gov. order about landuse in Ntura2000 grassland sites)
2009. évi XXXVII. törvény az erdőről, az erdő védelméről és az erdőgazdálkodásról (Forestry law.)
346/2008. (XII. 31.) Korm. rendelet a fás szárú növények védelméről (Gov. order about the protection of woody plants)
2007. évi CXXIX. törvény - a termőföld védelméről (Law about protection of the soil)
(http://nydtktvf.zoldhatosag.hu/index.php/jogszabalyok/termeszetvedelem)
(http://www.foldhivatal.hu/content/view/30/66/)

Although the DINPD is responsible for nature conservation in all these areas, the “lowest risk to biodiversity” condition can be fulfilled and checked easier if the feedstock is produced in the areas managed by the DINPD itself, so biomass type 1-5) have priority in the supply chain plan.
Further and more detailed data collection is still necessary to calculate the exact amount of available feedstock type 1-5. The sites managed by the DINPD itself (13.000 ha altogether) can be found in an area of 125 km diameter. Detailed data assessment is on-going at the moment. Data collection (review of the data assessment) is to be finished by the end of September 2014. Regarding the huge size of the potential territory, these areas shall provide the planned amount of feedstock.
Biomass exploitation rate from invasive removal has an uneven time characteristic for a certain site. DINPD has several on-going projects with natural conversation purposes. All these projects have to be examined in order to determine whether biomass could be used sustainably for energetic purpose. Although each project is adapted to produce usable biomass, the rotation, location and timeframe of the projects make calculations very complicated. In some selected areas the biomass production will be estimated more precisely based upon on site surveying. In grassland areas where shrubs should be removed the new estimation methodology (to be) elaborated in the Sas-hill pilot area could be used.

In forest areas the theoretic amount of yearly sustainably available biomass can be calculated theoretically. This is the base of the forestry planning strictly regulated by the forestry law.

The amount of available biomass for energetic use can be lowered by two important factors:
- if in the area the main goal is nature conservation (like in Ocsa) or recreation, not for profit forestry management
- if there is a strong concurrence of other types of BM uses (like industrial wood, food, forage etc.)

Focus is put on those areas – Esztergom, Ocsa regions – where woody biomass is available and can be used for building new supply chains. Sustainable supply chains will be formed in those areas as a consequence of the awareness raising actions of the project.

Although altogether sufficient amount of biomass is available from prioritized sites, setting up long term local supply chains based upon that BM originated from small sites needs a lot more work than setting up bigger supply chains. Therefore biomass type 6) is involved in the project. Here the forestry management provides huge amount of biomass of high energetic value considering both the production per ha and the area of these sites is so big (128.000 ha) that the long term availability of feedstock is guaranteed even in case of bigger consumers.

1.1.2 Harvesting

In case of biomass sources 1-4) the harvesting is done by the employees of the DINPD and/or by subcontractors of the DINPD. Environmental sustainability is guaranteed this way as the rules of harvesting are defined and controlled by the DINPD.
For some cases volunteers (i.e.: Sas-hegy) also help DINPD in harvesting.
The method of harvesting is determined site by site based upon the management plans or management conception plans, considering the specifications for each site. (For example in some areas the invasive species are very densly situated and after getting killed by the chemical treatment the biomass could be moved from the area cost-effectively by trucks, while in other sites the invasive species are rarely situated in valuable natural habitats, from where the removal of the biomass must be done very carefully, mainly by manpower.)
Description of the generally used methods is given in the data assessment. Harvesting the biomass from several smaller spots of very diverse characteristics can be less favourable

from economic point of view but the fact that the biomass is actually a byproduct of the nature conservation management activities, which are financed from other sources anyway, compensates the overcosts of the divers methods and thus ensures economical sustainability. So far the elimination of the biomass produced this way was a problem and that means that energetic use of the BM increases the environmental and economical sustainability.

As the matter of timing the own management is advantageous as well: in many sites the harvesting, transport and conversion is done by the employees of the DINPD, therefore the work phases can be organized the most favourable way.
In many cases, especially in new supply chains harvesting is done by either locals, forestry workers or contractors for a local governmental authorities controlled by the rangers of the DINPD.
In new supply chains, social companies could be one of the major form of structure that will be used. In social companies, local authorities will use their own (deprived) workers for harvesting biomass. DINPD experts also will be available for command and control the activity.
In areas managed by the forestry companies the economical sustainability is ensured by the for profit characteristic of the companies. Environmental sustainability of the harvesting method is partly prescribed by the legislation and by the forestry plan supervised by the National Forestry Agency. Further requirements can be specified in the supply chain contracts.

1.1.3 Transport

Only short distance transport is allowed for BIOEUPARKS: less than 50km from source to use. The transport method cannot be chosen freely because there is not much availability to different special capacities like trucks powered by biofuels. Usually the transport is conducted by the biomass provider (DINPD or forestry company) or quite often by the consumer – these are the two main concepts the supply chain plan deals with. Transport can be an important cost driver, therefore in case of the first two pilot supply chains the following methods are used to reduce the costs:
1) in case of the Sas-hill Supply Chain the biomass is used on site. Should additional fuel be necessary, the chips can be transported from other sites of the park by the vehicles of the DINPD rangers and other employees, which travel from time to time between the sites for other reasons and transporting the biomass can be scheduled for those travels.
2) in case of the Ócsa Supply Chain the consumer of the biomass is the end user, a local inhabitant, who can transport the biomass right from the site with his own vehicle. Being the end user local inhabitant, the transporting distance is very short and timing can be easily arranged with the ranger of the site (also local inhabitant himself).
Raising new social companies for becoming end-users of biomass, could play an important role in the future supply chains. Local social companies will have the financial power to transport the harvested biomass to either a storage or processing site.

1.1.4 Storage

The biomass might need to be stored before and after conversion.

The DINPD's goal in this project is to establish decentralized, small-size supply chains. That increases diversity, flexibility, security of supply and helps managing the available biomass as well as the produced energy.
Due to the limited amount of biomass needed, large storage capacities are not necessary.

The storage of biomass must be well designed and constructed for a number of functions. Most importantly it must keep the fuel in good condition, particularly protecting it from moisture. It must also be possible to deliver the fuel into an appropriate receptacle for transport, and convey it from there to its next destination conveniently and efficiently and requiring the minimum of additional energy input. A bigger store will allow larger, less frequent deliveries, a lower unit price for fuel, and more reserve in case of delays.
When setting up the supply chains, attention of the relevant actors will be drawn to these aspects.

However other aspects might influence the storage. For example in case of the first pilot supply chain (Sas-hill) calculation was made on how much biomass is needed for the energy installation and how much needs to be in storage to secure the supply for a year (heating season). On the other hand, calculation was made regarding the amount of biomass produced on the site and when can it be chopped. But finally the size of the chips storage was limited by the legislation as storage under a certain size may be built without building permission and thus it was easier to build a smaller storage and organize the inside transfer and conversion fitting these circumstances.

Many cases storage is solved by the end-consumer. When local inhabitants receive fire wood directly from DINPD, storage capacity is available at their own houses.
Storage is provided by state owned forestry companies as well. In some cases, with the close direction of local DINPD experts, forestry companies gather and procure biomass from DINPD for selling it to locals. In this case the forestry company is responsible for storage.
For the new supply chains operated by local social companies storage capacity is needed. As they will gather the biomass for decentralized heating of local governmental authorities' buildings and for own use, storage capacity will be built as part of their establishment.

1.1.5 Conversion

The supply chains are mainly built or will be build upon chips and fire wood as these are the fuel types most frequently used in the existing installations. Pre-treatment is not necessary for these fuel types. In the usual routine (eg. in case of the pilot supply chain in Ócsa) the harvester provides fire wood, so the conversion is done by the harvester and the biomass is sold for the end user in the final ready-to-use form.
DINPD has a small and a big chopper machine. In all areas wood choppers, pellet mills, and other conversion technologies are available. Local firms and companies own such machinery and as negotiated, they are ready to take part in new supply chains.
As fossil fuel prices are increased in the past years (but recently the natural gas price were lowered by the government as high as 20%) the different types of biomass heating receives greater importance among inhabitants and Small and Medium-sized Enterprises (SMEs). For that reason pellets, briquettes, fire wood and wood chips also are in the focus of attention.
The social companies under establishment at the moment will procure the appropriate equipment for biomass conversion since the goal of these organizations will be not only to provide heating for local institutions but to sell biomass to locals under the market price.

1.1.6 Energy production

Existing heating or CHP installations, their capacity, energy carrier and location is a very important factor. The first supply chains in areas of all 3 types were set up based upon this existing capacity. Mapping existing heating capacities should be going on to prepare further supply chains.

Questionnaire survey at awareness events and face-to-face meetings with majors were carried out in the 50 km radius areas around the possible feedstock producing sites to examine the possibilities of building new energy production capacity at local municipalities. Majors are very much interested in the BioEUParks project and they are ready to provide more detailed data. DINPD wants to encourage new investments with providing as much data as possible to Majors.

One new supply chain is under development at the moment in Esztergom region Pilismarót, where the local school's gym will be heated with wood chips.
Local inhabitants, companies and even institutions are also open for cooperation with DINPD to build new supply chains.

The traditional use of biomass is household scale heating by fire wood in traditional ovens and more and more frequently by modern heaters working with fire wood, woodchips or pellet. The rangers have personal contacts and thus information about the possible end-users, however further data collection regarding household scale heaters would be useful as well. Merchant of such installations is involved in this data collection as well.
Planned CHP installation capacity was examined. For some cases in Pilis, Ócsa Táborfalva, local governmental institutions are open to develop local CHP (under 50 kW rated electric power) supplying schools, kindergartens, nursing homes and other buildings. Based upon the negotiations between the merchant (subcontracted as expert by the DINPD) and the majors governmental fund will be needed to emplace such projects. The merchant submitted a project proposal including development of 8 CH installations (each of 50 kW) – these future developments should be followed, local supply chains should be built there.
In the pilot supply chain at the Sas-hill a fully automated, computer controlled woodchip heating boiler provides the energy for the visitor centre. The automatic fuel feeder provides the fuel without constant supervision, but human labor is necessary to carry the wood chip from the big storage to the inner storage (to the fuel feeder).
Introducing the modern, energy efficient installations to the public is part of the awareness raising activities as well. This can motivate new investments as well.
The decision on the form of energy production will largely depend on the type of feedstock, if it will be converted into chips or pellets and what kind of facilities are already in place on the side of the end-consumer. DINPD plans to set up a webpage where the potential actors of future supply chains can find each other: biomass providers, conversion and transport services, biomass consumers, merchants are to be presented on this page by location.

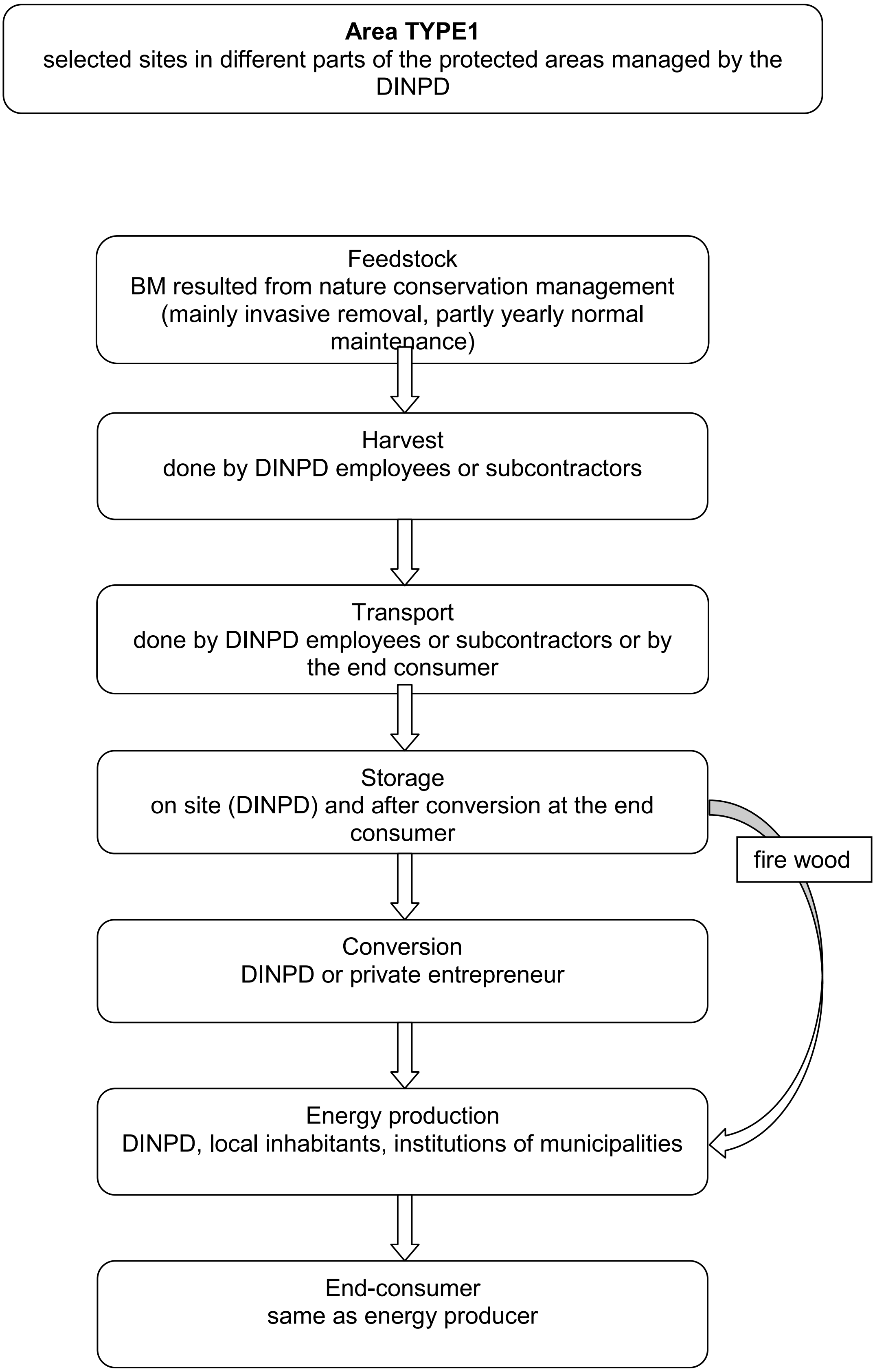
1.1.7 End-consumer

In most cases the producer is also the consumer of the energy. Institutions of the DINPD, municipalities and forestry companies are in focus of the supply chain plan. The potential consumers of the energy are involved from the beginning on based upon the existing cooperation between DINPD and these organizations. The main tool of involving individuals, local inhabitants is the organization of awareness raising events. DINPD organises many environmental education events so not only the project events but other events help as well getting the message home.
Involvement of the local governmental authorities as end-consumers is favourable for two reasons. Biomass extraction done by the employers of the local municipality – if natural conservation aspect is carefully applied – is socially and economically sustainable. It provides the possibility of sustainable, environmentally neutral energy production, security of supply and creates workplaces in the region. These are the first set of reason why DINPD works very hard on getting the local governmental authorities involved in the project. On the other hand situational awareness can be also raised through the local governmental authorities. Showing and communicating good example to inhabitants and local companies will raise not only attention, but demand that will further enable DINPD to build new biomass supply chains.
Further potential end-consumers are the local entrepreneurs, hotels etc. These are ususally endusers with higher demand therefore they can be members in supply chains where the BM is provided by the forestry companies. It is difficult to convince these end-users to sign long term contracts or agreements because they are for profit actors and thus strong commitment

towards environmental sustainability is necessary to risk buying fule for higher prise than available in the market. Two sided negotiations can solve this problem.
Institutions of the national defense can be potential end-users as well. These are also bigger end-users therefore forestry companies are their potential partners, too. Here the legal barriers relevant for public institutions can cause difficulties in signing long term contracts – the above mentioned two-level contract scheme can solve this problem.
It took long time to set up such pilot chains – in each case experts of the Pilisi Parkerdő Zrt. coordinated the process and they are going to provide data about running and monitoring the chains.

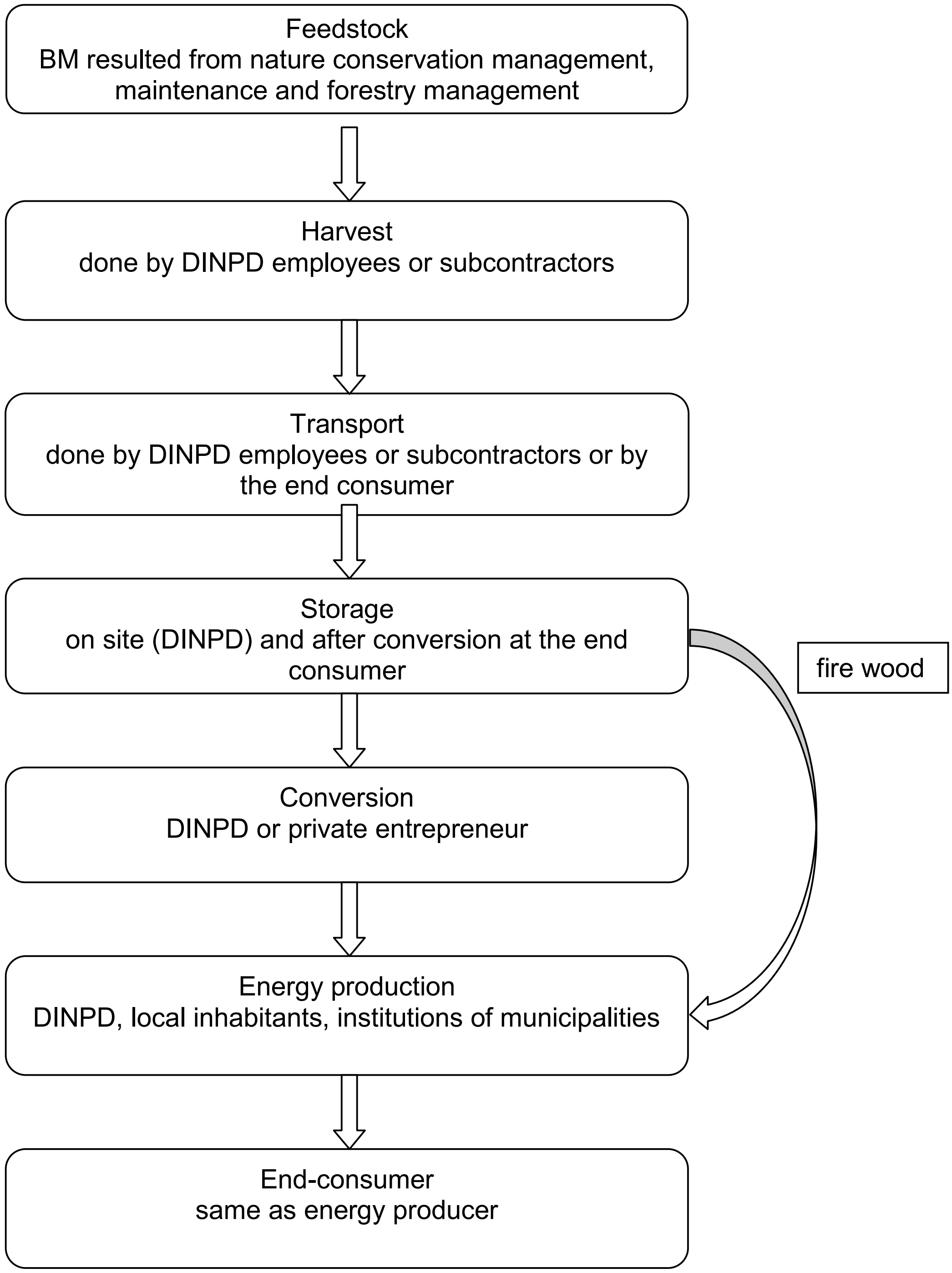
Long term monitoring of supply chains of type 3 are not possible without the data provided by the forestry companies. To ensure the availability of data, monitoring and providing data was included in expertise subcontract.

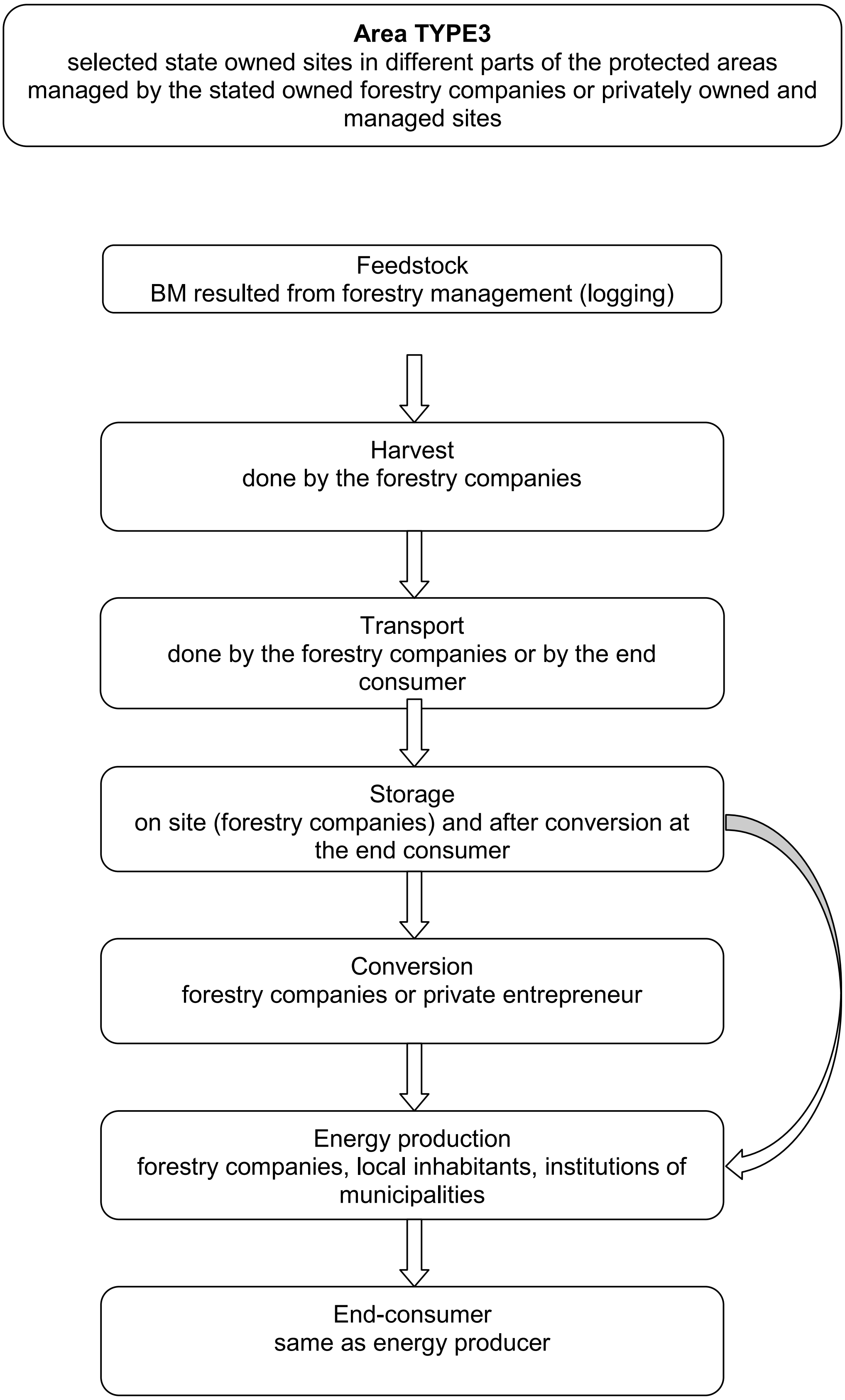
1.2 Basic types of the local supply chains



2.

Area TYPE2
other sites in different parts of the protected areas managed by the DINPD




Area TYPE3
selected state owned sites in different parts of the protected areas managed by the stated owned forestry companies or privately owned and managed sites
Feedstock
BM resulted from forestry management (logging)
Harvest
done by the forestry companies
Transport
done by the forestry companies or by the end consumer
Storage
on site (forestry companies) and after conversion at the end consumer
Conversion
forestry companies or private entrepreneur
Energy production
forestry companies, local inhabitants, institutions of municipalities
End-consumer
same as energy producer

2.1 Supply Chain organization, contracts and contracting

Identifying potential problems and how they can be avoided from the onset:

In case of the pilot supply chains type 1 and 2 the contracting procedure is easy. At Sas-hill the whole supply chain is owned by the DINPD itself. In Ócsa there are only two actors in the supply chain: DINPD itself and a private actor so the supply chain can be installed by a simple contract about selling the biomass.

In case of other supply chains municipalities and state owned forestry companies are important actors. In all cases the public ownership and the bureaucratic regulations of decision making can delay the setting up of the supply chains. Long term contracts and contracts without tendering are not allowed in normal procedure so special legal ways must were elaborated for these special conditions. The regulations were checked by a lawyer. The contracting scheme states of two types of documents: long term agreements (called MoU) signed by the supply chain member and yearly contracts and vouchers of selling.

In case of residential pilot supply chain common MoU was signed by several inhabitants. Even this way the organization of setting up the supply chain and the administration is very complicated. Therefore, regarding the huge number of household-scale endusers further MoU's are signed by the local governments representing the inhabitants of the settlement.

Regarding the frequent changes in the legislation, the legal framework must be monitored continuously.

Setting up new supply chains based upon new investments developing new heater installations cannot be done easily in a 1-2- year period because of the lack of capital.

Municipalities and local companies are also at the waiting mode since July 2014. All participants are waiting for the 2014-2020 EU grant agreements that determine the governmental funds available for developments.

In case of municipalities the municipal elections in Hungary in September 2014 influenced the contracting processes as well.

Therefore in many settlements supply chains might arise later as a post-result of the project.

As the state forestry companies are the forestry managers of several state owned protected areas where DINPD is the nature conservation manager of the sites, the relationship between forestry companies and DINPD is a kind of sensitive, partly friendly and partly concurrent. Though sustainable forest management is a common goal, there are differences in priorities because the task of the DINPD is nature conservation while the main task of the forestry companies is profitable silviculture. Therefore negotiations must be carried out very carefully with leaders of the forestry companies to result in a compromise acceptable for both parties. This requires long time as well. This is another reason, why areas managed by the DINPD itself got priority in the supply chain plan.

However the longstanding good relationship and cooperation with municipalities and forestry companies can lead toward successful partnership in setting up sustainable biomass supply chains as well.

Possible problems like insufficient cooperation, information and training within the agricultural and forestry sectors as well as the lack of public awareness are anticipated by ongoing monitoring, communication with the partners and capacity building and awareness raising activities of the project.

There is potential in local social companies. They are profit-oriented organizations but they also take social considerations into account. Local governmental authorities involvement in social companies helps to decrease the number of actors in the supply chains. The social companies could sufficiently build up a supply chains based uon the BM originated from the sites of thte settlement or produced by the DINPD or the local forestry company.

Dunakanyar-Pilis Helyi Termék Szociális Szövetkezet is an existing social company and it can be a potential partner.
Some social companies are under preparation in the area (e.g Fejlődő Leányfaluért Szoc. Szöv.) – the partnership should be built with them after the official foundation. (Preparational meetings were carried out in 2014.)
Further social companies are probably going to be formed with the help of the newly opened governmental fund supporting the development of such organizations in the underdeveloped regions. A few settlements in the administrative area of the DINPD might use this possibility.

Setting up supply chains with more than 2 actors, including private and public actors, are complicated, therefore DINPD does not plan to set up such supply chains itself but plans to inspire and help the forming of such supply chains by offering information: organizing awareness raising events and capacity building trainings, offering database about potential partners.

The results from this project could again be used to help implement and bring together stakeholders in the national park.

Annex I.: data assessment

1.1 data assessment for Area TYPE 1-2.

Nature park	Biomass	Potential/year	Heating installation
DINPD	Invasive species: small branches	9.972t	Heating for local visitor center – Pilot Supply Chain Sas-hill
DINP	Invasive species: woody biomass	n/a	Used in private homes
DINPD	Small branches, coppice from maintenance	n/a	Small institutional burner, local inhabitants
DINPD	Woody biomass from maintenance and forestry management	133,65t	Local residents Pilot Supply Chain Ócsa
			Pasta factory, Ocsa
DINPD	Coarse materials and forestry residues	n/a	Used by army heaters, as it comes from areas used and owned by the military
DINPD	Shrubs/berries from grassland	n/a	Local homes, nearby institutions
DINPD	Hay from grassland areas		Esztergom farm
DINPD	Reed from protected areas	n/a	Briquette burning heaters

1.2 data assessment for Area TYPE 3.

Forest management	Biomass	Potential/year	Heating installation
Pilis Park Forestry Ltd.	Invasive species: small branches	31.500 t	Heating for location – Pilot Supply Chain HM CURRUS Ltd and Hotel Silvanus
Pilis Park Forestry Ltd.	Invasive species: woody biomass	n/a	Used in private homes
Pilis Park Forestry Ltd.	Small branches, coppice from maintenance	n/a	Small institutional burner, local inhabitants
Pilis Park Forestry Ltd.	Woody biomass from maintenance and forestry management	180.500 t	Local home owners Pilot Supply Chain Pilis Park Forestry Ltd.
Pilis Park Forestry Ltd.	Coarse materials and forestry residues	n/a	Used by HM CURRUS Ltd and Hotel Silvanus heaters
Pilis Park Forestry Ltd.	Shrubs/berries from grassland	n/a	Used by HM CURRUS Ltd and Hotel Silvanus heaters

BIOENERGY POTENTIAL ASSESSMENT FORM

Partner name:	*Pilis Park Forestry Company*
Country:	*HU*

Matrix Field:	HM CURRUS Company	Short Definition:	BE usage in Gödöllő region
In case of waste (= waste/residues), EU waste code http://ec.europa.eu/environment/waste/framework/list.htm			

General description of bioenergy material

☞

Four different kind of biomass are available in the Gödöllő region. The Gödöllő Landscape Protection area (reservation manager is the DINPD) is 12000 ha, 7400 ha of the area is state forest. The area of wooden biomass is 3700 ha. Main biomass-types are the followings:

1. Low diameter wood form thinning, firewood d) (special), coppice forest from roads a)
2. Forest biomass from nature conservation interventions b)
3. short rotation system biomass c)
4. Firewood (diary) f)

General description of main production process

☞

Four different type of biomass are processed, by two different methods, according to the followings:

1. In 1st case c) and partly in the a) b) and f) case a part of the biomass stays in the area by nature conservation purposes, this part of the biomass is not important for further usage;
2. In 2st case f) and partly in the a) and b) the forest manager provide firewood for local inhabitants and other local enterprises

Options, preconditions and consequences for increased use of this type of bioenergy resource

☞ *Options:*

The main part of the area is forest, so there is a great potential to supply new maintenance chains. 12200 m3 firewood is disposable for energetic use. The biomass disposable for energetic purposes is close for local inhabitants. The forest manager informed the local people and local enterprises to involve them to biomass maintenance chains.

Conditions:

- *Human resources from forest manager, to coordinate and organize the local biomass production for nature conservation purposes.*
- *Suitable machines and vehicles or local cooperation to make the biomass production constant and economic.*
- *Find local people and enterprises, to convince them to change in case of heat and electricity production to biomass based energy production instead of fossil fuel usage.*

Requirements:

New biomass based production and supplement chains can be installed, the price of biomass based materials will decrease, and that allows involving new supplement chains.

Timeframe for significantly increased bioenergy availability, if all preconditions are fulfilled (Please mark accordingly with an "X".)

1-3 years		4-10 years		> 10 years	***X***

Legal framework for production and legal aspects for increased production of bioenergy

☞ *Directive 2009/28 / EC of the European Parliament and of the Council (23 April 2009) For the support of energy from renewable sources*
Describe the main energy carrier (e.g., wood chips, wood pellets, liquid fuels, gaseous fuels, etc.), gained from this bioenergy resource, and basic processes for this
☞ *The main energy carrier is firewood. Wood in the area is used as firewood historically. The forest manager would be open to the biomass-based micro-cogeneration usage with governmental support. Wood chips can also be taken into account, because this material is easier to handle for local enterprises and users.*
Describe the main end-consumer of energy, gained from this resource and the described production process
☞ *At least three end-consumer are the followings:* *1. The forest manager sold 620 m^3 of firewood for heat production in Gödöllő region. The place of the production is HM Currus Zrt.* *2. Further 11580 m^3 firewood was sold by the local forestry management company for local inhabitants* *3. The local forest managers are concerned in cooperation and the usage of biomass for heating and electricity-production purposes.*
Additional comments to this category of bioenergy
☞
Quantify the volume of this resource in typical units (tons, m^3 etc.), as far as it is presently used for energy
☞ *20 000 m3 wood per year can be used from the operation area, 61%-of it is firewood quality. Using the whole quantity of wood 64600 MWh/year heating energy could be used, involving the wood of the local forestry management companies. At 2014 a new local supply chain was created to use a part of the firewood locally. It means marketing 620 m3 firewood locally for energetic purposes. That is equivalent with 589 tons of biomass with witch 2002 MWh/year hating energy can be produced.*
Quantify the maximum additional volume of this resource in typical units (tons, m^3 etc.), as far as it can realistically be used for energy
☞ *Further local examinations are needed to define the exact quantity.*
Quantify the volume of this resource in energy units (MWh), as far as it is presently used for energy
☞ *2002 MWh*
Quantify the maximum additional volume of this resource in energy units (MWh), as far as it can realistically be used for energy
☞ *The LSC part of the biomass given above can be produced with 64600 MWh in form of heat or hot water in the local supplement chains. With new investments further energy production could be made in an economical way.*
Additional comments to quantification of this type of bioenergy
☞ *Using woody plant biomass creating new supplement chains, fossil heating of small communities could be substituted.*

Give your estimate and comments, how sustainable the present and the potential availability of this type of bioenergy will be, from aspects of … **… economic sustainability**
☞ The new biomass-supplement is economically sustainable, because is use local (max. 50 km) produced biomass material. Biomass used for heating is cheaper than any other energy source. According to plans a much bigger supplement chain or more numerous, smaller supplement chains could be created with the extant biomass. The main biomasses could be used for supplement chains are firewood and wholewood chips. The local participants of economy are open to create new biomass-supplement chains. Heating with biomass is cheaper than natural gas, so it is also an economical interest.
… social sustainability
☞ The new current biomass supplement chain is societal sustainable, because the local inhabitants use the firewood in the area of the supplement chain. Local consumers are pleased to gather and transport to their homes the biomass needed. That way local inhabitants and the forestry manager take part in the social efficient current supplement chain. It is a good tendency so it has to be continuously renewed when creating new supplement chains.
… ecological sustainability
☞ The ecological sustainability in forest area is assured by the experts of DINPD and the authorities. Plans provide assurance for nature conservation. In case of logging in the forest area, taking into account the nature conservation and Nature 2000 aspects, the ecological sustainability isn't harmed.
Additional comments to sustainability aspects
☞

Budapest, 2015.01.30.

BIOENERGY POTENTIAL ASSESSMENT FORM

Partner name:	Pilis Park Forestry Company
Country:	*HU*

Matrix Field:	Silvanus Hotel	Short Definition:	BE usage in Visegrád region
In case of waste (= waste/residues), EU waste code http://ec.europa.eu/environment/waste/framework/list.htm			
General description of bioenergy material			
☞ Four different kind of biomass are available in the Visegrád region. The Danube-Ipoly National Park (conservation manager is the DINPD) is 60314 ha, 3900 ha of the area is state forest. The area of wooden biomass is 3900 ha. Main biomass-types are the followings: 5. Low diameter wood form thinning, firewood d) (special), coppice forest from roads a) 6. Forest biomass from nature conservation interventions b) 7. short rotation system biomass c) 8. Firewood (diary) f)			
General description of main production process			

☞ Four different type of biomass are processed, by two different methods, according to the followings: 3. In 1st case c) and partly in the a) b) and f) case a part of the biomass stays in the area by nature preservation purposes, this part of the biomass is not important for further usage; 4. In 2 st case f) and partly in the a) and b) the forest manager provide firewood for local inhabitants and other local enterprises
Options, preconditions and consequences for increased use of this type of bioenergy resource
☞ *Options:* *The main part of the area is forest, so there is a great potential to supply new supplement chains. Firewood and wholetree chips are available in log therm. 13420 m3 firewood is disposable for energetic use. The biomass disposable for energetic purposes is close for local inhabitants. The forest manager informed the local people and local enterprises to involve them to biomass maintenance chains.* *Conditions:* • *Human resources from forest manager, to coordinate and organize the local biomass production for nature conservation purposes.* • *Suitable machines and vehicles or local cooperation to make the biomass production constant and economic.* • *Find local people and enterprises, to convince them to change in case of heat and electricity production to biomass based energy production instead of fossil fuel usage.* *Requirements:* *New biomass based production and supplement chains can be installed, the price of biomass based materials will decrease, and that allows involving new supplement chains.*

Timeframe for significantly increased bioenergy availability, if all preconditions are fulfilled (Please mark accordingly with an "X".)					
1-3 years		4-10 years		> 10 years	***X***

Legal framework for production and legal aspects for increased production of bioenergy
☞ *Directive 2009/28 / EC of the European Parliament and of the Council (23 April 2009) For the support of energy from renewable sources*
Describe the main energy carrier (e.g., wood chips, wood pellets, liquid fuels, gaseous fuels, etc.), gained from this bioenergy resource, and basic processes for this
☞ *The main energy carrier is firewood. Wood in the area is used as firewood historically. The forest manager would be open to the biomass-based mikro-cogeneration usage with governmental support. Wood chips can also be taken into account, because this material is easier to handle for local enterprises and users.*
Describe the main end-consumer of energy, gained from this resource and the described production process
☞ *At least three end-consumer are the followings:* 4. *The forest manager sold 1100 m3 of firewood for heat production in Visegrád region. The place of the production is Hotel Silvanus.* 5. *Further 12320 m3 firewood was sold by the local forestry management company for local inhabitants.* 6. *The local forest managers are concerned in cooperation and the usage of biomass for heating and electricity-production purposes.*
Additional comments to this category of bioenergy
☞

Quantify the volume of this resource in typical units (tons, m³ etc.), as far as it is presently used for energy
☞ *22000 m^3 wood per year can be used from the operation area, 61 %-of it is firewood quality. Using the whole quantity of wood 74800 MWh/year heating energy could be used, involving the wood of the local forestry management companies. At 2014 a local supply chain was created to use a part of the firewood locally. It means marketing 1100 m3 firewood and branchwood locally for energetic purposes. That is equivalent with 1000 tons of biomass with witch 3400 MWh/year hating energy can be produced.*
Quantify the maximum additional volume of this resource in typical units (tons, m³ etc.), as far as it can realistically be used for energy
☞ *Further local examinations are needed to define the exact quantity.*
Quantify the volume of this resource in energy units (MWh), as far as it is presently used for energy
☞*3400 MWh*
Quantify the maximum additional volume of this resource in energy units (MWh), as far as it can realistically be used for energy
☞ *The LSC part of the biomass given above can be produced with 74800 MWh in form of heat or hot water in the local supplement chains. With new investments further energy production could be made in an economical way.*

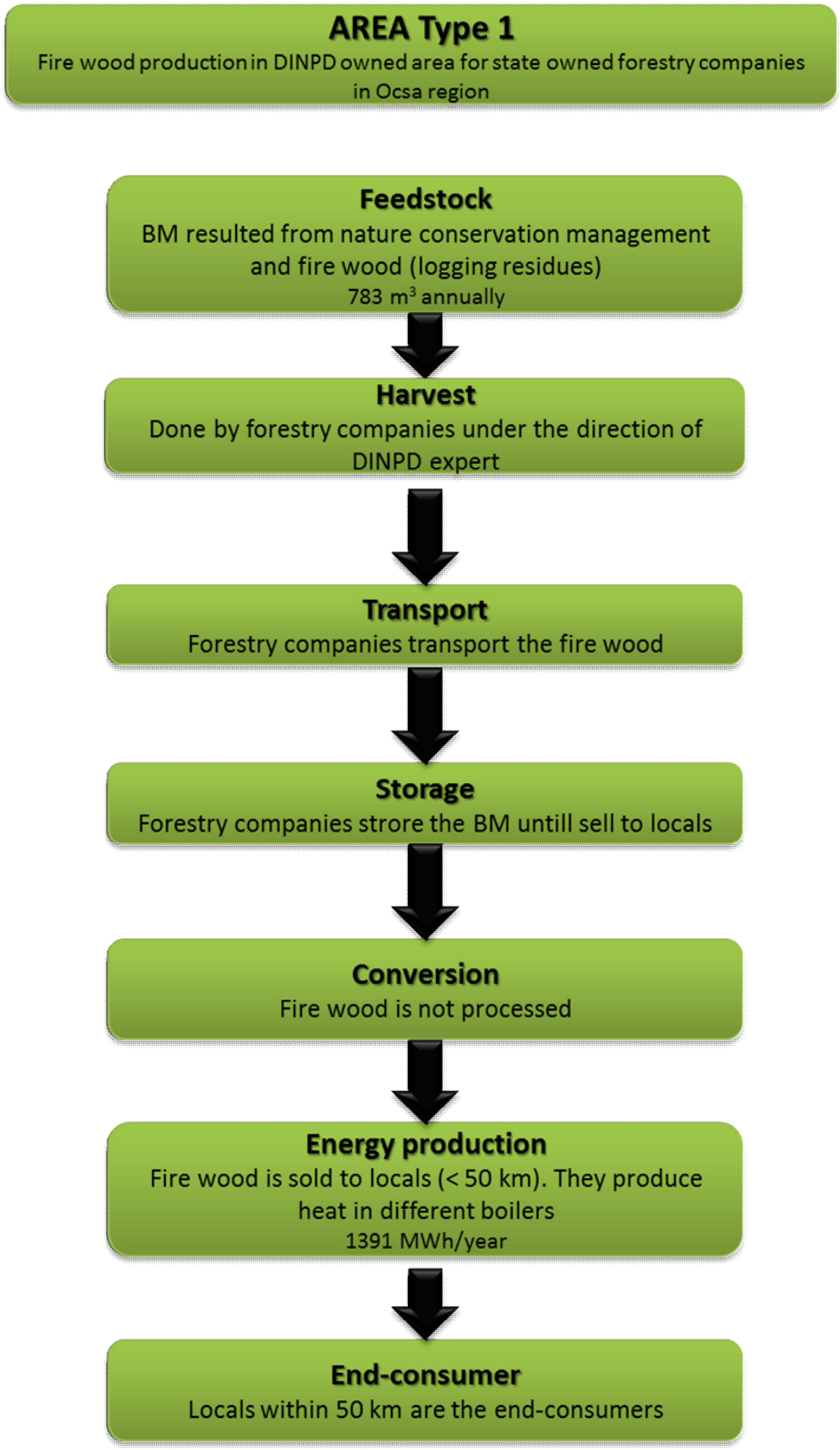
Additional comments to quantification of this type of bioenergy
☞ *Using woody plant biomass creating new supplement chains, fossil heating of small communities could be substituted.*
Give your estimate and comments, how sustainable the present and the potential availability of this type of bioenergy will be, from aspects of … **… economic sustainability**
☞ The biomass-supplement is economically sustainable, because is use local (max. 50 km) produced biomass material. Biomass used for heating is cheaper than any other energy source. According to plans a much bigger supplement chain or more numerous, smaller supplement chains could be created with the extant biomass. The main biomasses could be used for supplement chains are firewood and wholewood chips. The local participants of economy are open to create new biomass-supplement chains. Heating with biomass is cheaper than natural gas, so it is also an economical interest.
… social sustainability
☞ The current biomass supplement chain is societal sustainable, because the local inhabitants use the firewood in the area of the supplement chain. Local consumers are pleased to gather and transport to their homes the biomass needed. That way local inhabitants and the forestry manager take part in the social efficient current supplement chain. It is a good tendency so it has to be continuously renewed when creating new supplement chains.
… ecological sustainability
☞ The ecological sustainability in forest area is assured by the experts of DINPD and the authorities. Plans provide assurance for nature conservation. In case of logging in the forest area, taking into account the nature preservation and Nature 2000 aspects, the ecological sustainability isn't harmed.

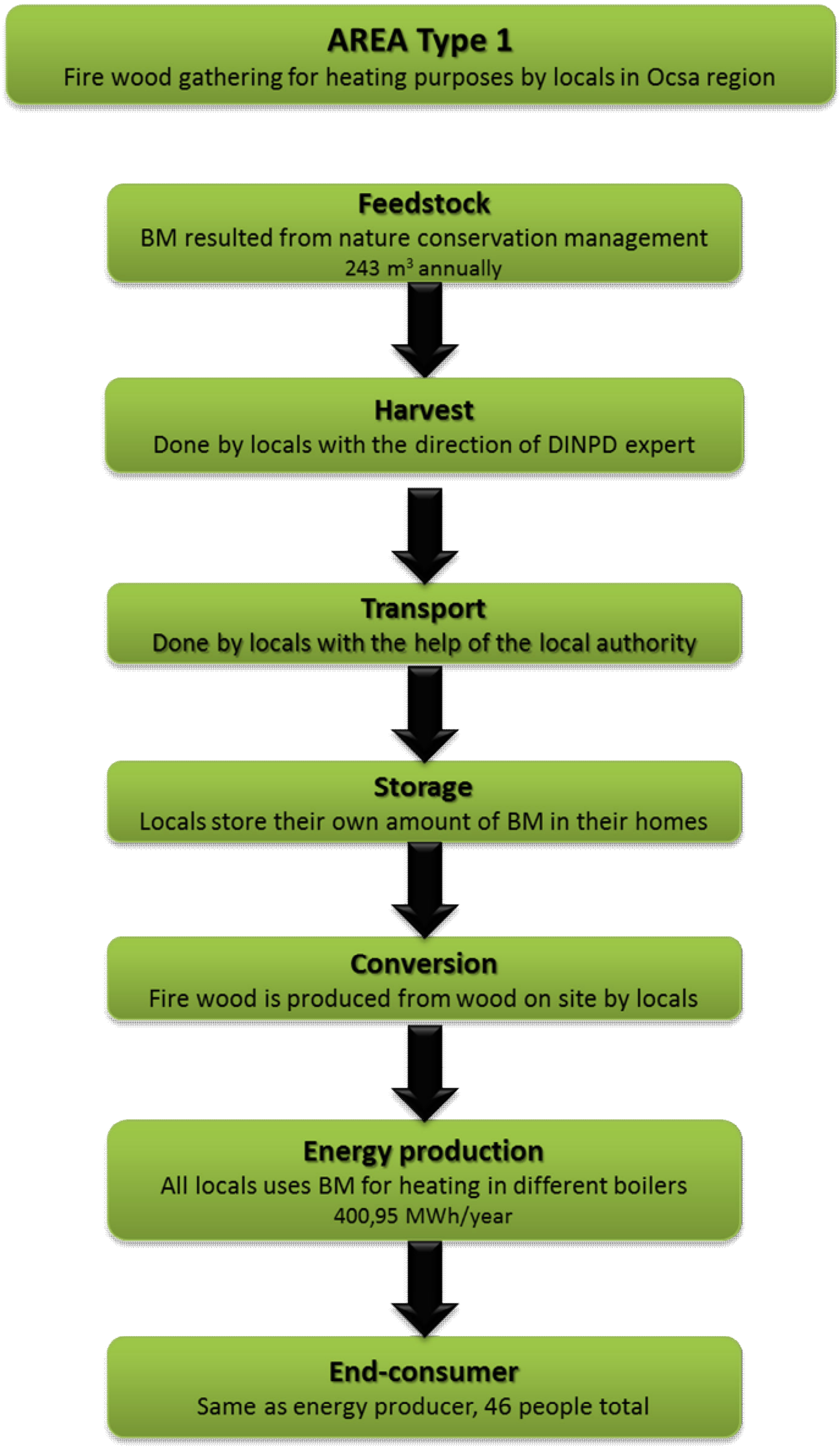
Additional comments to sustainability aspects
☞

Budapest, 2015.01.30.

Annex II.: Current working Supply chains

At the moment there are 3 working supply chains as shown in Annex I. The main data derived from the assessment is projected here.




AREA Type 1
Fire wood gathering for heating purposes by locals in Ocsa region
Feedstock
BM resulted from nature conservation management
243 m3 annually
Harvest
Done by locals with the direction of DINPD expert
Transport
Done by locals with the help of the local authority
Storage
Locals store their own amount of BM in their homes
Conversion
Fire wood is produced from wood on site by locals
Energy production
All locals uses BM for heating in different boilers
400,95 MWh/year
End-consumer
Same as energy producer, 46 people total

AREA Type 1
Wood chips production for Visitor Center in Sas-hegy

Feedstock
BM resulted from nature conservation management
4,5 m^3 annually

↓

Harvest
Done in accordance with the MOU between DINPD and local authority

↓

Transport
Done by DINPD and volunteers

↓

Storage
DINPD owned storage close to the Visitor Center

↓

Conversion
Wood chipper is owned and operated by DINPD expert

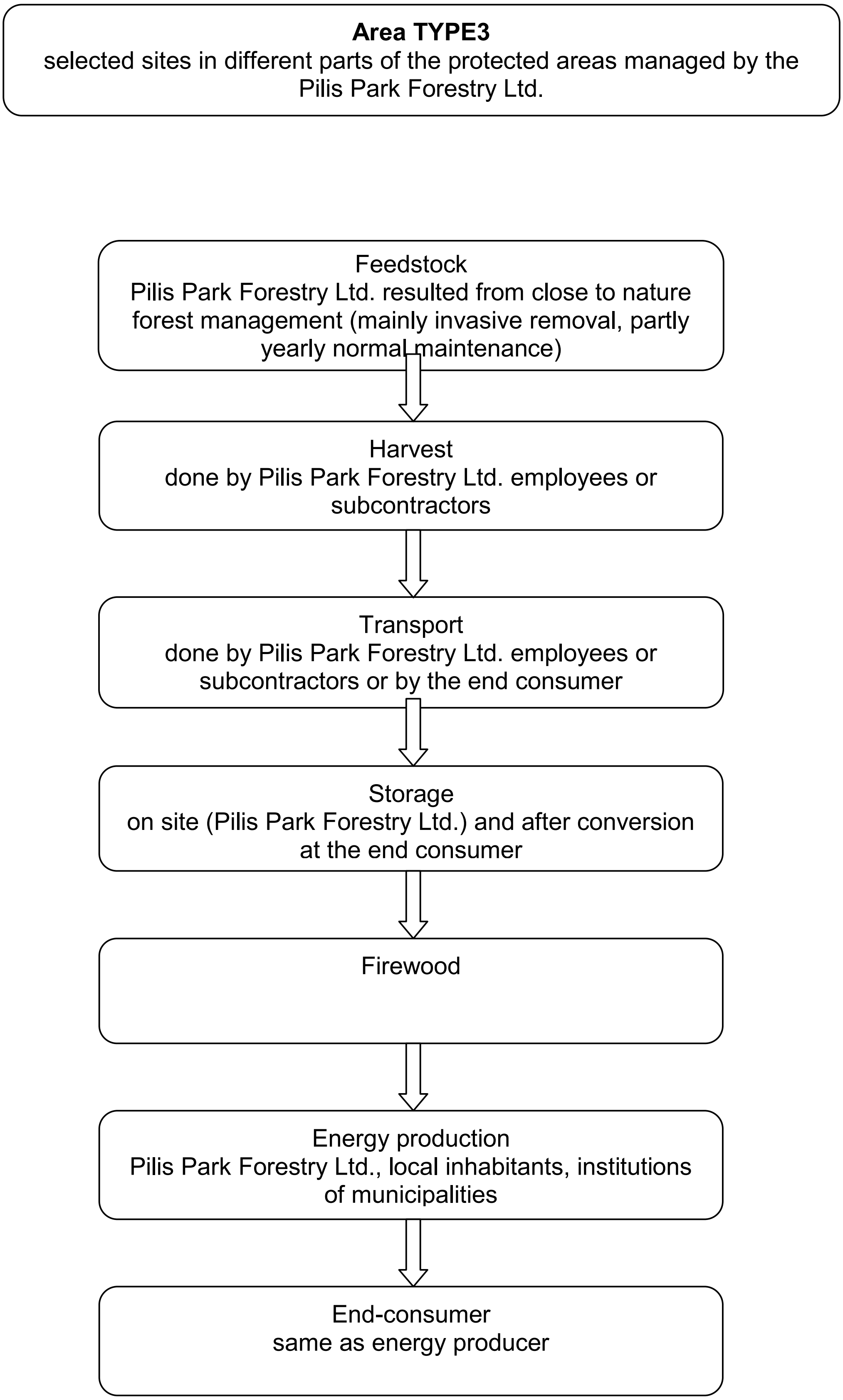
↓

Energy production
The Visitor Center uses wood gasification boiler for heat production (heating/domestic hot water)
7,425 MWh/year

↓

End-consumer
Same as energy producer

Supply Chains form Area Type 3.



Gödöllő Supply Chain

Name of the LSC	Pilis Park Forestry Company HM CURRUS Company
Feedstock: Owner of the land	Hungarian Government
Feedstock: Manager of the land	Pilis Park Forestry Company
type of the ownership (private/public)	public
Harvesting done by:	Gödöllő region
way of harvesting, maximum capacity:	12000 m^3
Transport done by:	trucks
way of transport, maximum capacity:	9000 m^3
Storage done by:	HM CURRUS Company - Gödöllő
place and type of storage, maximum capacity:	200 m^3
Conversion done by:	Pilis Park Forestry Company
place and type of conversion, maximum capacity:	forest area
Energy production done by:	HM CURRUS Company - Gödöllő
place and type of Energy production, maximum capacity:	MAWERA GmbH FSB 550 550 kW
End-consumer of Energy:	HM CURRUS Company - Gödöllő
way of energy-transfer, place of end-consuming, amount of used Energy:	HM CURRUS Company - Gödöllő

Pilis Park Forestry Company - Gödöllő Biomass exploitation area	
	ha
Area where biomass will be exploited for the supply chain	7400
Origin of biomass divided by ha	
	ha
Decidious forest/Shrub	7100
Mediterranean forest	-
Grassland, shrub	300
tot	-
Biomass production rate	
Decidious forest (Annual growth m3/(ha*year)	5,6
Grassland, shrub (Straw production of ton/(ha per year)	50
Conversion rate from biomass m3 and ton	
Decidious forest/Shrub	0,67
Mediterranean forest	-
% of the forest annual growth can be used for energetic use without changing the current use of wood	10-80%
Biomass exploited for the supply chain	**Ton**
Decidious forest (area x Annual growth x conv rate x exploit rate)	12.200
Mediterranean forest (area x Annual growth x conv rate x exploit rate)	-
Grassland, shrub (area x biomass prod rate)	45
Total	**12.245**

Gödöllő Region

Renewable energy production (MWh/year) (3 kWh/kg calorific value)	**36.735**
Electric power from CHP plants (ren. E x 50% x 17%)	**-**
Thermal energy (MWh/year) (ren. E x 50% x 75% + ren.E x 50% x 80%)	**14.694**
Primary enery savings (toe/year) (1 MWh of electrical energy * 0,137 toe + 1 MWh of thermal energy * 0,086 toe)	**1264**
CO2 emissions reduction (ton/year) (3,8 x primary energy savings toe)	**4803**
LSC HM CURRUS Ltd.	
Renewable energy production (MWh/year) (3 kWh/kg calorific value)	**1.770**
Electric power from CHP plants (ren. E x 50% x 17%)	**-**
Thermal energy (MWh/year) (ren. E x 50% x 75% + ren.E x 50% x 80%)	**762**
Primary enery savings (toe/year) (1 MWh of electrical energy * 0,137 toe + 1 MWh of thermal energy * 0086 toe)	**66**
CO2 emissions reduction (ton/year) (3,8 x primary energy savings toe)	**251**

Visegrád Supply Chain

Name of the LSC	Pilis Park Forestry Company Hotel Silvanus
Feedstock: Owner of the land	Hungarian Government
Feedstock: Manager of the land	Pilis Park Forestry Company
type of the ownership (private/public)	public
Harvesting done by:	Visegrád region
way of harvesting, maximum capacity:	13420 m^3
Transport done by:	trucks
way of transport, maximum capacity:	7300 m^3
Storage done by:	Hotel Silvanus - Visegrád
place and type of storage, maximum capacity:	100 m^3
Conversion done by:	Pilis Park Forestry Company
place and type of conversion, maximum capacity:	forest area
Energy production done by:	Hotel Silvanus - Visegrád
place and type of Energy production, maximum capacity:	500 kW
End-consumer of Energy:	Hotel Silvanus - Visegrád
way of energy-transfer, place of end-consuming, amount of used Energy:	Hotel Silvanus - Visegrád

Pilis Park Forestry Company	
Visegrád Biomass exploitation area	
-	*ha*
Area where biomass will be exploited for the supply chain	3900
Origin of biomass divided by ha	
	ha
Decidious forest/Shrub	3650
Mediterranean forest	-
Grassland, shrub	250
tot	-
Biomass production rate	
Decidious forest (Annual growth m3/(ha*year)	4,8
Grassland, shrub (Straw production of ton/(ha per year)	42
Conversion rate from biomass m3 and ton	
Decidious forest/Shrub	0,61
Mediterranean forest	-
% of the forest annual growth can be used for energetic use without changing the current	10-80%
Biomass exploited for the supply chain	**Ton**
Decidious forest (area x Annual growth x conv rate x exploit rate)	13.420
Mediterranean forest (area x Annual growth x conv rate x exploit rate)	-

Grassland, shrub (area x biomass prod rate)	45
Total	**13.465**

Renewable energy production (MWh/year) (3 kWh/kg calorific value)	**40.400**
Electric power from CHP plants (ren. E x 50% x 17%)	**-**
Thermal energy (MWh/year) (ren. E x 50% x 75% + ren.E x 50% x 80%)	**16.160**
Primary enery savings (toe/year) (1 MWh of electrical energy * 0,137 toe + 1 MWh of thermal energy * 0,086 toe)	**1390**
CO2 emissions reduction (ton/year) (3,8 x primary energy savings toe)	**5282**

Pilis Park Forestry Company	
Pilis Park Forestry Company Biomass exploitation area	
-	*ha*
Area where biomass will be exploited for the supply chain	64500
Origin of biomass divided by ha	
	ha
Decidious forest/Shrub	57000
Mediterranean forest	-
Grassland, shrub	7500
tot	-
Biomass production rate	
Decidious forest (Annual growth m3/(ha*year)	4,6
Grassland, shrub (Straw production of ton/(ha per year)	4,2
Conversion rate from biomass m3 and ton	
Decidious forest/Shrub	0,85
Mediterranean forest	-
% of the forest annual growth can be used for energetic use without changing the current	10-80%
Biomass exploited for the supply chain	**Ton**
Decidious forest (area x Annual growth x conv rate x exploit rate)	180.500
Mediterranean forest (area x Annual growth x conv rate x exploit rate)	-
Grassland, shrub (area x biomass prod rate)	31.500
Total	**192.000**

Renewable energy production (MWh/year) (3 kWh/kg calorific value)	**576.000**
Electric power from CHP plants (ren. E x 50% x 17%)	**-**

Thermal energy (MWh/year) (ren. E x 50% x 75% + ren.E x 50% x 80%)	**244.800**
Primary enery savings (toe/year) (1 MWh of electrical energy * 0,137 toe + 1 MWh of thermal energy * 0,086 toe)	**21.053**
CO2 emissions reduction (ton/year) (3,8 x primary energy savings toe)	**80.000**

Residential supply chain including 29 settlements

Name of the LSC	Pilis Park Forestry Company Public
Feedstock: Owner of the land	Hungarian Government
Feedstock: Manager of the land	Pilis Park Forestry Company
type of the ownership (private/public)	public
Harvesting done by:	Central Hungarian region
way of harvesting, maximum capacity:	2000 m^3
Transport done by:	trucks
way of transport, maximum capacity:	2500 m^3
Storage done by:	municipalities
place and type of storage, maximum capacity:	30000 m^3
Conversion done by:	Pilis Park Forestry Company
place and type of conversion, maximum capacity:	forest area
Energy production done by:	local population
place and type of Energy production, maximum capacity:	5 kW
End-consumer of Energy:	local population
way of energy-transfer, place of end-consuming, amount of used Energy:	local population

Co-funded by the Intelligent Energy Europe Programme of the European Union

BIOEUPARKS

Exploiting the potentialities of solid biomasses in EU Parks

Fine Tuned

Localized Supply Chain Plans

LEGAMBIENTE Lead Partner

Table of contents

1 Introduction

The present plan represents the fine-tuning of the provisional Localized Supply Chain Plan presented by the Park in 2014 which should have identified the guideline for the setting up of the local supply-chain.

During the supply chain setting up phase the technical administrative procedure responding to the park strategy have caused delays which didn't allow the running of the supply chain for the first heating season.

For this reason, the present document is not based on the technical assessment of the results of the operative supply chain, it is an executive planning and a detailed description of the production chain operating within the park and the specific characteristic of the supply chain which will start running for the heating season 2015-2016.

2 Basic information about the park

- **Sila National Park:**
    - **Land Surface Area (ha):** 73.695,00
    - **Regions:** Calabria
    - **Provinces:** Catanzaro, Cosenza, Crotone
    - **Municipalities:** Acri, Albi, Aprigliano, Bocchigliero, Celico, Corigliano Calabro, Cotronei, Longobucco, Magisano, Mesoraca, Pedace, Petilia Policastro, Petronà, San Giovanni in Fiore, Savelli, Serra Pedace, Sersale, Spezzano della Sila, Spezzano Piccolo, Taverna, Zagarise
    - **Establishment Measures:** L 344 8/10/1997 - DPR 14/11/2002
    - **PA Official List:** EUAP0550
- **Park Authority:** Ente Parco Nazionale della Sila
- **Further managed Protected Areas:**
    - **State Reserve Coturelle - Piccione**
    - **State Reserve Gallopane**
    - **State Reserve Gariglione - Pisarello**
    - **State Reserve Golia Corvo**
    - **State Reserve I Giganti della Sila**
    - **State Reserve Macchia della Giumenta - San Salvatore**
    - **State Reserve Poverella Villaggio Mancuso**
    - **State Reserve Tasso - Camigliatello Silano**
    - **State Reserve Trenta Coste**

The Sila National Park includes some of the most interesting areas in Calabria Region, its large forests are situated over plateaux spreading from Pollino mountains to Serre mountains. There are many rural villages and a rich cultural and artistic heritage. The highest mountains are Botte Donato (mt. 1928), in Sila Grande and Gariglione (mt. 1764) in Sila Piccola; there are many torrential rivers and artificial lakes with several utilisations. The fauna, both permanent and migratory, is numerous and diverse.

3 Description of wood biomass potential in the park

About 80% of the area of Sila National Park is covered with forests. More precisely, forests cover about 60.000 ha out of 73.000 ha. Except for Integral and Biogenetic Reserves (property of the Region) and areas owned by the municipalities, forests are privately owned. This is why private owners were invited to take part in the meetings held by the SNP to discuss the biomass supply plan.
In order to draw a realistic estimate of the amount of biomass produced in the Park forests, some dendrometric data must be preliminarily gathered, particularly those concerning the existing types of forests. To do this, forest areas need to be divided into vegetation belts or biomes (Corsican pine, beech, downy oak, Turkey oak) and each of these into chronological classes.

At present, data gathered by the National Inventory of Forests and Forest Carbon Pools (INFC – Ministry for Agriculture and Forestry) are available.

It can be therefore supposed that the existing amount of wood in the forests of SNP, divided per land cover and use classes, corresponds to the figures reported in the table below.

Table 1 *Wood potentials in SNP*

Classes of land cover and use	Area (hectares)	m^3/ha	Tot. amount (m^3)
Beech forests	13214	350	4.624.900,00
Mixed forests with prevalence of beech	10307	350	3.607.450,00
Corsican pine forests	27595	322	8.885.590,00
Mixed forests with prevalence of Corsican pine	5789	300	1.736.700,00
Deciduous oak forests	4597	200	919.400,00
Chestnut-tree forests	329	150	49.350,00
Evergreen sclerophyllous forests	176	50	8.800,00
		Total	**19.832.190,00**

The total amount only represents the total biomass of the SNP, without distinction of assortment.

It must be considered that not all of the Park forest area can be used, particularly areas located in Zone 1, that is, Integral and Biogenetic Reserves where law prohibits any cut.

Furthermore, no forest can be entirely used for energy purpose, as all wood assortments have to be valorised. Thus, the amount of extracted biomass should be fixed in relation to yearly tree growth rates, with no impact on existing stocks, that is, without reducing the existing amount of wood.

This is a sustainable use of forests and implies paying a strong attention to the environmental compatibility of the biomass supply chain.

4 Assessment of the actual available wood biomass for energy use

Out of total amounts of wood growth, the net amount of biomass that can be supplied to energy conversion plants is determined by the analysis of wood assortments and their use destination, ground slope degrees, other forestry programmes, mechanisation and, importantly, the authorisations yearly issued by Calabria Region upon forest owners request.

Supposing that available conifer biomass is up to the 25% of yearly wood growth, available hardwood biomass is up to 10% of yearly wood growth and available area is up to 13000 ha conifers and 9000 ha hardwoods:

Table 2 Available wood biomass for energy use

Forest type	Area (ha)	Amount (m^3/ha)	Increment (m^3/ha)	Biomass per year (m^3/ha)	Potential extraction (m^3/y)
Pure and mixed Conifers	13.000	350	4	0,8	10.400
Pure and mixed Hardwoods	9.000	400	4,5	0,675	6.075
				TOTAL	**16.475**

Conifers
The forests of Sila National Park that are potentially suitable to supply biomass occupy an area of about 28.000 HA, entirely in zone C. More specifically, the area involved in the plan is up to **13.000 ha** conifers, representing 50% of SNP areas, almost exclusively composed by Corsican Pine *var Calabrica* or Corsican Pine mixed with beech.
Present day scenario
From the analysis of data concerning land cover in SNP, it can be argued that the production of biomass for energy purpose, based on conifer forests. The availability goes down again due to lack of forest management plans is, currently up to around **5.200 tons/year.**

Hardwoods
As regards hardwoods, 12.000 ha of SNP area, also included in zone C, will be involved.
More specifically, hardwoods forests can be identified into **9.000 ha** of beech forests and beech forests mixed with other hardwoods. Most of these SNP forests are not included in any Forest Management Plan, therefore, their exploitation is up to the owner (either private or public) who asks Calabria Region for a cut permission.
Present scenario
From the analysis of data concerning land cover in SNP, it can be argued that the production of biomass for energy purpose, based on hardwood forests. The availability goes down again due to lack of forest management plans, is currently up to around **3.035 ton/year**.

5 Setting up the production chain

The process of building the supply chain started with the involvement of territorial stakeholders to analyse the present-day biomass market situation and the feasibility of a short supply chain based on environmental, social and economic sustainability.

During numerous public meetings and roundtables, it emerged that biomass produced in the Park area is entirely absorbed by thermal power plants of Crotone and Cosenza provinces.

Thus, the final user is GSE (national manager of energy services). As a consequence, all the energy produced from SNP biomass enters the national system with no direct advantage for the local territory.

The Park has therefore started a process to elaborate and share with stakeholders a different approach to forest resources management whose pillars are the short supply chain, environmental and social sustainability and the promotion of local scale energy districts.

The aim was to re-direct a part of the biomass stored by local producers to supply small stations inside the Park area. Such an approach raised the interest of biomass producers but had to deal with the problem of finding local plants fit for biomass combustion.

Two possible options have been identified:

- The Longobucco plant, described in the plan and representing an interesting hot spot in the park area
- The clustering of local demand coming from private economic activities such as restaurant, hotels, farms etc

Unfortunately, both the options didn't ensure the supply chain start up within a limited time-frame, in fact, on one hand, the Longobucco Plant is not currently operative due to the delay in issuing the permits, on the other hand, the clustering of local demand need a quite long process which shall be concluded with the signing of a formal agreement for the creating of a local purchasing group able to join to the supply chain.

In order to overcome the problem and to create the market conditions for the setting up of the supply chain, the Park has played the role of final user of biomass and has issued a call for tenders to purchase pellet form local suppliers.

The biomass purchased will be destined to 8 heating systems in buildings managed by the Park that have been converted from diesel and log to pellet using a national fund to convert eight boilers installed in the park premises.

In order to launch the tendering procedure for the purchasing of the local pellet the park has to open a new spending line in its annual budget. Being the Park a National authority under the control of National Ministry, the approbation of the annual budget including also the new budget line is under the responsibility of the State and was obtained only in January 2015 causing the impossibility to activate the pellet supply in the thermal season 2014-2015.

Once obtained the approbation of the budget, in order to activate the supply chain, the Sila National Park opened a tendering procedures restricted to the forest cooperatives signatories of the MoU, to purchase pellet produced respecting strict sustainability criteria. 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 a contract will be signed in next September 2015.

Once closed the procedure, the park activated a new process of stakeholders involvement, actually ongoing, promoting the creation of a Local Purchasing Group which can guarantee the economic sustainability and follow up of the supply chain.

6 Description of production chain

The analysis of the production change is made through the administration of specific questionnaires during the specific meetings, where forestry companies have described their machinery and working procedures, it can be concluded that harvesting operations depend on local orography and technical capacities of harvesters (that is, forestry machines and the equipment they use).

The following procedure is used by most of the forestry companies operating in the SNP territory:

1. **Preparatory phase:** Preparation implies wearing personal protective equipment (chainsaw trousers, chainsaw, steel-toe boots, helmet, gloves and ear defenders). Forestry operations can be generally synthesized as follows.

2. **Felling:** Felling consists in cutting the tree at the bottom. This operation is generally carried out with chainsaws and other tools able to determine the felling direction, such as wedges, felling levers, tackles, etc… the operator has first made the undercut and then the felling cut.

3. **Processing:** It includes delimbing, cross cutting, debarking where necessary. Delimbing and cross cutting are carried out through the chainsaw and manual tools such as bush knives and adzes. This operation can be carried out either in the felling point or in the landing area, after extracting the whole or delimbed trees.

4. **Bunching and extraction:** The cross-cut wood or the long stems are first moved from the felling point to the strip road, along which they are later brought to the landing. The landing is an area dedicated to the gathering of wood and it is accessible by roads suitable for heavy vehicles. The most common extraction systems involve the use of tractors equipped with winch or, in inaccessible areas, of draught animals. Where allowed by the condition of the striproads and by orography, forwarder forestry tractors are used.

5. **Chipping :** This operation involves reducing woods of different kind and form in small-sized pieces (called chips), through a mechanic cutting. In the use of biomass for energy purpose, chipping can be carried out in the forest, this shows some advantages compared to traditional bunching techniques:
   - it allows to use all wood biomass available, including branchwood that, as in traditional bunching it is usually left on the forest ground, represents a dangerous fire fuel;
   - it allows to partially or totally eliminate the bunching of small-sized assortments, saving workforce and improving ergonomics.

   Chipping in felling site is only possible in plains (up to 20% inclination) and less uneven areas. When working conditions are not favourable (too much inclination or too uneven lands), it is necessary to extract the whole tree up to the area where chipping will take place, through the so called “whole-tree” technique.

6. **Pelletisation:** Wood chips and sawdust obtained from first wood processing will be transformed into pellet which will then be supplied to SNP heating systems.
The pellet to be used in the boilers should comply with specifications provided by EN 14961-2, ENPLUS-A1 standard. In particular, pellet must be produced in pure round wood or wood residues with no chemical treatment by first processing industries.
Pellet should be composed, by 70% from Conifer wood (pine, douglas fir, etc…) and by 30% from hardwood (beech, alder, poplar), and present the following specifications:
    - Lower Calorific Value > 16,5 MJ/kg,
    - Moisture content <10%,
    - ash <0,7%,
    - diameter: 5-6 mm.

   As showed in more detail in the table below:

Parameter	Analitical Standards	Specification	Unit
Lowe Calorific value (dry basic) Net Caloric Value (wet basic)	CEN/TS 14918	4,30 18,00	Mkcal/kg MJ/Kg
Ash + inerts content (dry basic)	CEN/TS 14775	max 0,7	*[wt%]*
Moisture (wet basic)	CEN /TS 14774	max 10 %	*[wt %]*
Diameter		6	Mm
Dust		< 1	[wt%]

Chemical Analysis (dry basic)	(Analitical Standards)	Specification (Annual Average)	Specification (max x delivery)
Nitrogen (N) content	ASTM D 5373	< 0,1 % by dry weight	max 0.3 % by dry weight
Chlorine (Cl) content	CEN/TS15105	< 0.01 % by dry weight	max 0.2 % by dry weight
Sulphur (S) content	UNI 7584	< 0.02 % by dry weight	max 0.3 % by dry weight
Crome (CR) content	UNI 13657+ EPA 6010C/98	< 0,25 % by dry weight	max 1 % by dry weight

To demonstrate that required standards are met, pellet should be accompanied by ENPLUS-A1 certification. The potential supplier should verify compliance with specifications recommanded by the boiler producer.

Pellet should be packed in 15-kg transparent bags. Bags should bear, in legible characters, pellet specifications, the place of pelletisation and the logo of “**BIOEUPARKS**” project provided by the Sila National Park.

As regards consumptions, if the boiler is used during the autumn-winter months (6 months), operating at full capacity, that is, at top consumption, for 10 hours per day and during 4 more months with minimum consumptions, **the amount of chips/pellet needed is approximately 250 tons/year.**

The supplier will have to submit documents allowing the traceability of the supply, more specifically:

- Cut authorisation issued by Calabria Region identifying the cutting area;
- Wood purchase contract;
- Short report by the works director with specification of processing phases, origin of wood and other information requested by the Track and Trace system described in the LSCP (Localized Supply Chain Plan);
- Declaration certifying that pelletisation has been carried out within the SNP area or (in the territory of a municipality included in the SNP) in case the supplier had used a third pelletisation facility;

The SNP will supervise and control the supply chain and may ask any accredited laboratory to carry out analyses of the material supplied in order to verify the compliance with required standards. Furthermore, forestry processing phases and pelletisation will make the object of on-the-spot-checks. Audit reports will be countersigned by the supplier.

7 Description of producers, suppliers of wood biomass

Most of the forestry companies existing in the SNP area have been invited to take part in round tables and specific meetings.

The choice of actors to be involved has been made taking into account the capacity to create the supply chain and to maintain it in the future.

In particular, target forestry companies would have the following characteristics:

- Without regard to juridical status, target companies need to rely on a team of qualified workers and a number of forestry machines suitable for the creation of a short supply chain.
- Moreover, the company has to be included in the regional register of forestry companies with specific reference to forestry works, environment restoration, biomass chipping, reforestation, restoration of degraded forests, wood transportation.

8 Description of end user

Analyzing the flows of biomass that is currently produced within the SNP area, it results that the destination of wood biomass are thermal power stations in Crotone and Cosenza provinces. Thus, the final user is GSE (national manager of energy services). As a consequence, all the energy produced from SNP biomass enters the national system with no direct advantage for the local territory.

This project proposes a new approach to solid biomass valorization, based on social and environmental sustainability and directed to promote the utilization of biomass inside the harvesting area. This would, on the one hand, reduce transportation costs and, on the other hand, ensure the supply to small an very small-scale local stations.

In order to favor this process, during the first year of activity of the supply chain the Park has played the role, as further described in the next paragraph, of final user of biomass and has issued a call for tenders to purchase pellet form local suppliers.

The biomass purchased will be destined to 8 heating systems in buildings managed by the Park that have been converted from diesel and log to pellet; their technical specifications are showed below:

N	Structure	Municipality	Prv	fuel	brand	KW	Final users
1	SNP headquarters	Lorica	Cs	pellet	Pasqualicchio	208	Staff and Visitors
2	Cupone Segheria – Museum	Spezzano Sila	Cs	pellet	Pasqualicchio	208	Visitors
3	Cupone study center	Spezzano Sila	Cs	pellet	Pasqualicchio	77	Visitors
4	Longobucco Museum	Longobucco	Cs	pellet	Pasqualicchio	92	Visitors
5	Lorica-Mellaro	Lorica	Cs	pellet	Pasqualicchio	114	Visitors
6	CTA-Cava di Melis	Longobucco	Cz	pellet	Palazzetti	15	Staff CFS
7	CTA-Carbonello	Taverna	Cz	pellet	Palazzetti	15	Staff CFS
8	CTA-Cupone	Spezzano Sila	Cs	pellet	Palazzetti	15	Staff CFS

In the project's second year, the number of final users will be extended by inviting public bodies and private operators to take part in the supply chain and sign the framework agreement with the Park and local biomass producers.

One of the plants which provisionally should have been involved in the project is the central plant of Longobucco.
In this case, hot water will be produced downstream through a cogenerator fed with syngas from the gasification plant.
A district heating system will be created in order to distribute it.
The following buildings will be supplied with thermal energy:

1. "Former Convent of Reformed Friars" – via Roma, seat of SNP museum; rated thermal input of 108 kW;
2. "Santa Croce" school - via Matinata, rated thermal input of 72 kW

Anyway at the moment, due to the delay in issuing the permit which allow the running of the plant and for the clustering of local demand due to the time needed to formalize a formal agreement which allow to aggregate the demand.

9 Important aspects of the supply chain

The drafting of this project was inspired by the full awareness that finding a solution to environmental problems requires a comprehensive approach rather than actions on specific sectors. This is also emphasised in EU energy policies that, recognising the crucial role played by local authorities, encourage them to develop a mid-term integrated energy programme in their territories.

In this perspective, the Sila National Park has decided to take part in this important initiative recognising the huge potentialities of its forests and aiming to contribute, through a territorial planning strategy, to the creation of an agro-energy short supply chain based on the guidelines provided by this Local Biomass Supply Plan.

This plan is not exhaustive but can be considered as an open document for a first pilot project; it aims to be replicable in the territory and, therefore, flexible and adaptable to different contexts.

According to the principles of supply chain management, there is the need to set up cooperation tools among the actors of the agro-energy supply chain, in order to ensure its functioning within a context of shared rules.

The key-issues for the success of this work plan are listed below and represent the main challenges the SNP will deal with during the project:

- a model of governance that ensures the durable participation of agriculture/forestry companies, forest owners and institutions in the agro-energy system;
- encouraging final users confidence towards the supply chain and its actors, through the organisation of periodic and thematic meeting;
- the application of track and trace models to the agro-energy supply chain, ensuring the sustainable management of forest land from which biomass originates;
- promoting the PEFC and PSC forest certification frameworks;
- drafting of a Strategic Territory Plan, conceived as a planning tool suitable for a territory scale larger than the municipality, geographically and administratively homogenous;
- providing assistance, upon request, for the drafting of framework contracts for the supply of biomass. Contract procedures have to be subject to standardisation and continuous adaptation, including quanti/qualitative specifications of biomass supplied, relation to plant capacity, assessment of economic aspects, in order to avoid disagreements and problems in the execution of the contract.

BIOEUPARKS – Exploiting the potentialities of solid biomasses in EU Parks
Contract N°: IEE/12/994

REPORT

Fine tuned Localized Supply Chain Plan

by

SNP – Sölktäler Nature Park

Prepared by:

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English Version, 2015

Contents

Illustrations and Tables

1. Summery

The biomass heating plants in Kleinsölk, St. Nikolai and Mössna are operated 100% with regional biomass. Heating with wood has a long tradition Sölktäler Nature Park. The acceptance of biomass heating therefore is very high.

The closeness of forest owners and heating plants could not be better. The long experience of the operators of the three heating plants in operating heating plants results in a very high quality of the fine tuned local supply chain. All persons and companies involved in the Fine tuned Local Supply Chain are from the region. Improvements in the supply chain are limited to a small extent.

The biggest challenge is the economic development of the small scale heating plants in the coming years. Low energy costs, high wood prices and high maintenance costs are the biggest problems for the owners of the heating plants.

The low population density in the natural park Sölktäler hindered further expansion of biomass heating systems.

2. Introduction

The importance of renewable energy for the production of heating and electricity is increasing across Europe. In order to obtain durable utilisation, an efficient and sustainable supply chain for Biomass is indispensable. Promising projects often fail for technical, commercial or organisatory reasons, or where non-transparent decisions and actions of a company are seen as a threat to the environment, the landscape or to individual health. For this reason Intelligent Energy Europe initiated the BIOEUPARKS project – in five European Nature Parks a sustainable biomass supply chain should be developed, which above all centres on regional impact. The project began in April 2013, when the first two work packets (the planning of, sensitising to, and the development of new methods) has already been completed. The third working packet represents the technical and theoretical basis for all further phases. It should facilitate the development, the planning and the management of an environmentally friendly and economically sustainable biomass supply chain. What does regional biomass production presently look like? Is there potential for expansion and how would that be possible? The analysis is subject to national and EU legal provisions for nature conservation, forest law, and energy law.

Based upon the general supply chain for biomass – forest, harvest, transport, storage, processing, energy production, and end user – a specific supply chain for the particular region is being produced. Short delivery and shortest supply chains are in focus during investigation and planning, i.e. the distance from forest to end user should not exceed 50km and the thermal power plant may not produce more than one MW of power. In each individual subsection, adequate framework conditions for all stakeholders are created via SWOT-Analysis (Strengths, Weaknesses, Opportunities, and Threats).

In further steps it is intended to close out contracts and to implement the delivery chain. Through continuous controls, the prognosis and fine-tuning of processes will be enabled and the cornerstone will be laid for a continuation after the end of the project.

The aim is the establishment of an efficient supply chain which enables the sustainable management of forests. Therefore these both technical and social aspects must be integrated, in order to satisfy all parties concerned.

3. Sölktäler Nature Park

3.1. Land and people

3.1.1 Position – geographical, geological, climatic

Sölktäler nNature Park 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 (fig.1). 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 charactaristics of this are the often recurring straight-running segments of valleys. Often over-deepenings 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 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.

The climate is moderate and cold, total annual precipitation is 1369 mm, and the average temperature is about 4.8 °C. Precipitation peaks in summer, (whereby in the month with the least preciptation, February, 78 mm of precipitation falls), the coldest month is January with an average temperature of -5.2 °C, the warmest is July with a mean temperature of 14.2 °C.

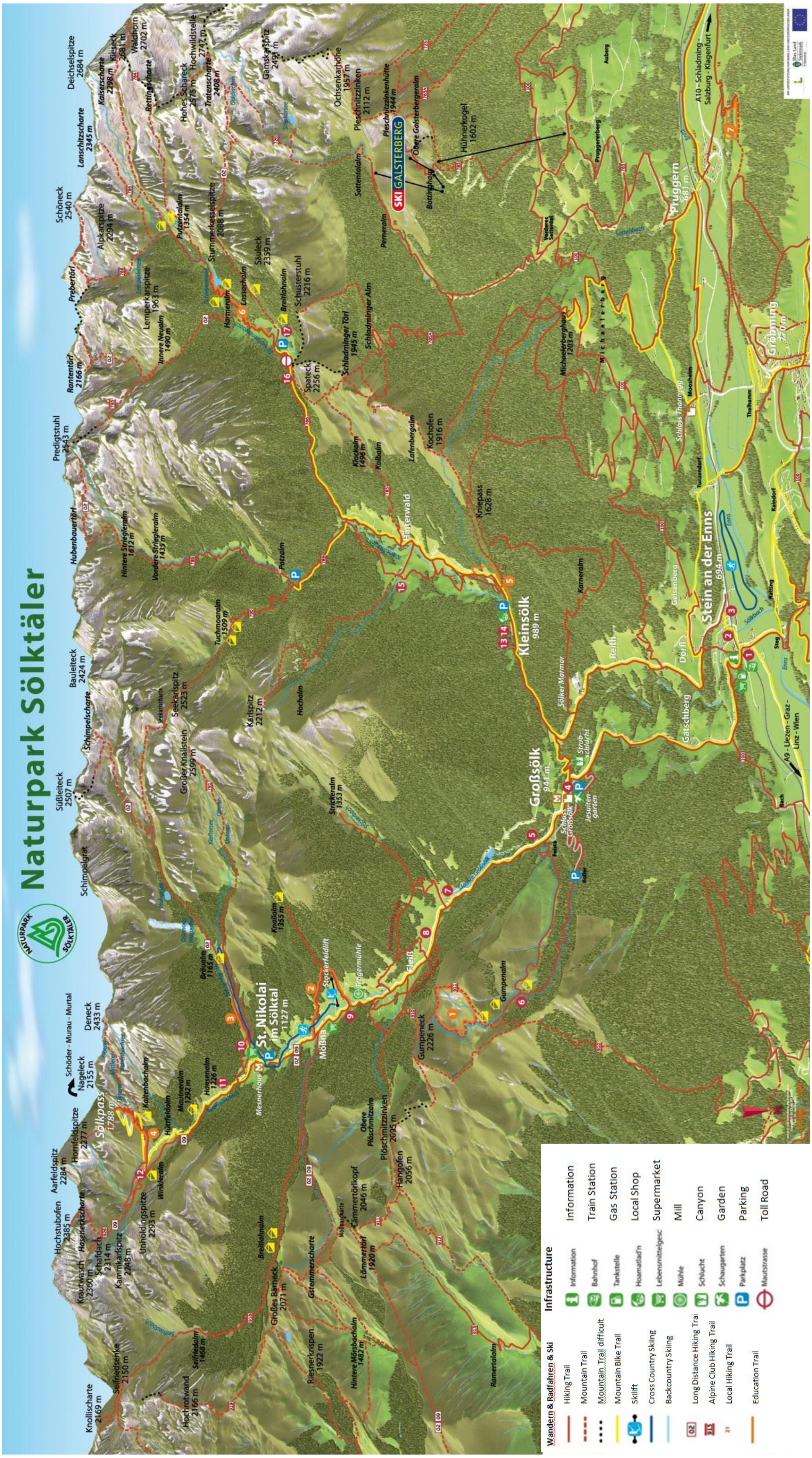


Figure 1: Sölktäler, view to the South

3.1.2 Population and History

The area of the nature park is identical to the area of the three municipalities Großsölk, Kleinsölk and St. Nikolai. Presently 1670 people are living there (606, 540 and 524). The most important commercial sector is tourism; in 2013, 18,942 overnight stays were recorded. However attendance culminates in the summer months of July and August, but in terms of energy consumption winter months are more relevant: from December 2012 to March 2013, 7,481 overnight stays were booked. In Austria there is a trend to slow tourism and Eco-tourism which suits this region, and it takes advantage of it by increasing conservation of biodiversity, traditional landscapes, local products and traditional cultivation and customs. The preservation of that natural and cultural landscape is an ultimate ambition and in 1983 it led to the foundation of Sölktäler Nature Park. Primarily it should work as natural conservation instrument with a strong relevance to the regional economy and recreational function. The nature park's philosophy is thereby striving for several objectives: aside from the protection of nature and cultural heritage; regional development, recreational function, and the transfer of knowledge about the ecological features and the long history are fundamental (www.naturparke.at).

The Großsölk valleys past is also reflected in the names given to settlements – for example St. Nikolai was named after the patron of traders "San Nicola". Until the 20th century the road ended there, only in summer 1964 the road, now continuously driveable by motor vehicles, was opened (Mandl et al., 2003). Because of snow conditions, the Sölkpass is still closed for nearly seven months a year; snow covers the the 1120 m altitude township of St.Nikolai for an average of 115 days a year (WEP Stainach, 1999).

3.1.2 Vegetation and Protected Areas

According to (Kilian et. al. 1994) Sylvatici-Abietetum, spruce and fir, form the dominant forest community, which is also true for the current situation. For the most part coniferous woods are present[1] (fig.2), predominantly spruce (*Picea abies*) at 76%, the percentage of larch(*Larix decidua*) increases at higher altitudes, until stands are formed (WEP Stainach, 1999). Mountain pine (*Pinus mugo*) grows almost exclusively at the treeline. Only individual firs (*Arbies alba*) can be found, as they incur heavy losses as seedlings due to game; scots pine (*Pinus sylvestris*), and especially in the inner parts of the valley and on mountain crests swiss stone pine (*Pinus cembre*), are intermingled. Only 6% are broad-leafed trees, with this tendency increasing, mostly in the lower valley and valley floor. There the majority consists of beech (*Fagus sylvatica*), ash (*Fraxinus excelsior*) and sycamore maple (*Acer pseudoplatanus*), furthermore green alder (*Alnus viridis*) and gray alder (*Alnus incana*), both of them are not used for forestry purposes. Much like birch (*Betula pendula*), willow (*Salix*), rowan (*Sorbus aucuparia*) and also pine they are pioneer species, having a balancing effect on the microclimate and providing special protection for regeneration of delicate species. Simultaneously they are slowing the growth and thereby the competitiveness of the herb layer. Because the leaf litter of these pioneer species can be decomposed easily it improves the humus structure and thereby the soil's base and nutrient balance (Hirschberger, 2006). The green alder for example roots mainly on moist steep slopes, at the edge of streamlets and in temporary aquiferous stream channels, also

[1] at least $^{8}/_{10}$ coniferous woods at a canopy cover ≥ ⅓

in avalanche and mudslide hauls; thereby it plays an important role in the stability of slopes and revegetation after large-scale disturbances.

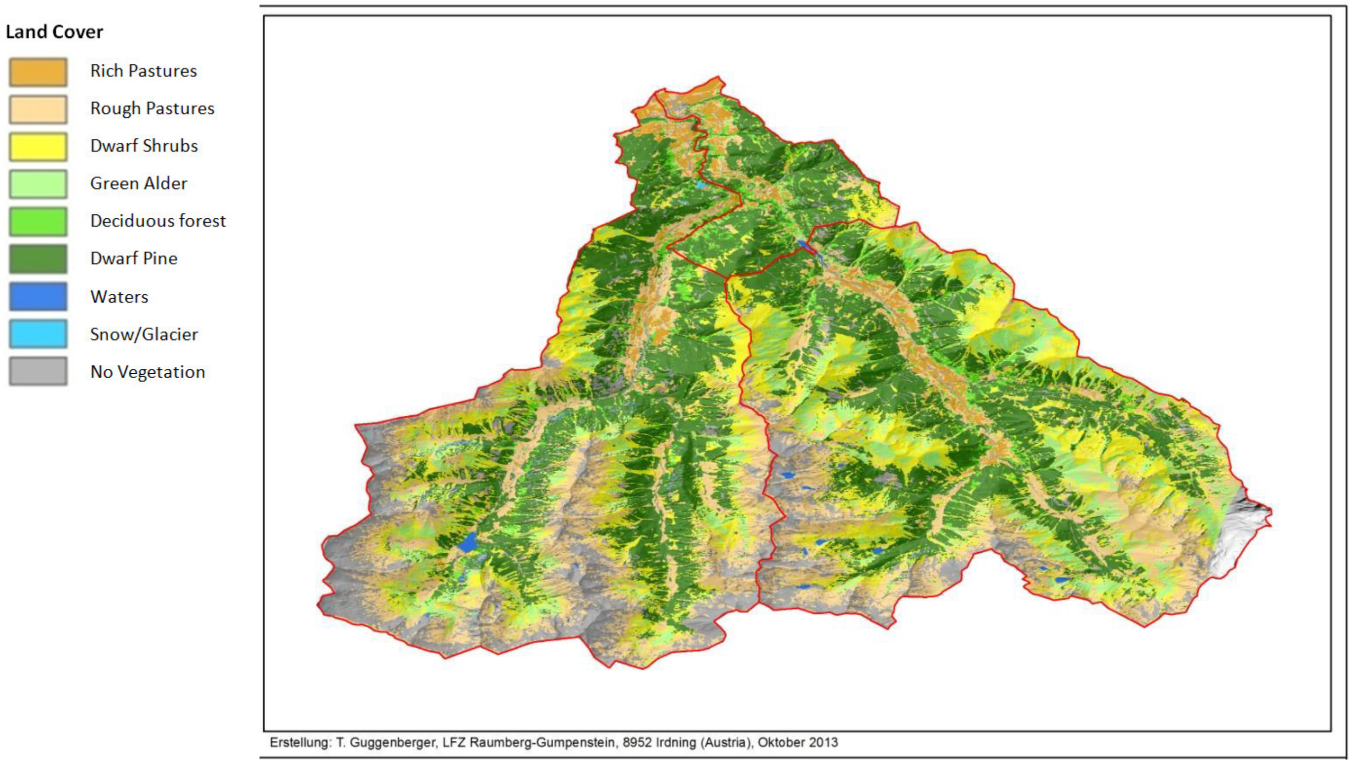


Figure 2: Coverige of the Nature Park

Due to the partly extreme weather conditions and steep slopes, the forest's protective function has a very high value in Sölktäler Nature Park. Therefore 5020 ha are classified as protective forests for objects or soil, to some extent in, but also out of yield (Guggenberger pers. information, 2014). They constitute 17.4% of the whole nature park area, and 33.8% of forest cover respectively, which represents 14,886 ha (Natreg, 2011). Protective forest areas already begin in lower valley in the gorge of the river Sölk, from there it stretches via the water channel to higher altitude. Along the elevational gradient, the protective forest zone meets the "battle zone" of the forest, which forms the transitional zone to non-forest-areas above the tree line.

Protective forests require more work in terms of management, and yield less than production forests, not only due to restricted usage: due to harsher conditions of growth the increment in protective forests is about 3 m^3 / ha less than in production forests.

Aside from the function as protective forest there are also declared protected areas. The Nature Park Sölktäler is nearly completely classified as a landscape conservation, nature protection and/ or Natura 2000 area (fig. 3). Apart from the nature protection area around the Sölk pass, the protected areas are not unharvested: especially in landscape conservation human cultivation is essential, but also in Natura 2000 conservation and utilisation do not exclude each other.

Protectet Areas in Sölktäler Nature Park

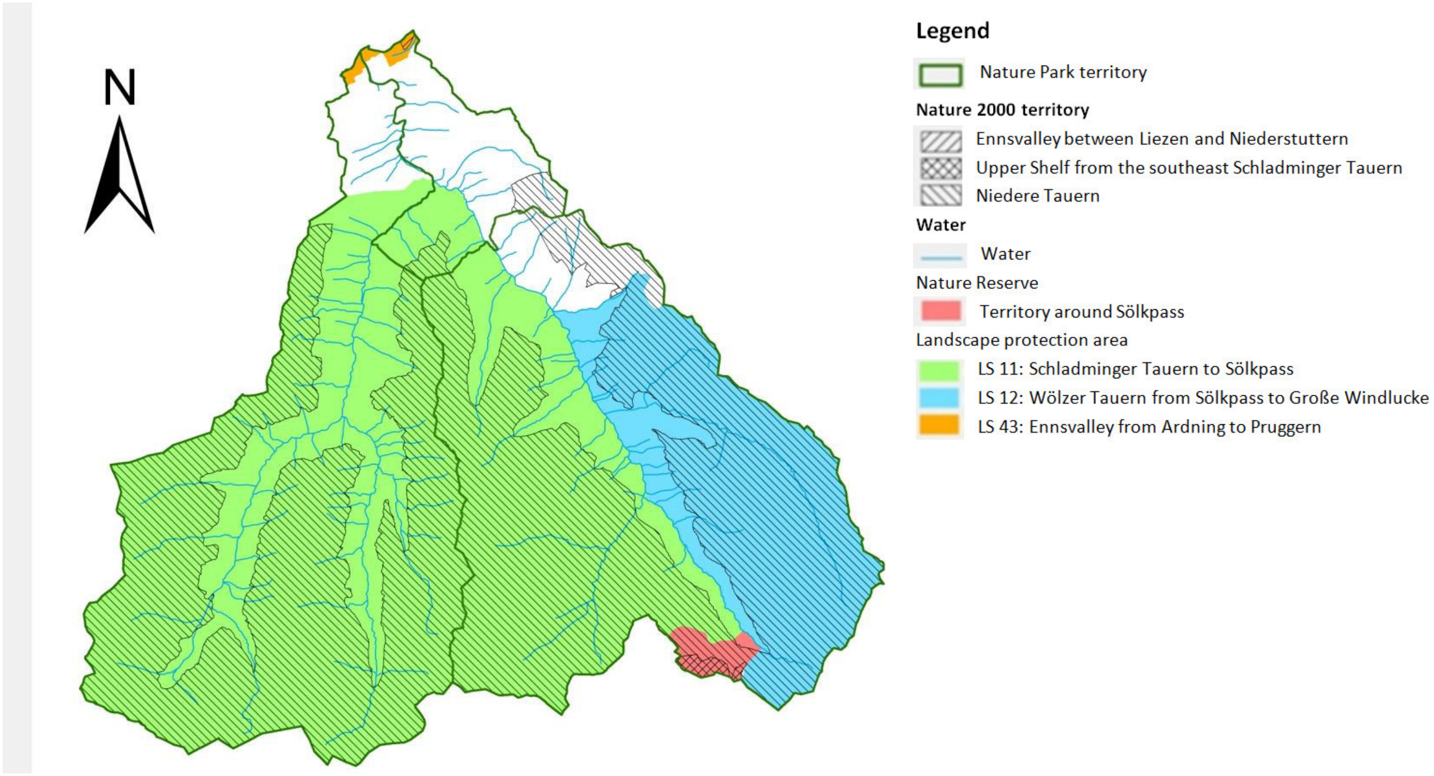


Figure 3: Extend of conservation areas

3.2 Energy supply in Nature Park Sölktäler

Around 2.5 km above the confluence of the greater and lesser Sölkbach rivers lies the Großsölk reservoir. The 39m high and 129.3m long arch dam is located at a geologically favourable position, the reservoir itself is a little over a kilometre long and contains when full a usable volume of 1.4 Million m³. The Sölk power plant was built between 1976 and 1978 and went into operation in August 1978. At that time it was the most powerful individual power station of der Steirischen Wasserkraft und Elektrizitäts-AG (STEWEAG), it has since come under ownership of the supply network.
The primary task of the power plant is to cover the peak current requirements, which occur in the late morning and between 5pm and 10pm (Schneider, 2002). The produced energy flows directly into the styrian electricity network – the local population do not profit in terms of energy from the position of the reservoir in Größsölk.
Apart from that there are around 13 large and small hydropower stations for electricity production – some private on farmland, others are for the supply of shelters, hunting lodges, and alpine farmhouses, or run by councils or cooperatives, or by a company as an electricity supply plant.
The richness of forests of the region is crucial for the thermal energy supply. This lead to the foundation of district heating communities. The first biomass heating station was already installed in 1997 in Kleinsölk, others followed in the Großsölk valley, and parts of the municipalities of Kleinsölk and St. Nikolai have been supplied since then with heating from biomass. In this way, regional resources can be better utilised,

and new income possibilities can open up in agriculture and forestry. Above all, low grade timber quality can be employed here, apart from which part time jobs are created. The improved air quality, which results from the centralisation of heating production, is a further positive effect (http://php.leader-austria.at/).

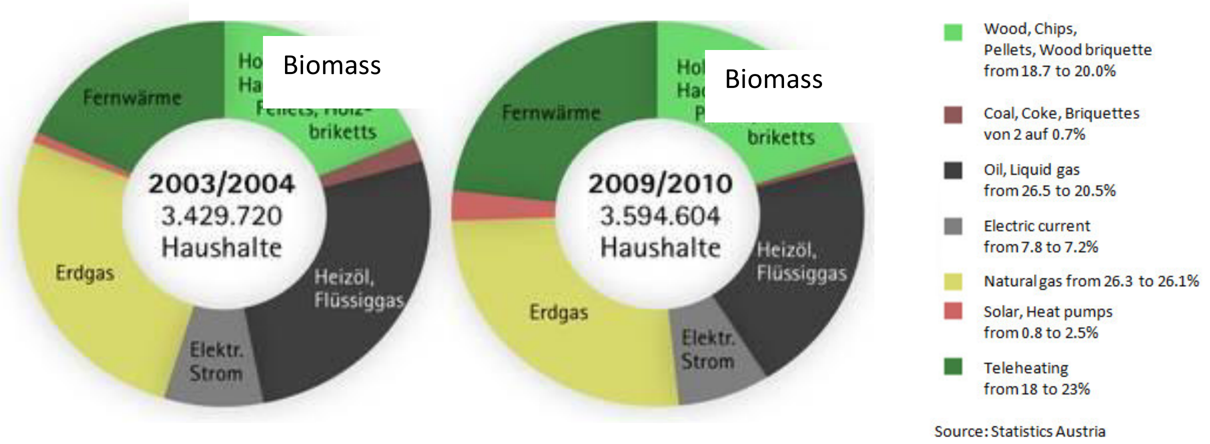
In the long term the entire district of Liezen should become self sufficient in terms of energy. This not only means regional energy supply, but also a balanced relationship between energy requirements and production potential. For this reason, the project “Climate and Energy Model Region Gröbming” began with an energy analysis and focused itself on savings possibilities in the region. In the Gröbming region ten communities are active participants on this project, the three communities of the nature park belong to those which already have put biomass heating plants into use (13 biomass heating plants in eight communities) (Pötsch et. al., 2014). The heating energy requirement calculated in the course of the analysis (before savings) for the mature park communities are as follows:

Community	kWh/Year	Inhabitants	Overnight stays 2013	Overnight stays 2014
Kleinsölk	5.361453	540	6.474	5529
Großsölk	5.432282	606	5.615	6223
St. Nikolai	5.766270	524	6.748	5420
Total	**16.560005**	**1.670**	**18.837**	**17.172**

Table 1: Heating energy requirements in the nature park communities

The micro-region Gröbming had heating energy requirements of 96,528,986 kWh/a, which equates to 39.0 % of the total energy requirement and is the most demanded energy type after fuel requirements (39.1%). On average around 50% of the households derive their heating energy from biomass. The conversion takes place in small installations or via rural local heating networks.

Used heating technologies in Austrian households



4. The forest in numbers

4.1 Forest area and use

The forested area of the nature park is 14,856 hecatres. Aside from harvested forests, this consists of protection, welfare, and recreational forest covered areas, and also those that are stocked with mountain pine and green alder. According to the Forest Development Plan 1999, just under half of the area (46%) belongs to small forest holders <200 ha, the second half is divided among private forest owners >200ha. The Austrian Federal Forests plc has and has had no possessions in the nature park. The calculated standing volume pertains only to harvested forests and productive protection forests; in the course of the last Austria-wide forest inventory (ÖWI) 2007 to 2009 a standing volume of 376 ± 29.5 m³ was measured for small forests in the Liezen district, 311 ± 21 m³ for private forests and commercial forests >200 ha – in total there are about 2,500,000 m³ in the nature park area. Annual increment amounts to 109,000 m³, around 99,000 m³ is harvested per year; additional, irregular extractions, such as the conversion and clearing of forest areas, as well as non-harvest maintenance measures in leisure or protection forests are not taken into account here.

	Area	Standing Volume				Increment				Harvest			
	[ha]	per ha [m³]			[1000 m³]	per ha [m³]			[1000 m³]	per ha [m³]			[1000 m³]
Small Forest	6834	376	±	29,5	2570	8,5	±	0,8	58	4,8	±	1,3	33
> 200 ha	8022	311	±	21	2500	6,3	±	0,7	51	8,2	±	1,8	66
Total	**14856**				**5070**				**109**				**99**

Table 2: The forest in figures

Here it becomes apparent, that in the case of forest owners >200ha the utilization (66,000 m³) is presently exceeding the increment (51,000 m³). On the one hand this is the result of long term under-utilisation, through which large reserves were allowed to accumulate, on the other hand the excellent timber prices in 2008/2009, triggered through the financial crisis (ÖWI 2007-2009), and also through the forced usage which resulted from the cyclones in 2007 and 2008. Furthermore it is clearly evident that especially for forest owners >200ha, forestry is a means of life and therefore there is also a more intensive management. This trend towards large harvests, which expresses itself especially with companies > 1000 ha, can also be confimed after consultation with two large companies in Sölktäler Nature Park (personal communication from Guggenberger, 2013). Small forest holders were not depentdant on thie forests to the same degree, due to the contribution of tourism (WEP, 1999). This small statistical extract form the forest inventory is in no way an indication for a non-susatainable forest management.

Biomass is primarily used by small forest holders (<200 ha). Fuelwood for energy is mostly obtained from lower quality trunks (grade C and D due to form, colouration, insect or fungal infestation, knot content, splits, wood defects etc.), as well as wood from thinnings, whose diameter as a rule falls far under the requirements of the sawmill industry; aside from this timber from previous forest stocks is used, when these areas are already stocked with climax tree species (Hirschberger, 2006). In the case of Sölktäler

Nature Park, the use of shrub and tree vegetation which is propagating on alpine pastures is also available for use. Around the issue of using logging residue (Top end logs <10 cm, branches, leaves, slash, rootstock) it must be considered that the removed mass increases by 40 to 70%, the removal of the macronutrients nitrogen, phosphorous, potassium, calcium and magnesium, however, increases by 300 to 1000% in comparison to assortment and cut-to-length logging methods. This utilization is guaranteed not to be sustainable and would lead to soil degradation (Schadauer et. al., 2009).

The average rotation time is 106 years. Forests in valleys with better site classes already reach harvesting maturity at 82 years, in the upper areas not until 123 years.

4.2 Road network and extraction distances

In the 28,824 ha region run 462km of roads of various classes, size and quality (Fig.4). Each kilometre is at least drivable with tractor and hauler, whereby the lowland areas with good site classes are especially good accessible, the southern high-alpine part of the region contains only a few kilometres of road, which does not greatly affect harvesting as the forest in these areas performs other functions than production. The road density *SD* amounts to 16 m/ha [2], the road interval *SA*, the average distance between two roads, amounts to 624 m [3] and the theoretical average extraction distance RD_0 156 m [4] (Fig.5).

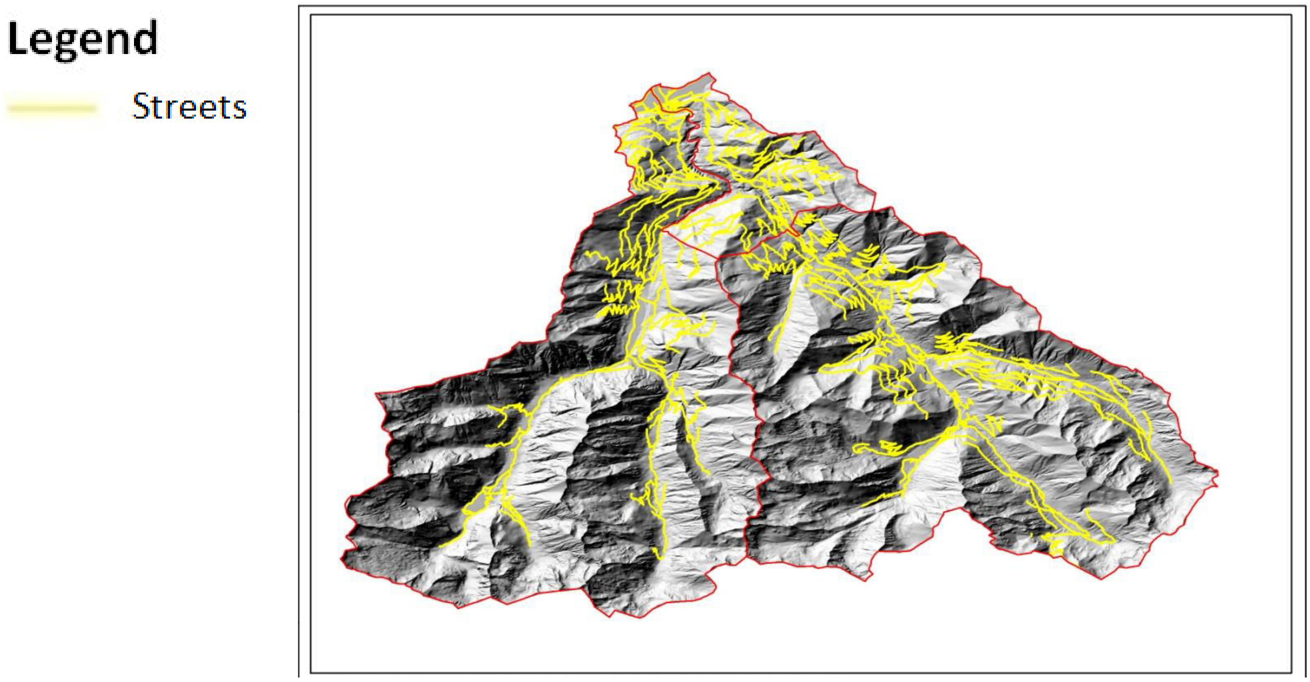


Figure 2: Road network

[2] $SD = \frac{L}{F}\ [lm/ha]$ (Stampfer, 2012)

[3] $SA = \frac{10000}{SD}\ [m]$ (Stampfer, 2012)

[4] $RD_0 = \frac{SA}{4}\ [m]$ (Stampfer, 2012)

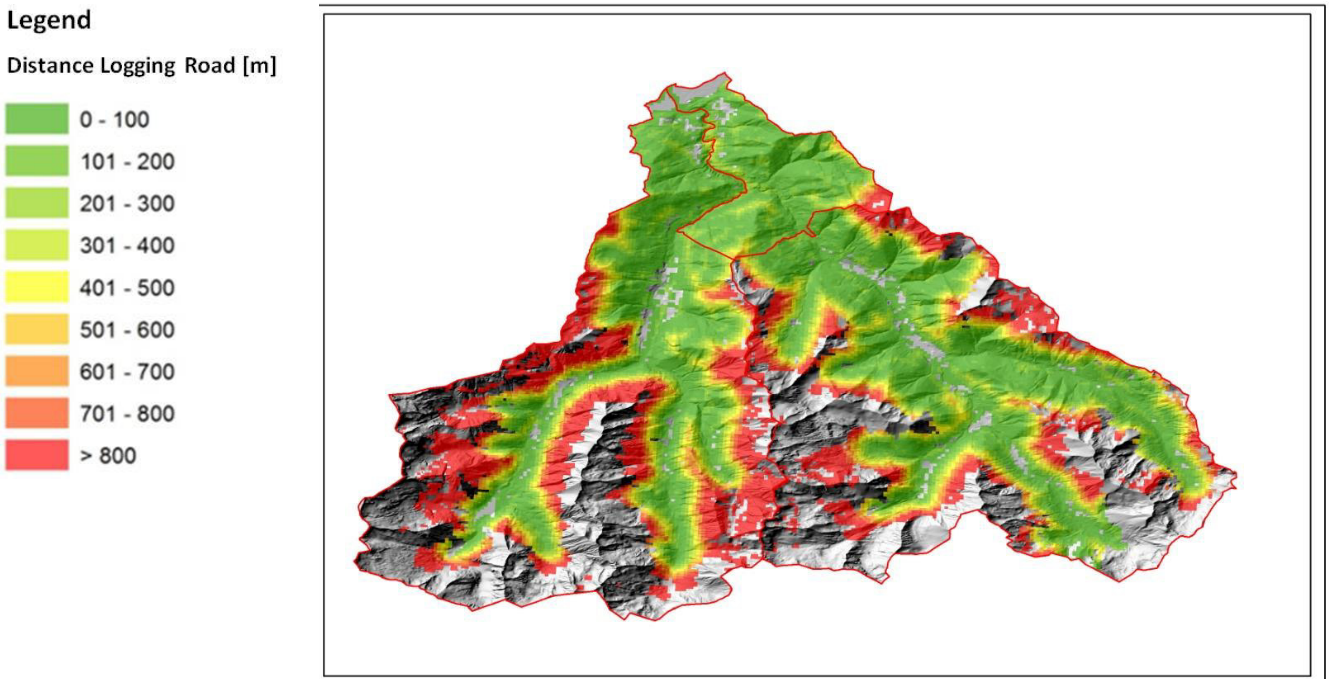


Figure 3: Distance from roads

5. Supply chain

A supply chain is seen as industry, respectively company transecting organisational structure. On cooperative basis all stake-holders are integrated and the arrangement of good relations is in focus. Aims are long-term (strategic) and short-term (operative) improvements of effectivity and efficiency. Central parameters are not only transparency and codex of value, but also the communication between the parties (Stampfer, 2012).

Quite a few households in the Sölk valleys are also (small-scale) forest owners. Heating was always achieved with wood, in many old farmhouses warmth is still exclusively produced with unit load firing such as fireplaces or cockle stoves. Everyone extracted firewood out of their own forests, or from communal or cooperation forest respectively or ib accordance with forest law, so the supply chain therefore was always direct. Although a structural change in Austria's rural zones started as early as the 1960s (Hogl et.al., 2003) this was of less importance in the vales of Sölk, (small-scale) forests were sold, subletted or merged. Often, farms were sold but forests retained. Nevertheless, full time time jobs did not allow people the time for wood work; some people contracted their timber harvest to companies for this reason. However this is not effective for fuelwood, which can be better done by befriended farmers or neighbours that can be paid with wood. It would seem to require less effort and be more efficient to change to a heating system – long or short distance heating from biomass power plants combining the inhabitants' connectivity with nature with modern technologies. Meanwhile some are operating small-scale biomass boiler in their farmyards too.

5.1 Local Biomass supply chain

In Nature Park Sölktäler four biomass heating plants (three operators) produce nearly 2000 MWh of thermal energy. The heat plant in local district Stein on the Enns in the municipality of Großsölk is the only one still sourcing 80% of their converted biomass from outside the nature park, therefore it is not considered in local supply chains analysis. In contrast, biomass for the plants in Kleinsölk and St. Nikolai derive solely from Nature park area.

On this foto you can see a actually working wood`n ropeway in the Sölktäler

On this foto you can see a actually working lumberjack, who is cutting wood for a local biomass heating plant

The wood is stored near the village Kleinsölk and is waiting for further transportation.

Here the wood is processed

Biomass is unloaded here.

Here one of our heating plants is filled

Here you can see the storage Room!

You can see on the photos that the local biomass - chain works very well. From logging to the final recovery everything is carried out in the Sölktälern. The machines belong the owners in the Sölktälern.

5.1.1 Short distance heating[5] Kleinsölk

Initialised through the EU Leader Programme 1997 for the promotion of rural development, a group of six farmers 17 years ago decided to operate a biomass heating plant in the Kleinsölk district. They founded a supply association and elected a chairman, the biomass heater was built and installed by the municipality of Kleinsölk in cooperation with the project leadership; the farmers did not incur any costs. They were later responsible for coarse materials, maintenance and servicing of the heater and the supply chain, the only condition was that only wood from the district region was allowed to be used. The sensible usage of lower quality wood and wood accrued through disasters was the basic idea of the operation – especially beetle-damaged wood which remains on the forest road often for a long time after processing, as virtually nobody has a use for it.

The owner of the plant is the Kleinsölk municipality: it covers up to 75% of repair, maintenance and servicing costs. The rendered heating services are deducted: each supplier commits to providing 2000 kWh, during this time the respective farmer is responsible for the plant. The control of the provided services is thereby made easier on one hand, on the other hand the farmer is free to decide which wood he would like to use – the final result, the warmth energy supply for the surrounding area, is paramount.

[5] Legally and technically similar to long-distance heating, but with shorter supply lines

Forest	Six farmers in a supply association, the energy fuelwood is sourced in their own forests in the Kleinsölk district; energy fuelwood arises as a side product
Harvest	The farmer decides which harvesting method to employ, use of machines or companies; because the focus is not on the production of energy fuelwood, it could be the case that later thermally processed wood is harvested for example by cable and processor, which would not be profitable for an exclusive energy usage. Only the trunk can be used thermally in the Kleinsölk plant, as the logging residue usually stays in the stand.
Transport	Also at the discretion of the farmer; mostly roundwood; <20 km distance from forest to respective farm, mostly with tractor and trailer, sometimes they also use a truck
Storage	at each farm, mostly as roundwood; around 1 year long; initial storage outdoors as wood chippings, later storage houses are erected on each farmyard, where the wood is now stored in whole; the trunks are split to hasten drying
Processing	Chipping is carried out almost exclusively by the company directly at the yard – individual machines are not worthwhile for the small amounts. In the mean time there are some suppliers in the region, as relatively many biothermal plants have been put into operation. The biomass heater in the Kleinsölk plant exclusively uses woodchip, the thermal use of logging residue is not and cannot be carried out.
Energy production	the heater is designed for 60 kW; energy in the form of long distance heating and warm water, due to the latter it is in operation all year; it is used at all times – in 17 years no energy has needed to be externally purchased, nor have additional customers needed to be found
End users	The district hall with five apartments and the local authority, the arts centre / music school and a wool cleaning plant, which was also initaiated and funded by the Leader programme. The distance to the plant is around 60m, the energy loss through the pipelines is therefore insignificant

(personal account of an operator in Kleinsölk, 2014)

SWOT analysis Kleinsölk

Strengths

- The local authority is the main financer (75%) and the owner of the plant
- Through the initialisation of a supply association, the labour is efficiently and fairly shared – each farmer delivers 2000 kWh calorific value, in this time he is responsible for the operation, maintenance and servicing of the plant
- The supply chain is very short: the distance from stand to yard of each farmer is in each case less than 20km, from yard to plant maximum 3km and the households, which are connected to the heating energy network are all found within a radius of 60m from the plant
- Small transport distances = little fuel usage = small transport costs
- Cost efficient heating and warm water possible
- The plant is very well utilized
- The wood reserves of the region can be optimally utilised, as mostly lower grade timber, wood from thinnings, and damaged trunks from calamities are used. The latter is kept within limits, as the plant can only use woodchip – soiled waste wood, such as that caused by the heavy rain and mudslides in 2010, is processed as shredded material in larger thermal energy plants.
- As the calorific value of the use of logging residue would be too low for the plant, the majority of nutrients remain in the forest
- Energy fuelwood is a byproduct for farmers
- Good opportunity for additional income
- Because of the long running time (17 years) the plant is well established, the acceptance of the local people towards renewable energy is very high
- Due to the SMS box installed on the plant, disturbances can be quickly repaired and failures rarely happen
- The SMS box also reduces the control effort of the relevant responsible farmer
- The private energy fuelwood requirements can also be processed to chip during the processing of wood for the plant
- Sustainable forest management is in the farmers interest

Weaknesses

- The biomass furnace is already 17 years in operation. The technology is older, the efficiency is less and the emission values lower than more modern equipment
- Only few buildings are connected to the long-distance heating network
- Expansion is however not possible with this heater, as it can only produce 60kW of power
- Without funding and with the district as main financer, the plant may in the future have a negative financial balance

Oppurtunities

- Some farmers have installed their own biomass heaters in order to produce cost efficient heating and to be able to better utilise incidental energy fuelwood, a collecting and delivering to a single large power plant would be less effort for everybody and would be presumably more efficient
- Theoretically a single farmer could operate the plant in Kleinsölk
- Promotion of hardwood in the form of hardwood from deciduous trees and filler, this has a higher calorific value
- The energy price could be raised to the average price of other energy providers

Threats

- In the meantime so many biomass thermal plants are operating in the region, that there are always customers for energy fuelwood. It is less effort and responsibility to simply sell the energy fuelwood as roundwood, the delivery, chipping, support and servicing of the plant is removed, the wood reserves would nevertheless be optimally utilised.
- The future of the plant in Kleinsölk seems uncertain, as the furnace needs to be replaced soon, however a merging of the Sölktäler districts is currently under negotiation. It remains therefore in question, whether the future district will contribute to the costs and therefore also whether the plant will remain at all.

5.1.2 Biomass heating plants at St. Nikolai & Mössna

Three farmers agreed in 2005 to form an association to deliver long distance heating from biomass. The impetus was provided by the various cyclones of the previous years and the large amount of pulpwood and energy fuelwood, which were barely marketable. In 2006 the first biomass heating plant in Mössna went into operation, in 2007 a second plant followed in St. Nikolai, each with an individual power output of 220 kWh. 30% of the building costs of the newly erected heating plant associated storehouses was funded. The processed quantities of wood was sourced from the woods owned by the farmers, and from cooperative-forests, in all cases from the Nature Park area – a sustainable management of the forests lies therefore in the individual interests of the farmers. As in Kleinsölk, energy fuelwood and pulpwood are also byproducts here, the billing is also relative to kWh, however without a standard value.

The costs are carried 100% by the association, the running costs often exceed the income – the three farmers are therefore presently not prepared to operate the plant after the supply contract runs out in 10 years time. The main reason for the negative balance is the rising wood prices, which have nearly doubled as the result of the many larger biomass thermal plants in the region. The sale of energy fuelwood in round form is also seen as a luctrative use of renewable raw materials

Forest	Wood from private and co-op forests of the three farmers

Harvest	Carried out by the farmers themselves with their own equipment (usually tractor and ground-pulling); the average extraction distance is around 150m; the logging residue is not used; energy fuelwood and pulpwood for thermal use are byproducts of timber harvesting
Transport	Mostly with own machines, seldom via truck; as roundwood; distance between forest and storage yard <10km, on average 3km, from storage yard to the thermal plant also <10km
Storage	At a central storage area; as roundwood or similar in the open, as woodchip in the storehouse (almost annual production capacity), furthermore both thermal plants have a wood chip store of 80 m^3 and 60m^3 respectively; storage duration ca. 1 year
Processing	The woodchip production is carried out by companies at the storage area
Enegy production	Two heaters at different places, each with 220 kW performance capacity, 5000 l buffer and additionally a solar panel of 60m^2 and 40m^2 repectively; warmth and warm water; the plants are nealy fully in use in winter; energy is not purchased in any form by the association.
End user	Nine parties are connected to each long distance heating network, including local authority and settlement housing, guesthouses and guestrooms; the cost savings to the user is calculated at 15 – 20%, the average supply length is around 550m in each direction, which leads to a distribution loss of 70 – 90%, especially in summer where requirements are lowest

(personal account of an operator St. Nikolai/ Mössna, 2014)

SWOT-Analysis St. Nikolai & Mössna

Strengths

- Small transport distances = little fuel usage = small transport costs
- Cost efficient heating and warm water oppurtunity
- Very good utilisation of the plant in winter
- The wood reserves of the region can be optimally utilised, as mostly lower grade timber, wood from thinnings, and damaged trunks from calamities are used.
- As the calorific value of the use of logging residue would be too low for the plant, the majority of nutrients remain in the forest

- Energy fuelwood is a byproduct for farmers
- The acceptance of the local population for renewable energy is high
- The private need for energy fuelwood is also processed during woodchipping
- Sustainability in forest management is in the interests of the farmers
- Up to 90% of repairs and servicing can ba carried out by the farmers themselves
- Disturbance reports are transmitted directly to mobile phones, resulting in a greater avoidance of disruption
- The control effort is reduced due to the automatic disturbance reports

Weaknesses

- The supply losses are considerable due to the large distance between the plant and end users (ca. 550m per direction) – especially in summer, where use is low, 70 – 90% of the energy is lost
- High workload for the individuals (mind. 600 h/a)
- High repair and servicing costs (4000 – 5000 €/a)

Oppurtunities

- Supply to a large customer in summer (e.g. heated public swimmingpool)
- Energy pice could be raised to the average price of other energy providers
- The plant could remain closed in the summer months, the warm water requirements of the connected households could for example be covered with solar energy

Threats

- The association does not have a positive financial balance – from the present perspective, a continuation after the end of the supply contract in 10 years is not intended by the three farmers
- The many biomass thermal energy plants in the surrounding area and the related increased demand on energy fuelwood and pulpwood has lead to the near doubling of the price of wood in the last 8 years. Also in the St. Nikolai area, it is considered that it is worthwhile delivering roundwood (and also merchantable timber) to the larger thermal energy plants
- The association has already had to deal with changes to its own personel

6. Conclusion

6.1. Conditions

The use of renewable energy is typically a leitmotif of sustainability. What is unfortunately too often forgotten is that this system consists of four pillars: the ecological, the economical, the social and the cultural pillars. As soon as one pillar receives too little attention, too much attention or no attention at all, the underlying idea becomes unstable. As soon as forest and biomass come into play, the ecological component receives an especially large place, which in itself is not a mistake, but which leads quickly to an imbalance. It is especially difficult to find a balance if, like in the case of a supply chain, many interest groups are involved.

Biomass usage can certainly be carried out in an ecologically sustainable way in the Sölktälern. A requirement of this is to limit energy usage to wood. This means the nutrient rich logging residue should be left in that stand, also working in a way which protects the soil as much as possible, and of course obeying the Austrian Forest Law. The economic requirements can also be sufficiently fulfilled – however this requires action. “The price of wood chippings and long distance heating seems to be set so low, that no thermal power plant in the region will be able to break-even without problems” said one heating plant operator. Actually the price for woodchip (Cent/kWh) in 2011 was a third of the price of heating oil. The Austrian Biomass Association wrote „The boom in raw materials since 2007 has led […] to a real price increase for energy which, interrupted by the financial crisis in 2010, continues. There has also been a price increase in biogenic energy sources; The price difference is opening up in households, increasingly in favour of woodchip, firewood, and pellets“ (Jauschnegg et. al., 2013).

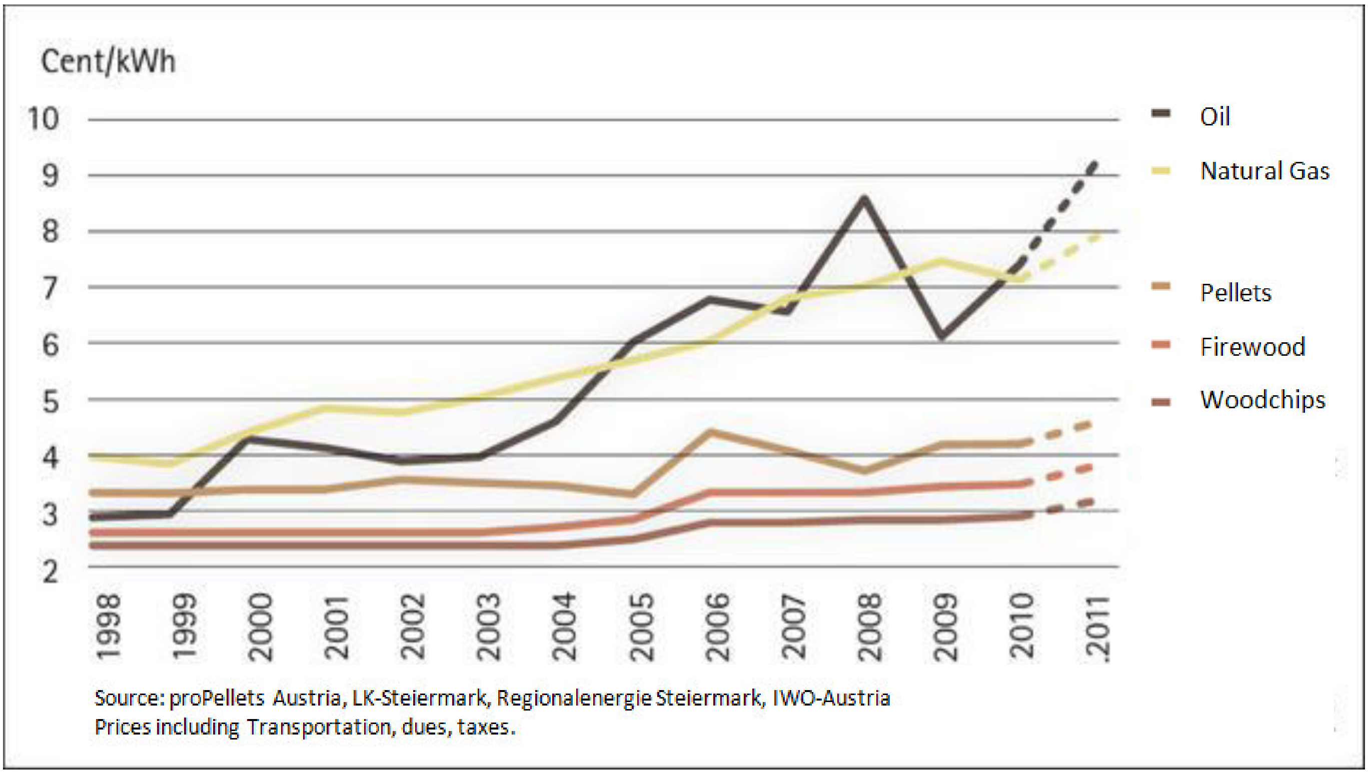


Figure 4: Price development of various energy sources

On the one hand that is naturally an oppurtunity for heating plant operators, especially when they are large plants capable of processing biomass with a very low calorific value – a wealth of customers could be supplied cost effectively with heating energy in this case. On the other hand a small heating plant operator would be confronted with the fact that that energy wood is only a byproduct for him. On account of the unit-mass-law[6] the individual harvest of energy fuelwood and often also pulpwood is not viable. The profits

[6] The unit-mass-law describes the correlation between tree volume and harvesting costs. The unit size of a tree is the most important cause variable on the work performance and therefore the harvesting costs. The lower the tree volume, the higher the cost for processing and extraction.

from timber production keep the harvesting costs for energy fuelwood down. It is especially problematic, therefore, when no timber is harvested. The development in 2008 was thus charactarised,with large-scale windthrow being incurred at the beginning of that year due to the storms “Paula” and “Emma”, which caused the processing of large amounds of fallen timber, thereby resulting in a record harvest volume. In the second half of the year, this was accompanied by the worldwide economic downturn. As a result of these developments, the price of wood, with the exception of fuelwood, sank lower than it had been in the previous two years (Grüner Bericht 2009).

Price development	2004	2008	2012
Blockwood [€/fm] [1]	86.46	83.81	95.71
Pulpwood [€/fm] [2]	25.67	29.27	36.65
Fuelwood price [€/rm]			
Soft wood	27.0	35.8	41.63
Hard wood	43.5	52.31	61.07
Fallen timber percentage of harvest volume	38%	64%	18%

Table 1: Wood price development 2004 to 2012

[1] Cubic metre log wood Spruce/Fir, Class B, Media 2b
[2] Cubic metre Spruce / Fir
[3] 2007 the fallen timber percentage of harvest volume came to 73%
(**www.grünerbericht.at**)

It must also be taken into account, that different price trends in the various federal provinces is also possible – for fuel within Austria a price range of more than 18% exists. This canveys that prices and their development are also strongly influenced by regional differences, e.g. by the creation of a higher local demand for woodchip, for example because of a biomass thermal plant (Lang, 2013).
Those who invested in the building of small scale regional long distance heating on account of the increase in calamities over the last 20 years, in order to optimally utilise the fallen timber volume, are up against strong competition due to the „biomass boom“[7]. Economic sustainability can only be achieved for some through funding, for example rural development, or by the increase of prices. The latter could be justified with a guarantee for transparent, sustainable forest management and regionality.

The social and cultural component of sustainability can be taken well into account in Sölktäler Nature Park. As already mentioned, the population has always been closely linked to nature, which is naturally reflected in their lifestyle – the reference to traditional methods of agriculture is not just a maketing gag in the nature park, it is the conviction of the inhabitants of the Sölktäler and in their interest to keep this cultural speciality. New technologies which are in harmony with the older concepts and increase efficiency are also naturally welcomed here.

In relation to biomass thermal plants, the social pillar of sustainability has an influence on the price. Specifically, it is only an advantage for the customer, who has low costs for heating energy; the operator of the plant can only earn an extra income through subventions. In the special case of the biomass incineration plant in Großsölktal (St. Nikolai and Mössna) pulpwood as well as energy fuelwood is used thermally. According to the green report (Grünem Bericht) 2013, 17.6% of all harvested volume in Austria was pulpwood, 28.8% was roundwood for energy use and fuelwood, which amounts to nearly half (46.4%) of the total harvested volume. The planning of the plant requires however, that energy fuelwood will only

[7] (Huber, W., 2012)

be harvested as a byproduct, which in the course of a harvest normally isn't taken into account. The operators are already struggling by the second point of the supply chain with the efficiency of the plant. In this way long distance heating plants are not sustainable. One approach in a comprehensively social direction would be for example the raising of the price for long distance heating from woodchip and the possible subsidising of the consumer via heating grants. The regional strengthening of the economy also promotes in this case a social component.

6.2 Potential

The wood reserves needed to supply the public thermal plants of Sölktal, and to produce sufficient thermal energy are definitively stated. As the energetic use of biomass is more or less a byproduct, the energy fuelwood harvested volume is only a small fraction of the total harvest. Momentarily 1,901,750 kWh, are produced per year by the three plants, of which 1,217,950 kWh is produced with biomass from the nature park. To leave the entire supply chain in the nature park would mean a preparation of 1,125 m³, which is around one percent of the total harvested volume (99,000 m³).

Biomass thermal plant	Annual output kWh	Total usage (loose) m³	Total usage m³
Kleinsölk Gem.	97,000	163	65
Stein/Enns	854,750	1350	540
Mössna + St. Nikolai	950,000	1300	520
Total	**1,901,750**	**2813**	**1125**

Table 2: Output and usage of the biomass thermal plant (Guggenberger, 2013)

Furthermore, only heating production with biomass incineration plants are worthwhile in this case – electricity can be much more efficiently and also more sustainably obtained via hydropower, combined heating and power is therefore to be considered.

6.3 Experience

The woods in Sölktäler Nature Park have a very large potential for the grow of biomass. The use of biomass for heat production has a very long tradition in this region. In implementing the Fine tuned Local Supply Chain the owners of the heating plants have access to people and companies in the region with a lot of experience in working with wood.

The economic development of heating plants represents one of the greatest challenges in the next years. The low population density (5 persons / km²) limit the expansion possibilities of biomass heating plants in Sölktäler Nature Park.

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