

6. Setting up the production chain

The production chain was divided into three phases.

Phase 1: The organization of an informative event.

We organized two events for the general public. We invited farmers, forest owners, municipal officials, the Agricultural Advisory Service, the Slovenian Forest Service, and students of nature conservation. We presented them with the project objectives, stocks of wood biomass in the protected area and an example of the production chain. The meeting was also attended by the then potential investor of the district heating who presented the advantages of such a system to the participants.

Phase 2: The organization of round-table discussions

We organized four round table discussions. The first round table was devoted to forest owners, producers of biomass, the district heating investor and the Slovenian Forest Service. The potential district heating investor wanted to know the chances of obtaining biomass within the protected area for his needs, and was especially interested in the final price. In the second round table, we invited representatives of the

Slovenian Forest Service and namely the Brežice area unit and Celje area unit, who are responsible for forest management within the protected area. We wanted to learn more about the interest of forest owners in the production and sale of wood biomass and the chances to establish an Association of Forest Owners within the protected area. The third round table was devoted to the presentation of the Association of Slovenian Forest Owners and a presentation of good practice within the framework of the association. At the fourth round table the representatives of various associations as well as certain protected areas were acquainted with the meaning and operation of the wood biomass production chain in the country.

Phase 3: The organization of individual meetings

Given the fact that the topic is the exploitation of wood biomass in the protected area, it is important to consider the aspect of sustainable use in exploitation. We carried out the arrangements on how to sustainably exploit biomass with the individual professional institutions operating within the protected area. All of our findings will be further shared with other protected areas.



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USE OF WOOD BIOMASS FROM PARK Example of Kozjansko Regional Park, Slovenia



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1. Description of the park

Kozjanski Park is one of the oldest and largest nature reserves in Slovenia, located in the Eastern part of Slovenia, stretching 206 square kilometers. It has the status of Regional Park, and is a mosaic comprised of the sub – Alpine Posavsko Hills, wine-bearing slopes, and plains along the Sotla River. It is a beautiful expanse of pristine nature, with a rich cultural heritage. Manager of the protected area is Public Institution Kozjanski park. The beech forest on Mt. Orlica, the grassy slopes of Vetrniki and Oslica, the old orchards scattered across the hillsides, the wetlands along the Sotla Rivers, the gorges and ravines are home to a multitude of plants and animal species, some of which are rare or endangered. The isolated karst area adds a special quality to the region of Kozjansko, surprising us with sinkholes, dry valleys, spring of rivers, karst caves and chams. The well – preserved countryside reflects hundreds of years of people’s activities: mighty castles, ancient cathedrals and pilgrimage sites, medieval markets, and characteristic local homesteads with perfectly tilled fields.

The high rate of biodiversity ranks Kozjanski park among the most important nature reserves in Slovenia and Europe, and most of the park (69%) is protected as a special NATURA 2000 reserve.

The remoteness of the Kozjansko region has created a uniquely harmonious coexistence of people and nature, of tradition and progress, both essential for modern sustainable development.

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

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

2. Wood biomass potentials in the park

A 10-year increment totals 865,000 m³, of which the maximum possible falling of the increment is 77% and the allowable falling of growing stock is 21%. The realization of the allowable falling in 2008-2012 was from 100 to 106% in state forests and 30-53% in private forests. In the past five years, the average annual falling amounted to 36,000 m³.

Overview of the possible sources of wood biomass inside the protected area:

Land use	Area (ha)	%
Forest	9.580	47
Meadows	5.640	28
Cropland	2.130	10
Vineyard	1.080	5
Orchard	460	2
Other land	1.710	8
Total	20.600	100



Total Current Potential of Biomass in the Protected Area

The full potential of biomass, according to the data collected, is 40,000 m³ or almost 30,000 tonnes. Between 27,000 and 34,000 m³ or between 20,000 and 25,000 tonnes of biomass would be appropriate for permanent use.

The Issue of the Withdrawal of Biomass from the Forest:

- it is unacceptable to take shrubs narrower than 5 cm.
- it is unacceptable to crush entire trees.
- tree skidding method and technology of preparing wood chips is not acceptable with tree stumps.

3. Description of production chain

In the first phase of the project, in cooperation with the Slovenian Forest Service, Agricultural Advisory Service and Forestry Institute, we prepared an overview of the potential sources of biomass and established a value chain of wood and other agricultural residues

as well as the use of biomass in the protected areas.

Sources of Biomass	
Forests	around 40% of the allowable cut
Waste from Wood Processing	40 – 60%
Waste from Agricultural Land	up to 3 m ³ /ha/year
Wood Residue on Farms	1 to 3 m ³ /year
Overgrowing Land	up to 1m ³ /ha/year
Riparian areas overgrown with trees and bushes and scrapped wood products	up to 3 m ³ /ha/year

The Potential of Biomass from Different Areas within the Protected Area

Use	m ³ /year
Forests	16.000 m ³
Agricultural Land (vineyards, orchards)	3.000 - 6.500 m ³
Overgrown Lands	300 - 600 m ³
The Potential of Riparian Areas	100 - 200 m ³

Ownership Structure of Forests

Forests are divided among approximately 8.000 owners. The size of an average private estate is 1.5 hectares.

- 66% of owners own a property of 1 ha, which comprises 15% of the surface area
- 95% of owners own a property of 1-5 ha, which comprises 60% of the surface area
- 4% of owners own a property larger than 5 -10 ha, which comprises 20% of the surface area
- 1% of owners own a property larger than 10 ha, which comprises 20% of the surface area.

Skidding Conditions

99% of skidding is performed using a tractor. The average skidding distance is 344 m.

4. Description of wood biomass producers and suppliers

The provider of biomass in the protected area is a farmer who has registered a complementary activity on the farm, which means that the production of biomass functions as an additional form of income. During the 2014/2015 heating season, they provided a full supply of wood biomass for district heating in Kozje. A sufficient amount of woody biomass is obtained from farmers who also own forest lands. All the necessary equipment is their own.

5. Description of end users

In addition to the district heating in Kozje, the biomass is also used for heating in the protected area in some individual households. This is considering the quantity of forest that covers the area a little, as a lot of households are still heated using conventional firewood. Given the high price of fuel oil, biomass heating in individual households is expected to increase in the next ten years. We also expect that the number of producers and suppliers of biomass will increase in the coming years.

The end-users of district heating in Kozje are:

- the health center
- the elementary School and Kindergarten
- an apartment building (6 apartments)
- three multi-apartment buildings (15 apartments)
- five individual houses

Technical characteristics of the district heating system	
Boiler output	1,5 MW
Buffer storage tank	50.000 l or 1 day autonomy
Wood chips storage capacity	500 nm ³
District heating network	1,5 km
Annual thermal production	2.000 MW/year

