Project co-financed by the European Regional Development Fund

Forest Bioenergy in the Protected Mediterranean Areas

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

Annex 5 : Study area report – CROATIA (Lika Senj County)

Workpackage 3 - Testing

Activity A.3.5. - Threats and benefits of increase the biomass use in the protected areas

Deliverable D.3.5.1 – Impact assessment of increase biomass use in the short, medium and long term in the protected areas

February 2018

Table of contents

1 PRELIMINARY ASSESSMENT IN THE STUDY AREAS

1.1 Nature Park Velebit

Report was prepared by:
Forest green d.o.o.
Public institution „Nature Park Velebit"

Nature Park Velebit (further: Park or NP Velebit) is the largest and most complex protected area of the Republic of Croatia, extending to 203,551.12 hectares, which vegetatively and reliably encompasses the mountain Velebit as the most important mountain of Croatia and the Mediterranean. Velebit Mountain belongs to the Dinarid system and belongs to one of the most impressive karstic units - in the Dinaric karst.
In the Nature Park Velebit Management Plan for the 2007-2017 period, there are no guidelines and action plans apart from the action plan for the western capercaillie (*Tetrao urogallus*) and the plan is aimed at raising the visitor's infrastructure with the aim of increasing the revenue of the Park. In the end, it can be said that resourses are not provided for the fundamental purpose for which the Park was founded and - nature protection. In the next programming period, it is necessary to provide financial and other resources so that Park as a public institution can carry out its tasks.
Hrvatske šume d..o.o. as the most important economic entity in the Park area and the most significant part of the forest management chain (the only one in the management of state forests), with its business decisions and long-term forestry policies, is the most influential and contributing to the maintenance of ecological balance.
The area abounds in numerous and varied karst relief forms. The area of Velebit is characterized by varied and rich vegetation and wildlife.There are a number of economically significant forest communities in the park, as well as a large number of rare, endemic and protected plants.
There are many animal species in the park, many of which are rare and endangered. This is an area where three large carnivores/predators inhabit.
The value of this area confirms that since 1978., Velebit Mountain is part of the international biosphere reserve network, and international non-governmental

organisation The World Wide Fund has included Velebit on the list of 10 hot-spots within Mediterranean Forests Program.

At the same time, economic forests in the Park area are managed by the state company Hrvatske šume d.o.o. and forestry is one of the most important economic branches of the area. The pressure on natural phenomena is intensifying and increasing the number of tourists, hunting, forest management, opening forest roads. All these activities together increase the risk of fire and its consequences on vegetation and wildlife.

1.1.1 Biotic components

Velebit Nature Park is the most important floristic region of Croatia and is one of the most important floristic centers of flora diversity in Europe. Recent research has covered about 15% of the Park's surface and the flora of flora is far from explored. So far, the established flora consists of 1854 species and subspecies. The number of endemic taxa amounts to 4.3% of taxa, and the number of taxa protected by different international conventions is 6%.

The vegetation of the area can be divided into forest, grassland and plant communities of rocks and karst terrain, which grow in extreme conditions.

There is no plantation of forest cultures throughout the park.

The Park area is the habitat of numerous, protected and endemic, plant taxa. In the area of the Park, 92 stenoendemic taxa were registered.

In addition to the forest communities, in the Park area are important grassland communities (anthropogenic plant communities). The most significant negative phenomenon is natural vegetation succession on all types of grasslands due to lack of grazing and harvesting.

In the area of the Park, there are also rare communities of bog (Ljubica stream in Baške Oštarije), aquatic habitats and wetlands (on the Lika side of Velebit mountain), a community of tall-herb meadows, rare plant communities within cliffs and rocks. Ruderal and weed habitats are located along settlements, courtyards and roads.

In the area of Velebit Nature Park, 46 habitat types were recorded, of which 19 were classified into the category of endangered and rare habitat types. Of the endangered and rare habitat types in the area of the Park, the most prominent are the Dinaric Beech and Fir Forest, *Polysticho lonchitis-Fagetum* and Dinaric Fir Forest on limestone blocks.

The forests cover 110,494 ha of Velebit Nature Park. In the Lika-Senj County there are two branch – offices of Hrvatske šume d.o.o. which manage forests: Forest Administration Gospić, which manage 75.542 ha and Forest Administration Senj which manage 21.103 ha. Economic forests extend to 81,017 ha and represent the most important economic resource within the Park.

The basic principles of Croatian forestry are the sustainable management with the preservation of the natural structure and diversity of forests, the constant increase of the stability and quality of the economic function and forest functions of general benefit. All the economic forests managed by the Hrvatske šume d.o.o. havebeen jointly certified by the Forest stewardship council (FSC) since 2002,) which is unique to SA-FM / COC-001212, valid for all branch forest affairs and is subject to annual control inspections. The certificate of registration is also accompanied by a list of product groups within the scope of this certificate. FSC certification means that the forest is managed by strict ecological, social and economic standards.

In addition to state forests in the area of NP Velebit there are 4,192 hectares (3.79%) of private forests that are predominantly located along the settlements, and are also part of the neglected meadows that are gradually overtaking into the forest. Private forests are most often enclaves or semi-enclaves within state forests. In the Velebit Nature Park there are 53 economic units from the three branches of the Hrvatske šume d.o.o, but some of them are only part of it. The data does not contain private forest areas.

In the Park area there are forest communities, 91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion), 91L0 Illyrian oak-hornbeam forests (Erythronio-Carpinion), 9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea), 9530 (Sub-) Mediterranean pine forests with endemic black pines, as referred to in Council Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora as (sub)natural woodland vegetation comprising native species forming forests of tall trees, with typical undergrowth, and meeting the following criteria: rare or residual, and/or hosting species of Community interest.

The map of the study area shows Velebit Nature Park as an unique Natura 2000 site

The following forest communities are present in the Park:

- Turkey oak and hornbeam forest and underbrush (Querco-Carpinetum orientalis), E.3.5.1. – the most important climazonal forest community of the coastal belt.
- Hop hornbeam forest and underbrush with autumn moor grass (Seslerio autumnalis – Ostryetum), E.3.5.6. – grows in cooler climates and is the last vegetation community prior to continental vegetation. These surfaces are growing at a daily rate due to abandoned pastures and extensive use over the past forty years.
- Black pine and cotoneaster forest (Cotoneastro-Pinetum nigrae), E.7.4.4.- 9530
- Hop hornbeam forest with heather (Erico herbaceae-Ostryetum), E.7.4.2. – most frequently developed as a low forest and underbrush. This plant community has great scientifi c and conservation signifi cance, developing as a permanent cover on steep slopes.
- Jerusalem thorn and buckthorn patches (Rhamno-Paliuretum), D.3.1.1.1. – widespread on the coastal slops and Dalmatian portion of Velebit; constitutes a

degradation stage of turkey oak and hornbeam forests and hop hornbeam and moor grass forests.

- Durmast oak and hornbeam forest (Epimedio-Carpinetum betuli), E.3.1.5. – suited to humid climates, at elevations of 450-800 m/a.s.l- 91L0
- Black alder forest with white-yellow sedge (Carici brizoidis-Alnetum glutinosae), E.2.1.3. – covers very small surface (about 10 ha) and subject to fl ooding (small plateaus, habitats on which water from higher elevations drains, and areas adjacent to streams).
- Beech forest with white viburnum shrubs (Luzulo-Fagetum), E.4.2.1. – primary covers steep, most often northern slopes at altitudes up to 800 meters. - 9110
- Maritime beech forest with autumnal moor grass (Seslerio autumnalis-Fagetum), E.4.6.3. – this is a beech community of high karst, covering rocky plateaus of northern and central Velebit at altitudes above 1,000 m.-91K0
- Beech forest with giant deadnettle (Lamio orvalae-Fagetum), E.4.5.1. – this is the most important climazonal community of the montane belt, growing on the northern and central parts of Velebit in the Nature Park at altitudes above 900 m. – 91K0
- Durmast oak forest with viburnum shrubs (Luzulo luzuloidi-Quercetum), E.3.2.2. – grows in somewhat warmer climes.
- Dinaric beech/fir forest (Omphalodo-Fagetum), E.5.2.1. – extend at altitudes above 800 m. -91K0
- Sycamore maple forest with perennial honesty (Lunario redivivae-Aceretum pseudoplatani), A.4.4.2.– occupies small surfaces sporadically (about 10 ha) in secluded depressions in which large quantities of snow accumulate, abundantly soaking the soil.
- Mountain spruce forests with forest agrimony (Aremonio-Piceetum), E.7.3.1. – widespread in broad depressions with high concentrations of cold air. The assemblages at Štirovača stand out in particular.
- Subalpine beech and sycamore maple forest (Polysticho lonchitis-Fagetum), E.6.1.2. – grows at elevations of 1,100 to 1,650 meters under specific living conditions with abundance of snow, low temperatures, short vegetation periods and strong winds. Generally encompasses all peaks of northern and central Velebit.-91K0
- Dinaric fir forests on limestone blocks (Calamagrosti-Abietetum), E.7.1.1. – vital to prevention of soil erosion. Grows on open sunny slopes at altitudes of 1,300 meters, with a protective character.- 9410

- Subalpine spruce forest with Alpine clematis (Clematido alpinae-Piceetum), E.7.3.4. – grows on steep stone blocks above altitudes of 1,400 m with large protective signifi cance. -9410
- Subalpine spruce forest with Adenostyles (Adenostylo alliariae-Piceetum), E.7.3.3. – protective character, particularly near peaks, develops on steep, northern, cold and closed sink-holes and dolines under conditions of high and long-lasting snow.- 9410
- Dwarf pine and honeysuckle forest (Lonicero borbasianae-Pinetum mugi), D.2.1.1.1. – forms the upper limit of forest vegetation on Dinaric mountains above altitudes of 1,650 m. It has great signifi cance as it grows over many steep and rocky terrains containing numerous endemic and rare Croatian plant species

Forests and forest lands in the Republic of Croatia are managed on the basis of the Forest Management Plan, which are made for a period of 10 years. At present, it is based on the basis of the year 2006, which is valid until 2015. (the new Management Plan is being made). Forest Management Plan is divided into economic units. For management programs for individual managing units, expert backgrounds are prepared by the Croatian Environmental and Environmental Agency (abrev. HAOP), which includes information on endangered species, habitats, protected and recorded areas and ecological network areas, in accordance with legal regulations. All state forests are covered by the appropriate Forest Management Plan, while for private forests they are continuously produced, but due to the surface they occupy; Significantly fewer forest and forest land surfaces, forests predominantly near settlements, have less importance than the Forest Management Plan for state forests. Professional study lists all protected and endangered species (flora and fauna), endangered and rare habitats, areas of the Ecological Network and provides guidelines that are being built and aligned with forests management.

The basic principles for the management of state forests in the area of Nature Park are laid down in expert base:

- The Hrvatske šume d.o.o., in collaboration with the Public Institution "Nature Park Velebit", should develop and implement a program for the protection of forest ecosystems for the Nature Park
- In order to preserve the biodiversity of forests, management according to the principles of forest certification is necessary (Croatian National Standard for FSC Forest Certification);

- Based on the aforementioned principle of forest certification it is necessary to leave at least five dead standing trees per hectare and leave them to lie after natural tree falling;
- For the protection of forest from pests and diseases, based on the systematic monitoring of the health status of stands, it is required to use a biological and biotechnical products, while the chemical may only be used in exceptional cases of potential greater damage where there is no appropriate biological or biotechnical product, with the permission of the central body of the government administration responsible for Agriculture and Forestry Affairs and with the consent of the Ministry responsible for Nature Protection.
- In the area of Velebit Nature Park, scientific research can be conducted in order to preserve forest ecosystems as well as the natural development of forest ecosystems can be used for educational purposes;
- All activities related to the Nature Park area include the collaboration and mutual information of the Public Institution "Nature Park Velebit" and the competent Forest Office;
- When constructing facilities for regular forestry activities, as well as facilities for tourist and recreational purposes, it is necessary to use autochthonous materials (e.g. wood) and to comply with the guidelines of the traditional method of constructing forests;
- In the area of the management unit it is not acceptable to store substances that are harmful to the environment;
- Manipulation of oil and petroleum products, oils and lubricants must be carried out with precautionary measures at locations away from water surfaces;
- It is not acceptable to forest machinery interfere with ecologically sensitive habitats;
- When logging, it is not acceptable to dispose of surplus branches on sensitive non-forest and forest habitats;
- It is necessary to prevents any pollution, as well as to act in accordance with legal regulations in the event of machine malfunctions, spillages, etc.
- Forest silviculture should be carried out with the aim of establishing a high forest and a stable ecosystem, and filling and / or affreforestation using a indigenous species;
- From the nature protection point of view it is not acceptable to conduct afforestation on grassland habitats;
- In the area of established rare and endangered habitat types, it is necessary to preserve forest cleanings and edges, and in even-aged stands when completing the final felling of larger forest areas, wherever possible and appropriate leave smaller untouched areas or conduct felling on a smaller areas, similar to the principles of group logging;
- In the forest management of rare and endangered habitat types, it is necessary to preserve the protective function of forests, forest cleanings and edges, conduct felling on the smaller areas and to ensure the extension of harvesting maturity of the native species of trees with regard to the physiological life of a certain species and health condition of the forest community;
- In order to preserve the diversity of fauna, it is necessary to leave evenly spaced trees with twigs and nests of endangered species on the log and leave the fruit trees as one of the sources of food;

- When performing exploitation of forests, it is necessary to take into account the preservation of the young forests, the habitats of endangered or protected plant species and the prevention of damage to standing trees and changes in the physical structure of the soil due to the mechanical activity of forest mechanization;
- It is necessary to prevent a landfill growing and to implement fire protection measures;
- Construction of fire-fighting areas with forest road elements and afforestation of non-forest areas (grasslands) are potentially significant impacts on the conservation purpose of the ecological network area (Velebit Nature Park), and require the implementation of the procedure for acceptability assessment of the nature intervention;
- All planned interventions that may have a significant impact on an ecologically important area are subject to an acceptability assessment of the nature of the project;
- In order to efficiently implement the supervision and protection of forest areas of the Velebit Nature Park, one copy of the key from the ramp on forest roads must be delivered to the Public Institution "Velebit Nature Park" and the competent fire brigade unit.

Management Plan for Velebit Nature Park 2007.-2017. prescribes a important habitats for wild taxa and habitat types and internationally important bird areas in the Ecological Network within the boundaries of the Park. Action plans have been developed for the past 10-year period:

- reconstruction of Premužić path and its adaptation to the requirement of Park visitation;
- monitoring the lekking site of western capercaillie (*Tetrao urogallus*) in order to ensure the survival of the population;
- arranging the Visitor and Information Center of the Park in Baške Oštarije;
- complete arrangement of the cave complex „Cerovačke špilje".

According to the goals of the Action plans, which are at different stages of implementation, it is clear that the Ministry's intention was to provide visitor infrastructure in order to increase the park's own revenues and increase self-sustainability.

Accordingly, in conservation of the habitat, the heaviest load have been carryed by the Hrvatske šume d.o.o. through its organizational units Forest Administration Gospić and Senj, which increases their production costs of wood.

In the production forests managed by the Hrvatske šume d.o.o. there is no difference in the management methods between individual forest communities, but in all state

forests it is managed in a sustainable manner by the continued commitment of Croatian forestry. In the area of the Park there is no forest plantation. (There are certain plantations of coniferous forests outside of the park area, near Gospić, which were planted for paper produced in the 80's of the last century for the paper and kraft pulp mill Simo Dimić - Due to the war effort and the economic transition the factory were closed and this form of forest breeding were abandoned).

In the following table the habitat present in the Natura 2000 sites are listed. In the table those habitats which could be affect by the forest management operations are indicated.

List of habitat types present on the sites (from Standard Data Form - SDF)

Natura 2000 site code	Natura 2000 site name	Natura 2000 site area (ha)	Habitat code	Habitat type	Forest management could interface the habitat
HR5000022	Park prirode Velebit	250	4030	European dry heaths	X
HR5000022	Park prirode Velebit	2200	4060	Alpine and Boreal heaths	X
HR5000022	Park prirode Velebit	1000	4070	Bushes with *Pinus mugo* and *Rhododendron hirsutum* (*Mugo-Rhododendretum hirsuti*)	X
HR5000022	Park prirode Velebit	2000	5210	Arborescent matorral with *Juniperus* spp.	X
HR5000022	Park prirode Velebit	5	6110	Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi*	X
HR5000022	Park prirode Velebit	3800	6170	Alpine and subalpine calcareous grasslands	X
HR5000022	Park prirode Velebit	5000	6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	X
HR5000022	Park prirode Velebit	200	6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	X
HR5000022	Park prirode Velebit	49000	62A0	Eastern sub-Mediterranean dry grasslands (*Scorzoneratalia villosae*)	X
HR5000022	Park prirode Velebit	5	6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	X
HR5000022	Park prirode Velebit	7	7230	Alkaline fens	X
HR5000022	Park prirode Velebit	10	8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	X
HR5000022	Park prirode Velebit	200	8140	Eastern Mediterranean screes	X
HR5000022	Park prirode Velebit	1000	8210	Calcareous rocky slopes with chasmophytic vegetation	X
HR5000022	Park prirode Velebit	0	8310	Caves not open to the public	X
HR5000022	Park prirode Velebit	73200	91K0	Illyrian Fagus sylvatica forests (*Aremonio-Fagion*)	✓
HR5000022	Park prirode Velebit	2170	91L0	Illyrian oak-hornbeam forests (*Erythronio-Carpinion*)	✓
HR5000022	Park prirode Velebit	1693	9410	Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)	✓
HR5000022	Park prirode Velebit	500	9530	(Sub-) Mediterranean pine forests with endemic black pines	✓

Estimation of forest chain operations on habitats are made on the basis of the matrices listed below.

Magnitude	Impact	Description
	None	The operation will cause no relevant impact or may be beneficial to plant community structure or functionality, with regard to the threat considered
I	Low	The operation will cause limited impact to plant community structure or functionality, with regard to the threat considered
II	Medium	The operation will cause significant impact to plant community structure or functionality, with regard to the threat considered
III	High	The operation will cause extreme impact to plant community structure or functionality, with regard to the threat considered. In this case operation should not be performed.

The reversibility of impact is colour coded according to the following scale:

Colour	Reversibility	Description
	Short term	Plant community structure or functionality will be unaffected or recover in a short amount of time.
	Medium term	Plant community structure or functionality will recover over a period of time measured in years.
	Long term	Plant community structure or functionality will recover over a period of time measured in decades.
	Irreversibile	Impact is irreversible and plant community will not recover. Operation should not be performed.

The influence of the chain for forest operations on the synthropic and foreign species and the possibility of recovery has not been evaluated due to the complexity of this issue.

Potential influence on habitats based on Directive 92/43/EEC and other forest communities in the Park area. Given that forests manage on the principles of sustainable management, all actions in the forests include continuous restoration and maintenance of forest communities with the aim of long-term continuous exploitation.

Potential influence on habitats (based on Directive 92/43/EEC)

Natura 2000 Habitat Code:	*91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)* *91L0 Illyrian oak-hornbeam forests (Erythronio-Carpinion)* *9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)* *9530 (Sub-) Mediterranean pine forests with endemic black pines*												
Action	**Silvicultural practices (high forest)**											**Post harvesting management**	
	Thinning/Shelterwood cutting/Salvage cutting					Crown pruning		Clear cutting					
THREATS	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	**INDICATORS**
direct removal of natural vegetation	II	I	I	I	I	I	I	II	I	I	I	I		vegetation sampling life-form spectrum /diversity indices
alteration of floristic composition	II	I	I	I	I	I	I	II	I	I	I	I		
reduction of protected and endemic species population	II	I	I	I	I	I	I	II	I	I	I	I		presence of protected and endemic species
introduction of synanthropic species	II	II	II	II	II	II	I	III	II	II	II	II		presence of synanthropic species
introduction of alien species	II	I	II	II	II	II	II	III	II	II	II	II		presence of alien species
reduction of natural regeneration	II	I	I	I	I	I	I	II	I	I	I	I		presence of natural regeneration
damage to natural regeneration	II	I	I	I	I	I	I	II	I	I	I	I		presence of damages to natural regeneration

Potential influence on habitats not included in the „Habitats Directive“

Forest categories not included in the "Habitats Directive"	*other forest communities not included in the "Habitats Directive" Autochthonous broadleaved reforestation*												
Action	**Silvicultural practices (high forest)**											**Post harvesting management**	
THREATS	Thinning/Shelterwood cutting/Salvage cutting					Crown pruning		Clear cutting					**INDICATORS**
	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	
direct removal of natural vegetation	II	I	I	I	I	I	I	II	I	I	I	I		vegetation sampling life-form spectrum / diversity indices
alteration of floristic composition	II	I	I	I	I	I	I	II	I	I	I	I		
reduction of protected and endemic species population	II	I	I	I	I	I	I	II	I	I	I	I		presence of protected and endemic species
introduction of synanthropic species	II	I	I	I	I	I	I	II	I	I	I	I		presence of synanthropic species
introduction of alien species	II	I	I	I	I	I	I	II	I	I	I	I		presence of alien species
reduction of natural regeneration	II	I	I	I	I	I	I	II	I	I	I	I		presence of natural regeneration
damage to natural regeneration	II	I	I	I	I	I	I	II	I	I	I	I		presence of damages to natural regeneration

List of plant species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Direcitve 92/43/EEC, indicating the species that could be influenced by forest management.

Natura 2000 site code	Natura 2000 site name	Species group	Species Code	Species Scientific Name	Forest management could influence the species
HR5000022	Park prirode Velebit	P	1473	*Aquilegia kitaibelii*	x
HR5000022	Park prirode Velebit	P	4089	*Arabis scopoliana*	x
HR5000022	Park prirode Velebit	P	1386	*Buxbaumia viridis*	x
HR5000022	Park prirode Velebit	P	4072	*Cerastium dinaricum*	x
HR5000022	Park prirode Velebit	P	1902	*Cypripedium calceolus*	✓
HR5000022	Park prirode Velebit	P	6351	*Degenia velebitica*	x
HR5000022	Park prirode Velebit	P	1547	*Genista holopetala*	x
HR5000022	Park prirode Velebit	P	2093	*Pulsatilla grandis*	x
HR5000022	Park prirode Velebit	P	4101	*Scilla litardierei*	x

Species group: P = Plants

Animal communities: potential influence on habitats, according to Directive 92/43/EEC and other forest communities).

List of animal species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Direcitve 92/43/EEC, indicating the species that could be influenced by forrest management

Natura 2000 site code	Natura 2000 site name	Species group	Species code	Qualifying Natura 2000 species scientific name	Forest management could influence the species
HR5000022	Park prirode Velebit	I	1092	*Austropotamobius pallipes*	x
HR5000024	Park prirode Velebit	M	1352	*Canis lupus*	✓
HR5000025	Park prirode Velebit	M	6338	*Dinaromys bogdanovi*	*x*
HR5000026	Park prirode Velebit	R	1279	*Elaphe quatuorlineata*	*x*
HR5000027	Park prirode Velebit	R	1293	*Elaphe situla*	*x*
HR5000028	Park prirode Velebit	I	1065	*Euphydryas aurinia*	*x*
HR5000029	Park prirode Velebit	I	6199	*Euplagia quadripunctaria*	*x*
HR5000030	Park prirode Velebit	I	4019	*Leptodirus hochenwarti*	*x*
HR5000032	Park prirode Velebit	M	1361	*Lynx lynx*	✓
HR5000034	Park prirode Velebit	M	1310	*Miniopterus schreibersii*	*x*
HR5000037	Park prirode Velebit	M	1307	*Myotis blythii*	✓
HR5000038	Park prirode Velebit	M	1316	*Myotis capaccinii*	*x*
HR5000039	Park prirode Velebit	M	1321	*Myotis emarginatus*	✓
HR5000040	Park prirode Velebit	M	1324	*Myotis myotis*	✓
HR5000041	Park prirode Velebit	I	6350	*Protoerebia afra dalmata*	*x*
HR5000042	Park prirode Velebit	M	1306	*Rhinolophus blasii*	✓
HR5000044	Park prirode Velebit	M	1305	*Rhinolophus euryale*	✓
HR5000046	Park prirode Velebit	M	1304	*Rhinolophus ferrumequinum*	✓
HR5000048	Park prirode Velebit	M	1303	*Rhinolophus hipposideros*	✓
HR5000051	Park prirode Velebit	R	1217	*Testudo hermanni*	*x*
HR5000052	Park prirode Velebit	M	1354	*Ursus arctos*	✓
HR5000053	Park prirode Velebit	R	6337	*Vipera ursinii macrops*	*x*

Species group: A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles;

List of animal species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Direcitve 92/43/EEC, indicating the species that could be highly influenced by forrest management.

Natura 2000 site code	Natura 2000 site name	Species group	Species code	Qualifying Natura 2000 species scientific name	Forest management could influence the species
HR5000023	Park prirode Velebit	M	1308	*Barbastella barbastellus*	✓
HR5000031	Park prirode Velebit	I	1083	*Lucanus cervus*	✓
HR5000035	Park prirode Velebit	I	1089	*Morimus funereus*	✓
HR5000036	Park prirode Velebit	M	1323	*Myotis bechsteinii*	✓
HR5000050	Park prirode Velebit	I	1087	*Rosalia alpina*	✓

Group: A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles;

In zoogeographic point of view, in the Park area there is a significant propotion of species (small animals living on the ground, bats and ihtiofaunas) typical of the Eastern Alps and the western Dinarides. There is also a complete Mediterranean fauna that inhabits the coastal slopes up to an altitude of 900 m. Along the edge of the Park, from Vratnik to Kuterevo, and along the continental border to the great karst fields of Gacka and Lika, there are also some types of amphibians that are not typical for Velebit as a whole.
Numerous species of bats, amphibians and fish occurring in the Park area are listed Annex of the Habitats Directive.

*Also, in the Park area, there are numerous species of butterflies that are found in the Red List of Endangered Plants and Animals in Croatia, the Red Data book of European butterflies and the Habitats Directive. The main threat to butterflies is the loss of grassland habitats and illegal collection.

Up to now, there are 257 bird species in the Park, of which 139 are regular or occasional nesting birds in the Park. Of the nesting birds, 56 species are found in the Red Book of Endangered Birds: 3 species in the category of endangered - EN (the golden eagle, *Aquilia chrysaetos*, the western capercaillie, *Tetrao urogallus*, western Bonelli's warbler, *Phylloscopus bonelli*), 6 species in the category of risky, 21 species the category of low-risk and 26 species in the category of the least concern species. In the Park, regularly or occasionally, nest 20 species from Annex I of the Birds Directive, 9 (the golden eagle, *Aquilia chrysaetos*, the western capercaillie, *Tetrao urogallus*, the

Eurasian pygmy owl, *Galucidium passerinum*, the boreal owl, *Aegolius funereus*, the Ural owl, *Strix uralensis*, the corn crake, *Crex crex,* the white-backed woodpecker, Dendrocopos leucotos, three-toed woodpecker, *Picoides trydactillus*, The ortolan, *Emberiza hortulana.*

There are many animals in the Park area, which, according to the Hunting Act, are considered wild game, which is classified into big, small and feathered game. The game is managed by concessionaires / hunters of the hunting ground, on the basis of contracts with the Ministry of Agriculture or Lika-Senj County, Hunting management Plan, Action Plan for Wolves and Action Plan for Bears.

The Park area is an area where three species of large carnivores live: brown bear (*Ursus arctos*),the eurasian lynx (*Lynx lynx*) and the wolf (*Canis lupus*); four species of medium beasts: the wildcat (Felis sylvestris), the European badger (*Meles meles*), the golden jackal (*Canis aureus*) and fox (*Vulpes vulpes*); in the rivers Lika and Zrmanja the otter (*Lutra lutra*) was recorded.

Wolves and lynx are endangered species on the IUCN Red List and are protected by law. Likewise, there is a growing threat of lynx due to the segmentation of habitats and inbreeding (along with the monitoring and maintenance of habitats, in the coming years the introduction of individuals must be made).

The Management Plan, apart from the diurnal butterflies, did not include other types of insects.

Estimation of forest chain operations on the animal community are made on the basis of the matrices listed below.

Magnitude	Impact	Description
	None	The operation will cause no relevant impact or may be beneficial to animal community structure or composition, with regard to the threat considered
I	Low	The operation will cause limited impact to animal community structure or composition, with regard to the threat considered
II	Medium	The operation will cause significant impact to animal community structure or composition, with regard to the threat considered
III	High	The operation will cause extreme impact to animal community structure or composition, with regard to the threat considered

The reversibility of impact is an estimation of the amount of time the community will need to return to its previous state after impact takes place. It depends on impact type, impact magnitude and community's resilience. The reversibility of impact is colour coded according to the following colour scale:

Colour	Reversibility	Description
	Short term	Animal community structure or composition will be unaffected or recover in a short amount of time..
	Medium term	Animal community structure or composition will recover over a period of time measured in years..
	Long term	Animal community structure or composition will recover over a period of time measured in decades
	Irreversible	Animal community structure or composition recover will take an extremely long time. Operation should preferably not be performed.

Potential influence on habitats (based on Directive 92/43/EEC)

Natura 2000 Habitat Code:	***91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)*** ***91L0 Illyrian oak-hornbeam forests (Erythronio-Carpinion)*** ***9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)*** ***9530 (Sub-) Mediterranean pine forests with endemic black pines***												
Action	**Silvicultural practices (high forest)**											**Post harvesting management**	
	Thinning/Shelterwood cutting/Salvage cutting					Crown pruning		Clear cutting					
THREATS	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	**INDICATORS**
Noise	II	II			III	III	III	III	II			III	III	Birds (Non-Strigiformes)
Soil compaction	I	I	I	I	III	I	III	I	II	I	I	III	I	Ground-active beetles
Decrease of habitat suitability	III	II			III	II	I	III	II			II	III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	III	I	I			II	I	III	I				I	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	III	I	I		II	III	I	III	I	I		II		Monitoring of carcasses

Natura 2000 Habitat Code:	other forest communities not included in the "Habitats Directive" Autochthonous broadleaved reforestation												
Action	**Silvicultural practices (high forest)**											**Post harvesting management**	
	Thinning/Shelterwood cutting/Salvage cutting					Crown pruning		Clear cutting					
THREATS	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	**INDICATORS**
Noise	II	II			III	III	III	III	II			III	III	Birds (Non-Strigiformes)
Soil compaction	I	I	I	I	II	I	II	I	II	I	I	II	I	Ground-active beetles
Decrease of habitat suitability	III	II			III	II	I	III	II			II	III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	III	I	I			II	I	III	I				I	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	II	I	I		I	I	I	II	I	I		II		Monitoring of carcasses

1.1.2 Abiotic components

Abiotic factors, which are specifically considered are: branches, forest wastes, organic matter in the soil, specific soil density, different types of erosion caused by flood and rain, and risk of fire.

In the area of the Park, the most important stakeholder in the biomass production chain are Hrvatske šume d.o.o. They manage state forests and their business policy have a significant influence on all other stakeholders, from subcontractors, employees, residents, customers, to the Park itself as a protected area but also as a public institution.

Forest protection is carried out in accordance with the annual plans of the needs arise from the monitoring of all causes of forest damage, and they are reflected by the effects of abiotic, biotic and anthropogenic factors.

The main abiotic factors discussed here are: the presence of deadwood and litter, and the impact of erosion and the density of forest soil. In the current forest management model of the Hrvatske šume d.o.o. business decisions are of crucial importance.

In the production of all types of wood assortments of the Hrvatske šume d.o.o. represent a state monopoly, and business policy is reflected positively or negatively on the overall situation in the forestry of the Republic of Croatia. Regarding the amount of branches that is deposited or left on the ground after logging and log extraction, the same is left in sufficient quantity.

Given the low prices that these jobs are contracted with small and medium-sized entrepreneurs, the branches is extracted to the limit of cost-effectiveness. The costs of extracting part of the branches (which could be used in biomass production) are the main limiting factor for increasing its exploitation.

Small forest waste of ≤ 2.5 cm in diameter is located at different stages of decomposition above ground. Its quantity depends on the stage of forest development and the implementation of various forest operations and can significantly alter its attributes.

In the area of the Park no monitoring of the quantity of decommissioned forest waste and / or bunglings is carried out, since it generally leaves more than enough plant residues on the ground. This plant residue can potentially be used in energy-using

plants, but it is necessary to draw up precise cost-benefit calculations to maximize the use of plant residues in the Park area.

It should be borne in mind that access to forests in the Park is significantly different and harder (and more expensive) than in some other parts of Croatia because it is difficult due to land slope, sharp mountain climate, reduced use of machinery,

Measurement of the amount of organic matter in the soil is not carried out in the Park area, and its presence in the method of forest management has no major influence because the forests are managed in a sustainable manner and there is no plant breeding.

The Velebit Nature Park covers the Velebit mountain that belongs to the western Dinarids. It is an extremely karstic area marked by special geological geomorphological and hydrological attributes.

Since the area of the Velebit Park or the Park is a part of the Dinaric karst, in order to protect the soil from all types of erosion on very steep terrain, on rocks, in areas of great rockyness and on the coastal terrain there are protective forests. They are outside of management and do not undertake any interventions. The surface of these forests in the Park area is 29.133 ha. The fundamental purpose of protective forests is the protection of soil from all types of erosion and the entire ecosystem in unchanged form.

The impact of soil (its compactness and the increase in density) resulting from the movement of forest vehicles affects the growth and increase of the stands and should be reduced to the smallest possible extent. Some of the mitigation measures are suitable logging systems, a form of secondary forest road network, and mandatory, directed tree demolition.

Ground configuration in the Park does not allow heavy mechanics to be used, but the Park does not conduct an estimation of the level of damage to the habitat when extraction out the wood is being made.

The risk of fire is one of the risks that will affect all habitats, flora and fauna in the future. The towns of Senj and Gospić have public fire brigades, while other units of local self-government firefighters are organized through voluntary fire brigades. Croatian Forests d.o.o. have an organized surveillance service during the fire protection season that begins, for the County, every year in May. It is also important to increase the awareness of responsible behavior in the Park as by the participants of

the chain of recruitment being the mass of the forestry operations, as well as by the population and visitors of the Park.

Observed climatic trends in the territory of the Republic of Croatia are:

- an increase in average temperature has been observed, especially in the last 20 years, which can be attributed mainly to summer movements in the Adriatic;
- a slight decline in the annual precipitation rate during the 20th century, which continues at the beginning of the 21st century, and an increase in the number of dry days throughout Croatia;
- the frequency of dry periods increases, ie the number of consecutive days without precipitation.

The Mediterranean, including the Croatian Adriatic coast, is affected by the global sea level rise. Particularly vulnerable are low islands and estuary of the river that are vulnerable to flooding. However, the Croatian coast is a tectonic active area which makes it difficult to predict the effects of sea level rise, as long-term trends in sea level changes may therefore be unclear. It is anticipated that in the colder part of the year warming will be somewhat higher in Northern (continental) Croatia, while warming will be higher in the coastal part of Croatia in a warmer period.

Reduction of the total precipitation is expected in most of the year, primarily in the coastal part of Croatia and in the immediate hinterland. Although not the most prominent, this decline in rainfall is relatively high in summer because of the marked annual minimum climatological minimum rainfall in this part of Croatia. In the winter there would be a slight increase in precipitation, again in the narrow coastal zone, but this increase was not statistically significant.

The assessment of the influence of the chain of forest operations on abiotic factors was made on the basis of the matrices listed below.

Magnitude	Impact	Description
	None	The operation will cause no relevant impact or may be beneficial to abiotic components, with regard to the threat considered
I	Low	The operation will cause limited impact to abiotic components, with regard to the threat considered
II	Medium	The operation will cause significant impact to abiotic components, with regard to the threat considered
III	High	The operation will cause extreme impact to abiotic components, with regard to the threat considered

The reversibility of impact is colour coded according to the following colour scale:

Colour	Reversibility	Description
	Short term	Abiotic components will be unaffected or recover in a short amount of time
	Medium term	Abiotic components will recover over a period of time measured in years
	Long term	Abiotic components will recover over a period of time measured in decades
	Irreversible	Abiotic components recover will take an extremely long time. Operation should preferably not be performed

Potential influence on habitats (based on Directive 92/43/EEC)

Natura 2000 Habitat Code:	*91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)* *91L0 Illyrian oak-hornbeam forests (Erythronio-Carpinion)* *9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)* *9530 (Sub-) Mediterranean pine forests with endemic black pines*												
Action	**Silvicultural practices (high forest)**											**Post harvesting management**	**INDICATORS**
	Thinning/Shelterwood cutting/Salvage cutting					Crown pruning		Clear cutting					
THREATS	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	
Reduction of deadwood	I	II			II			III	III	III	III	III		Deadwood
Reduction of litter cover	I	I			II			III	III	III	III	III		Litter
Reduction of litter height	I	I			II			III	III	III	III	III		
Reduction of SOC	I	I			I			II	II	II	II	II		Soil Organic Carbon (SOC)
Presence of Rill erosion	I	I			II			III	III	III	III	III		Erosion
Presence of Interrill erosion	I	I			II			III	III	III	III	III		
Presence of Gully erosion	I	I			II			III	III	III	III	III		
Increase of Soil Bulk Density	I	I			I			II	II	II	II	II		Soil Bulk Density
Fuel model features	I	I			I			III	III	III	III	III		Fire risk

Forest categories not included in the "Habitats Directive"	other woodland type not included in the "Habitats Directive" Autochthonous broadleaved reforestation												
	OPERATIONS												
	Silvicultural and harvesting practices (high forest and coppice)											**Post harvesting management**	
	Thinning/Shelterwood cutting/Salvage cutting					Crown pruning		Clear cutting					
THREATS	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Cutting	Yarding	Felling and Arrangement	Storing (Winch)	Storing (Raceways)	Yarding (Raceways)	Yarding (Tractor)	Chipping	**INDICATORS**
Reduction of deadwood	I	I			II			III	III	III	III	III		Deadwood
Reduction of litter cover	I	I			II			III	III	II	II	III		Litter
Reduction of litter height	I	I			II			III	III	II	II	III		
Reduction of SOC	I	I			I			II	II	I	I	II		Soil Organic Carbon (SOC)
Presence of Rill erosion	I	I			II			III	III	II	II	III		Erosion
Presence of Interrill erosion	I	I			II			III	III	II	II	III		
Presence of Gully erosion	I	I			II			III	III	II	II	III		
Increase of Soil Bulk Density	I	I			I			II	II	I	I	II		Soil Bulk Density
Fuel model features	I	I			I			III	III	III	III	III		Fire risk

1.1.3 Social, economic and demographic components and ecosystem services

For most countries, regional employment and economic benefits are the most important items related to the use of biomass for energy production. Opening up new jobs in biomass utilization (harvesting and preparation of biomass, construction and plant management) and bioenergy production can contribute to stopping negative social and demographic trends such as the level of income or depopulation.

The use of biomass produced in the Park, which is managed by the principles of sustainable management, will not negatively affect the environmental, natural and landscape value of the area.

The use of biomass in bioenergy production contributes to the rural labor market either by opening up direct jobs either by supporting related industries and by employing them in the same. Biomass energy production is labor-intensive compared to gaining energy from other renewable sources.

Job vacancy opened up in the biomass recovery sector will likely be less paid than in other industries, but if the population can provide more than one source of income (rural tourism, agriculture, home-based sales, home labor), it can be expected to have a positive impact on keeping the local population and reducing depopulation. Otherwise, the industry will have to rely on the import of labor.

The development of the biomass sector can contribute to the creation of new jobs in other better-paid sectors (service activities, supporting industry such as equipment trade, services, assembly, etc.).

From a macroeconomic perspective, the use of biomass has a number of other benefits such as:

– ensuring economic growth and increasing GDP;
– substitution of energy import;
– improving efficiency;
– provision of energy supply and energy diversity.

In the demographic development of the Velebit Nature Park, it is possible to distinguish two fundamental periods: first one, from the beginning of the 18th to the beginning of the 20th century, and the second one from the beginning of the 20th century until the present day. The first one is characterized by a general population growth (with the exception of the 1870s) influenced by high natural growth. The largest population of the Park was reached in 1910, when there were 40,737 inhabitants in this area. In the outskirts of Lika settlement, the maximum population

density was reached at the turn of the century, in 1900. The main centers of settlement were at the beginning of the 20th century, in the coastal littoral settlements and in the coastal zone, while the much smaller population was in the sub-mountain area and in the sub-continental part of the Park. Given that at that time the most important income of the population was from agriculture, the differences in spatial distribution of the population indicate also the corresponding differences in the problem of space overload, as a result of the pressure of the overpopulated population on the labile ecological balance of the karstic area, between parts of Velebit. Since the area of Lika was part of the Military Frontier (Vojna krajina) until its annulment, a significant source of income was related to the revenues generated by the recruitment, while the middle class (craftsmanship, tradesmen) was oriented towards providing the military service. The annulment of the Military Frontier (Vojna krajina, 1870s) had a negative impact on the wider area, and instead of economic integration with the rest of Croatia, a sudden collapse of the economic system resulted in intensive (overseas) emigration and the Park area affected by depopulation at the beginning of the 20th century (1910.).

Unfavorable demographic trends continued during the World War II. Due to the aging of the population, and since the early 1970s all the more pronounced depopulation factors became negative natural movement, denatality. Consequently, the spatial tendency of the population has been transferred to the coastal zone that now gather the majority (3,982 inhabitants or 41.46%) of the population of the Park. Also from World War II. the expectations of the population increases in terms of personal standards (education, infrastructure) which encourages further emigration of the population towards small urban centers (Senj, Gospić, Otočac).

Settlements can be divided into those within the boundaries of Park and to those at its border, all of which are administratively divided into several local self-government units (Gospić, Otočac and Senj, Municipality Perušić, Lovinac, Karlobag). The boundaries of the Park, defined on the topographic map scale of 1: 25,000 and synthesized on map 1: 100,000, do not match the boundaries of statistical settlements, but usually cut their area (at edge settlements, the construction part of the area of the settlement is located outside of the park, and wooded areas are usually in the the borders of the Park). From a demographic point of view, as the supreme criterion for separating settlements, it is justified to exclude the construction (which implies inhabited) area of the statistical settlement. Accordingly, in this analysis, the park includes all edges of

littoral settlements whose construction area, wholly or partially, is within its boundaries. Such differentiation of marginal settlements is further justified by the fact that within the park rural settlements are included, irrespective of their ambience and cultural-traditional values, representing three types of cultural landscape, coastal, dalmatian and Lika. By applying such a criterion, a total of 64 settlements are included in the spatial coverage of the Nature Park.

Some areas of the Park are gravitationally directed towards central settlements of local self-government units. These centers have emphasized, and in most cases, the key importance in the evaluation of economic resources, as well as the protection of the protected ecosystem. Because of their interdependence and connectivity, the Park and the City Areas and the surrounding municipalities form a specific functional spatial unit. Since the Velebit Nature Park does not have a spatial plan, the spatial plans of the local self-government units, applies in its area, which also has a significant impact on the development possibilities.

Table 1: Settlement arrangement of the local self-government units within the Park and at their borderland

Town/ Municipality	Within the boundaries of Nature Park Velebit	Marginal settlements alongside border of Nature Park Velebit
Town Senj	Biljevine, Krasno Polje, Senjska Draga, Stolac Jablanac,Klada, Lukovo,Prizna,Starigrad,Stinica,Sveti Juraj Velike Brisnice,Volarice	Crni Kal, Melnice, Vrzići
Town Gospić	Brušane	Bužim, Divoselo, Donje Pazarište, Drenovac Radučki, Kruškovac, Kukljić, Lički Čitluk, Lički Novi, Kalinovača, Mala Plana,Medak, Novoselo Trnovačko, Počitelj, Popovača Pazariška, Rizvanuša,Smiljan, Trnovac,Velika Plana
Town Otočac		Kuterevo, Hrvatsko Polje
Municipality Karlobag	Baške Oštarije, Crni Dabar, Došen Dabar, Konjsko, Kućišta Cesarička,Ledenik Cesarički,Ravni Dabar,Sušanj Cesarički, Barić Draga,Cesarica,Karlobag,Lukovo Šugarje,Staništa,Vidovac Cesarički	
Municipality Lovinac		Ličko Cerje,Ričice, Sveti Rok, Lovinac, Raduč, Štikada
Municipality Perušić		Donji Kosinj, Kosinjski Bakovac, Lipovo Polje

Data source: Department for Physical Planning of Lika-Senj County, november 2017.

Settlements are located in several separate zone; bordering coastal, borderline of Lika and mountain. Most of the inhabitants are located in the coastal settlements of

Municipality Karlobag and Town Senj (on the coastal side of the park boundary is the line of the sea, so the Municipality of Karlobag is entirely in NP Velebit, and the Town Senj with its largest part, while the smaller number of settlements of Municipality Lovinac and Town Gospić is located in it's surrounding.

The highest number of inhabitants are in coastal settlements (6,407 or 52,28%), then Lika (4,015 or 34.71%) (1,819 or 18.6%) and the least in higher parts of the Nature Park, i.e. Velebit settlements (1,505 or 13,01%). The majority of settlements have been affected by the depopulation process. The largest number of settlements which, according to the Census of 2011, did not have one inhabitant, are located in the Municipality of Karlobag 4 of 14 or 28.57%. Also, the southern part of the Municipality of Karlobag towards Zadar County has a lack of water supply, which is negatively reflected in the retention of the population and in the eventual serious investment of the business sector. Also, the drainage system is not solved.

The population of Senj with 4,810 inhabitants (41.58% of the population) is the largest border town, but also the only urban settlement whose potential is not sufficiently brought to consciousness because it provides a range of services to the population (health services, trade, education). Although modest in comparison to other places, the area of the town of Senj are involved in the tourist industry and catering, and also in its area are the ports of Stinica and Prizna, which are the main ports for the island of Rab and Pag.According to the development index (from 2013), Senj, Gospić, Perušić and Lovinac are classified in III. group by development index (75-100% of the Croatian average), the town of Otočac is in the II. group (50-75% of the Croatian average) and the municipality of Karlobag is in the IV group (above the average of Croatia) with 111.87% of development compared to the average of the Republic of Croatia.

In the settlement structure, the biggest development potential, apart from the town of Senj, is the coastal settlements of Sveti Juraj and Karlobag and of the Krasno (Krasno Polje) and Kuterevo settlement. Traditionally, in this area, the population was engaged in forestry and hunting, cattle breeding, farming and the collection of medicinal herbs, mushrooms, forest fruits, etc. Summer pasture of livestock in the past has maintained grassland in the Nature Park which are now being in ecological succession. Forestry is still one of the main activities, and the inhabitants are engaged in agriculture (cattle breeding and farming) and tourism. On the seashore sporadically there is also horse-breeding.

Table 2: Indicators of the Development Index, 2011. and 2013.

TOWN SENJ									
Average income per capita (kn)*		Average sources of income per capita (kn)		Average unemployment rate (%)		Population movements		Precentage % of educated population in the population16- 65 years	
2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2001	2011
24.229	**26.898**	**2.146**	**2.069**	**16,9**	**18,2**	**89,0**	**93,4**	**64,7**	**76,76**
TOWN GOSPIĆ									
Average income per capita (kn)*		Average sources of income per capita (kn)		Average unemployment rate (%)		Population movements		Precentage % of educated population in the population16- 65 years	
2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2001	2011
29.599	31.135	1.818	2.013	13,5	12,6	60,1	91,2	68,0	79,64
TOWN OTOČAC									
Average income per capita (kn)*		Average sources of income per capita (kn)		Average unemployment rate (%)		Population movements		Precentage % of educated population in the population16- 65 years	
2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2001	2011
20.907	24.480	1.583	1.214	16,7	16,2	65,7	90,8	59,2	72,27
Municipality Karlobag									
Average income per capita (kn)*		Average sources of income per capita (kn)		Average unemployment rate (%)		Population movements		Precentage % of educated population in the population16- 65 years	
2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2001	2011
19.115	21.087	**11.688**	**6.444**	**17,1**	**14,2**	**100,1**	**109**	**54,7**	**71,20**
Municipality Lovinac									
Average income per capita (kn)*		Average sources of income per capita (kn)		Average unemployment rate (%)		Population movements		Precentage % of educated population in the population16- 65 years	
2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2001	2011
21.741	21.305	2.411	6.258	18,8	19,2	39,9	87,1	50,7	76,62
Municipality Perušić									
Average income per capita (kn)*		Average sources of income per capita (kn)		Average unemployment rate (%)		Population movements		Precentage % of educated population in the population16- 65 years	
2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2006-2008	2010-2012	2001	2011
19.596	24.172	1.904	3.689	18,6	17,3	65,7	75,9	47,7	62,56

Data source: Ministry of Regional Development and EU funds, 2017
**in Croatian kuna (HRK)*

Nearly all economic activities in the County are conducted in the towns and in the Plitvice Lakes Municipality. The average paid off net income of the taxpayer in Lika-Senj County is lower than that in the Republic of Croatia by 25.14%. The average wage per employee in the companies was paid in the town of Novalja. Seven units of local

self-government within the Lika-Senj County (Brinje, Donji Lapac, Karlobag, Lovinac, Perušić, Udbina and Vrhovine) together account for a total of 10.8% of the revenues of companies based in Lika-Senj County and have 11.96% of employees in companies in the territory of the County (they have a total of 25.9% of County residents).

According to the data of the Central Bureau of Statistics of the total number of employees in the County, 55% of employees in the agriculture, forestry and fisheries sector receive salaries up to 5.500,00[1] HRK (aprox. 733,33 EUR), in the processing industry of such workers 64.2% and in the supply sector el. energy, gas, steam and air conditioning of such workers is 10.7%. The most important branches in the coastal part of the Park are the activity of accommodation and food preparation and service, and in this sector up to 5.500,00 HRK is received by 74.7% of workers, and in the trade sector 86.9%. In general, 64% of the workers in these sectors employing the largest number of employees in the interspace of the Park receives salaries of up to 5.500,00 HRK.

It is very difficult to estimate the per capita income in the area that gravitates to the Park, because apart from income from work, some of the older population in the village has so called agricultural pensions or none at all, a portion of the population receives a veterans' pension, and part of the population in the coast adds family income by renting rooms and apartments during the tourist season. Also part of the population in rural settlements is supplementing their income by selling wood, forest fruits and agriculture. By entering the European Union, first of all, direct payments were stabilized per ha of agricultural land and increased interest in maintaining agricultural land. Nevertheless, given the immigration trends that have emerged, especially since Croatia's entry into the European Union (1 July 2013), not only because of unemployment but also for low wages (compared to those earned in other countries), it can be estimated that per capita income does not exceed 2.000,00 – 2.500,00 HRK (aprox. 266,66 to 333,33 EUR) per month, and in old households it ranges from HRK 1.000,00 to HRK 1.500,00 (aprox. 133,33 to 200 EUR) per month. Given that there are no serious surveys on income in rural areas, the County can indirectly confirm this assessment with respect to some indicators of a personal standard such as poorer maintenance of houses and yards, worse (older) vehicles, very few people going on holidays, etc.

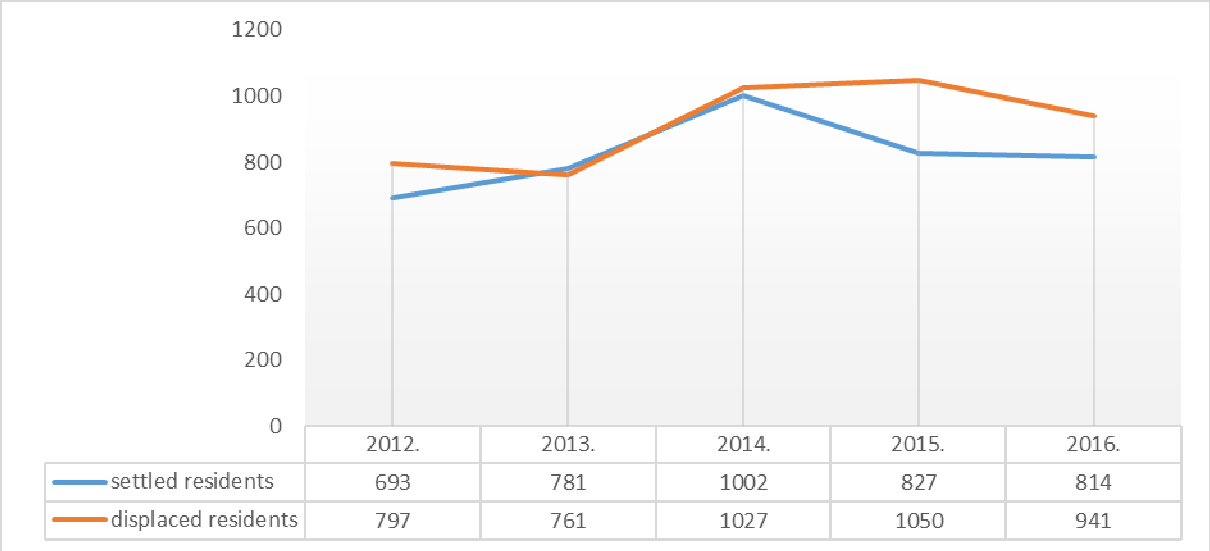
[1] Exchange rate: 1 EUR is aprox. 7,5 HRK:

The average monthly net wage bill in 2016. was 5.135,00 HRK (aprox. 684,66 EUR), which is nominally 1.7% more than in 2015. (due to a 1.1% decrease in consumer prices, a real increase of 2.8%).
The unemployment rate is monitored at the level of the state and counties, and in 2011. the same amounted to 22.3% in Lika-Senj County.

According to the unemployment indicators that were processed for the purpose of calculating the Development Index (2010.-2012.) in all local self-government units, the unemployment rate was lower than the county average.

With the emergence of a long-term economic crisis, the unemployment rate in the Republic of Croatia and the Lika-Senj County decreased, but the trend of depopulation continued not only due to natural population movements but also economic emigration because of the significant trend of emigration to other more developed countries of the European Union, reasons not only for unemployment but also for smaller income (for the same or similar jobs). Thus, in the territory of Lika-Senj County, a total of 562 residents were inhabit in the period from 2012. to 2015. and 1,873 inhabitants have emigrated. (This trend has continued in 2016. and 2017., but data by counties and cities are fully processed for 2015. In 2016., 202 people moved to the county and 419 people left). In units of local self-government that are entirely or partially within the Park in the period from 2012. to 2015., 332 people moved more than the resettled population. However, in the area of Karlobag Municipality (which has the highest development index) more than settled in the period from 2012. to 2015. (+82), as well as in Lovinac Municipality, where there are a total of more than 12 persons. It is considered that the number of inhabitants did not increased by the fact that some people reported their place of residence in order to avoid paying taxes on the cottages. In the area of Senj, in the period considered, 595 persons moved in total and moved 813 (-218). The largest number goes to other counties, then overseas, and to other cities and municipalities within the same county.

Picture 1: Population by cities and municipalities for the period 2012.-2016.



Data source: Croatian Buro of Statistics

In the period 2006-2008 and 2010-2012 (79,64%), the percentage of educated population in the working-age population increased which is understandable because Gospić is the administrative center of the county, where the institutions of higher education are located, the Polytechnic Nikola Tesla and the Department of Teacher Education in Gospić, University of Zadar.

According to the Energy Efficiency Program of Lika-Senj County's Energy Consumption in 2014- 2016, the use of energy gained from biomass fuels was not estimated at all. The Program states that district heating is used only in the service sector in the amount of 0.7 TJ (2013). Installed capacity for pellet production in the County area is 85,000 tons/year. Part of the households that have introduced central heating switch to the use of pellets. As outlined in the previous chapter, it is expected that most of the planned cogeneration plants for electricity and heat generation will be completed by 2023. In the period up to 2020, no significant increase in the use of energy produced from biomass plants is expected. Neither in one unit of local self-government there are no built-up systems for the distribution of heat energy (at the level of settlements for a larger number of consumers).

Table 3. Final energy consumption in Lika-Senj County in TJ in 2013.

SUBMITTED TO CONSUMERS	2013
Industry (Manufacturing, Agriculture and Construction)	231,68
electrical energy	107,61
liquefied gas	6,00
petroleum products, motor gasoline, diesel fuel	118,07
Transport	638,07
liquefied gas	12,76
petroleum products, diesel fuel	625,31
Households	1.932,14
firewood	1.540,17
electrical energy	247,39
liquefied gas	42,37
petroleum products	107,19
Services	455,82
electrical energy	188,92
remote heating	0,74
liquefied gas	31,70
petroleum products	234,45
Public lighting	21,40
electrical energy	21,40

Data source: Energy Efficiency Program in Lika-Senj County's Energy Consumption 2014 – 2016 years

The dominant source of energy in households was fuel wood and it covered nearly 80 percent of the total demand, while the other energy source was 12 percent of the electricity used. Of this average, the zone 4 is significantly deviated, where the most energy used in households is electricity, and in Senj, electrical power is about 22 percent. The heating oil in the base year is represented in a smaller share, about 6 percent, and is most used in the households of Gospić where it is represented in households with about 19 percent.

The average value of useful energy consumption for heating is different for each zone. In the areas of colder climatic conditions, in the continental part of this size, in 2007. it ranges from 200 to 260 kWh/m^2 of heated area. In the coastal area and on the island of Pag, this specific consumption is considerably lower, in the city of Novalja the lowest is 125 kWh/m^2 of heated area. The average surface area of the residential building in the county was relatively large in 2007., amounting to 88 m^2, which is certainly a contribution to the structure of the types of housing that are dominated by family houses. The model has foreseen areas for four basic categories of households, namely flats and family houses that are heated centrally or in room. For central heating units, the average area of the residential area was about 115 m^2 in 2007., and for this category of households it is envisaged an increase of the total area of about 5 m^2, so that in 2020. it would amount to 120 m^2. Heated surface is also an essential

energy consumption parameter, especially for heating. The load factor, the ratio of the heated and the total surface area is considerably higher on central heated buildings on average, and in Lika-Senj County it approximates 87 percent, while in heated households it is 60 percent. Due to a rise in the standard of living and an increase in the number of centrally heated households, the average load factor will increase in the long term, from 68 percent to 85 percent.

The largest number of inhabitants of Lika-Senj County uses wood as an energy source for heating, and it is estimated that this percentage in settlements in the Park area is even higher. Since older people are predominantly concerned, it is questionable to talk about self-sustainability, as people are very difficult to provide for their own heating.

Socio-Demographic Indicators	Value Before operations				
	Unit of measure	data	Year	Source	territorial reference*
Population	number of inhabitants	11.514	2011	National Census, Croatian Buro of Statistics	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag, Lovinac i Perušić)
Population structure	% of population aged under 15 years	11,81	2011	National Census, Croatian Buro of Statistics	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag, Lovinac i Perušić)
	% of population aged 15-64 years	60,85			
	%population aged 65 years and over	27,34			
Per capita family income	mean value of per capita income for resident families close to the protected areas	2.000-2.500 HRK, approx.	2016	Employment and salaries, Croatian Buro of Statistics	Towns: Senj, Gospić i Otočac; Municpalities: Karlobag, Lovinac i Perušić
Unemployment rate	% of persons in work age who are unemployed	14,2- 19,2	2010-2012	Development Index, Ministry of Regional Development and EU Funds	Towns: Senj, Gospić i Otočac; Municpalities: Karlobag, Lovinac i Perušić
Educational level	% of persons who have an upper secondary degree	62,56-79,6	2011	Development Index, Ministry of Regional Development and EU Funds	Towns: Senj, Gospić i Otočac; Municpalities: Karlobag, Lovinac i Perušić
Energetic self-sufficiency	% of consumed energy provided by the biomass plant on the total energy consumed	0,00 /data is not avalilabe	2014	Energy Efficiency Program in Lika-Senj County's Energy Consumption 2014.-2016.	Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić

The socioeconomic indicators table provides data from the 2016. Annual Report on the Business of Legal Entities dealing with biomass harvesting and exctraction, processing and marketing of wood, bioenergy production and distribution and those involved in satelite activities. In the targeted area of the project, which includes settlements within the Park and bordering settlements within the 6 local self-governments – Towns: Senj, Gospić and Otočac and the Municipalities: Karlobag, Lovinac and Perušić, there are 463 legal entities registered (or 60.52% of the total number of legal entities in Lika - Senj County, which is 762), of which 85 (or 11.11% of the total number of legal entities in Lika-Senj County) are involved in targeted activities. The total number of employed persons within legal entities in the Lika-Senj County (2016.) was 4.150, while the total number of persons employed in 463 legal entities in the targeted area of the project (6 mentioned local self-governments) was 2.572. In the 85 targeted legal entities in the targeted area of the project, the total number of employees (2016.) was 438 persons.

In addition to trading companies and cooperatives (Legal Entities), private business can also be registered as a craft. According to the legal regulations regulating the business of crafts, crafts can be registered for more activities, and their business results are published only in aggregate by counties. Most trades are registered for more than one activity and in practice without interviews with every craft owner it is impossible to find out which craft really deals with.Therefore, in the table of socio-economic indicators, data on crafts are added to the number of companies involved in the activities listed below, as only data on the number of trades can be displayed. In the area of 6 local self-government units, which are entirely or partly located in the Park area, a total of 642 trades (trade register, December 2017) were registered. Data on the number of employees are published for crafts only at county level. According to published data from Lika-Senj County, in 2016, 1,128 crafts employed 2,260 people, ie every craftsman employed 2 workers on average.

According to the above, it can be estimated that, in total, crafts in the area of 6 considered local self-government units employ 1,284 workers. The number of trades registered in the forestry, primary processing, production el. energy and satellite activities is 242, and according to the estimates they employ a minimum of 484 workers.

Hrvatske šume d.o.o. are the most significant timber producers and their publicly available financial reports are the unified data of all forest management in Croatia.

Therefore, in the table of socio-economic indicators, the data for FA Gospić and FA Senj are also not presented in a separate annex (Annex 1). They will be included when and if Hrvatske sume deliver dana upon request from „Public institution Nature park Velebit.

No cooperatives for the exploitation and production of biomass, processing and trade of wood sorting, production and distribution of bioenergy and related activities is registered in the area under consideration.

The data that is labeled "not applicable" (N/A) are those that are not publicly available.

Labor productivity is calculated by the formula LP = net profit / number of workers.

Socio-Economic Indicators		Value Before operations				
		Unit of measure	data	Year	Source	territorial reference*
Total firms	firms involved in the biomass harvesting and extraction	Number of companies in the total number of companies in the targeted area (territorial reference; 85 out of 463 companies)	3	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood		48			
	firms involved in bioenergy production and distribution		9			
	firms involved in satellite activities		25			
Legal form	firms involved in the biomass harvesting and extraction	% of the total number of firms in the targeted area (territorial reference, all in total 463 firms) / % in the total number of firms dealing with biomass harvesting and exctraction, processing and marketing of wood, bioenergy production and distribution and those involved in satelite activities (85 firms in territorial reference area numbered in Total firms part of the table, above)/% of legal form – firms (there is non of crat or cooperative in targeted area)	0,65/ 3,53/ 100 % firms	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood		10,37/ 56,47/ 100% firms			
	firms involved in bioenergy production and distribution		1,94/ 10,59/ 100% firms			
	firms involved in satellite activities		5,4/ 29,41/ 100% firms			

Net income	firms involved in the biomass harvesting and extraction	mean value of net income; HRK[2] (Croatia)/EUR	18.157/ 2.420,93	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood		297.653/ 39.607,06			
	firms involved in bioenergy production and distribution		43.711/ 5.828,13			
	firms involved in satellite activities		107.213/ 14.295,06			
Labour Productivity (LP)	firms involved in the biomass harvesting and extraction	Mean value of LP; HRK[3] (Croatia)/EUR	4.952/ 660,27	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood		51.026/ 6.803,47			
	firms involved in bioenergy production and distribution		21.855/ 2.914,00			
	firms involved in satellite activities		20.778/ 2.770,40			
Workforce	firms involved in the biomass harvesting and extraction	Number of workers (employees)	11	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood		280			
	firms involved in bioenergy production and distribution		18			
	firms involved in satellite activities		129			
Workforce Age	firms involved in the biomass harvesting and extraction	Mean value of age of workers - N/A - not publicly available	N/A	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood					
	firms involved in bioenergy production and distribution					
	firms involved in satellite activities					
Type of contracts	firms involved in the biomass harvesting and extraction	Number of employees with fixed-term contract and permanent contract - N/A - not publicly available	N/A	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
	firms involved in processing and marketing of wood					
	firms involved in bioenergy production and distribution					
	firms involved in satellite activities					

[2] Exchange rate: 1 EUR is aprox. 7,5 HRK:
[3] Exchange rate: 1 EUR is aprox. 7,5 HRK:

Position or job	firms involved in the biomass harvesting and extraction firms involved in processing and marketing of wood firms involved in bioenergy production and distribution firms involved in satellite activities	Number of skilled and unskilled employees - N/A - not publicly available	N/A	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
R&D Investments	firms involved in the biomass harvesting and extraction firms involved in processing and marketing of wood firms involved in bioenergy production and distribution firms involved in satellite activities	A - Mean value of turnover destined in the research and development activity – N/A - not publicly available B - number of patents developed - N/A - not publicly available C - number of employees employed in the research & development activity - N/A - not publicly available	N/A	31.12. 2016.	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
Innovations introduction	firms involved in the biomass harvesting and extraction firms involved in processing and marketing of wood firms involved in bioenergy production and distribution firms involved in satellite activities	Mean value of number of the adopted certifications – N/A - not publicly available	N/A	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)
Tangible Resources	firms involved in the biomass harvesting and extraction firms involved in processing and marketing of wood firms involved in bioenergy production and distribution firms involved in satellite activities	Mean value of machineries and equipment of firms – N/A - not publicly available	N/A	31.12. 2016	Annual business reports processing by National Financiral Agency and Croatian Chamber of Commerce	Settlements inside the Park and edge settlements (Towns: Senj, Gospić i Otočac; Municpalities: Karlobag,Lovinac i Perušić)

Final remarks and recommendations

The Velebit Nature Park is of utmost importance for the preservation of natural heritage in Croatia and Europe. Its wealth of habitats, plant and animal species is conditioned by climatic conditions and geographic position. Hrvatske šume d.o.o. its

sustainable management policy has significantly influenced the state of habitat and biodiversity as it is today.

Over the next 10 year period, it is proposed that through the new Velebit Nature Park Management Plan, more activities will be undertaken that will contribute to the monitoring of habitats, flora and fauna; to ensure funds and adequate human resources from different sources of funding and through various forms of employment and cooperation with the scientific community, other parks, volunteer centers, non-governmental organizations, etc.

It is estimated that the model of sustainable forest management, as well as various forestry operations, does not significantly affect the plant and animal health of the abiotic factors.

The danger for the overall Park in the future will be climate change in the long term, which will need to be continually adapted, and with regard to these it is estimated that the risk of fire is the highest risk for Park's biodiversity.

REFERENCES

Original source:

Prof. dr. sc. Dane Pejnović, Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu, Naselja i stanovništvo Parka prirode Velebit

Zavod za prostorno planiranje Ličko-senjske županije, podaci o naseljima na području PP Velebit

Izvješća o računu dobiti i gubitka, te bilance stanja na dan 31.prosinca 2016. godine (Financijska agencija, obrada Hrvatska gospodarska komora)

Ličko-senjska županija, 2017., Izvješće o poslovanju gospodarskih subjekata Ličko-senjske županije u 2016. godini

Ministarstvo kulture, 2007., Plan upravljanja Parka prirode Velebit (2007.-2017.)

Ministarstvo regionalnog razvoja i europskih fondova, Indeks razvijenosti jedinica lokalne samouprave za 2011. i 2013.

Državni zavod za statistiku, Zaposlenost i plaće u 2016.

Obrtni registar (online) http://or.minpo.hr/pretraga.htm

Ličko-senjska županija, 2014., Program energetske učinkovitosti u neposrednoj potrošnji energije Ličko-senjske županije 2014.-2016.

Bioportal, http://www.iszp.hr/

Zavod za prostorno planiranje, razvoj i zaštitu okoliša Ličko-senjske županije, 2003., Šume i šumarstvo u Parku prirode „Velebit“

Ličko-senjska županija, 2013., Izvješće o stanju u prostoru Ličko-senjske županije

Hrvatske šume d.o.o., podaci dobiveni 2016. godine

Državni zavod za zaštitu prirode, Velike zvijeri u Hrvatskoj, http://www.life-vuk.hr/ris-u-hrvatskoj/razlozi-ugrozenosti-i-smrtnosti-194.html

Translation on english:

Prof. dr. sc. Dane Pejnović, Faculty of Natural Sciences and Mathematics of the University of Zagreb, Village and Population of Velebit Nature Park

Institute for Spatial Planning of Lika-Senj County, data on settlements in the area of PP Velebit

Statement of Income Statement and Balance Sheet as at 31 December 2016 (Financial Agency, Processing by the Croatian Chamber of Economy)

Lika-Senj County, 2017, Business Report of Business Entities of Lika-Senj County in 2016

Ministry of Culture, 2007, Velebit Nature Park Management Plan (2007-2017)

Ministry of Regional Development and European Funds, Development of Local Self-Government Units for 2011 and 2013

Central Bureau of Statistics, Employment and Wages in 2016

Craft Register (online) http://or.minpo.hr/pretraga.htm

Lika-Senj County, 2014, Energy Efficiency Program for Lika-Senj County Power Consumption 2014-2016

Bioportal, http://www.iszp.hr/

Institute for Spatial Planning, Development and Environmental Protection of Lika-Senj County, 2003, Forests and Forestry in the Nature Park "Velebit"

Lika-Senj County, 2013, Report on the Situation in the Lika-Senj County

Croatian forests Ltd., data obtained in 2016

State Institute for Nature Protection, Great Beasts in Croatia, http://www.life-vuk.hr/ris-u-hrvatska/razlozi-ugrozenosti-i-smrtnosti-194.html

Forest Bioenergy in the Protected Mediterranean Areas

www.interreg-med.eu\ForBioEnergy

REGIONE SICILIANA
ASSESSORATO REGIONALE DELL'AGRICOLTURA, DELLO SVILUPPO RURALE E DELLA PESCA MEDITERRANEA
DIPARTIMENTO REGIONALE DELLO SVILUPPO RURALE E TERRITORIALE

Municipality of Petralia Sottana

ENVELAND

GOZDARSKI INŠTITUT SLOVENIJE
SLOVENIAN FORESTRY INSTITUTE

RDA Green Karst

amufor
municipios forestales valencianos

Cámara Valencia

VELEBIT