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HOLISTIC

SEISMIC AND WILDFIRE RISKS

STUDY

LITERATURE REVIEW OF WOOD BIOMASS PRODUCTION AND USE IN SLOVENIA FOR PERIOD 2010-2014

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GOZDARSKI INŠTITUT SLOVENIJE
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1. Introduction

Slovenia is one of the most forested countries in Europe. Forests cover 1.184.369 ha, which is 58,4 % of the country. Most of the Slovenian forests are beech, fir-beech, and beech-oak with relatively high capacity. Annual increment is about 8.4 million m³, and annual cut was between 3.4 and 3.9 million m³. Wood biomass is mostly used for households heating, but the use of pellets and briquettes is increasing (Triplat, 2013, p. 5).

In Slovenia, the use of renewable energy is increasing; with 88 % share from traditional sources, solid biomass and hydro energy. In 2010 the share of renewable sources in electricity consumption was 34,4 % (target value is 33,6 %)(UMAR, 2012). Between 2010 and 2011 the use of energy from renewable sources has increased by 6 %, between 2011 and 2012 for 3 % (EBRS, 2012).

Data from SORS (Statistical office of the Republic of Slovenia) for 2011 show that households consume 1,137,000 tons of wood fuels with a predominance of wood logs (1,100,000 tons). In year 2011 around 1,700,000 m³ of roundwood were used for energy purposes (including bark), 70 % of which was used in households; the other 30 % were used in large energetic systems.

Having in mind that forests and wood are significant resources in Slovenia, there is a great diversity of literature dealing with wood production and woody biomass. The aim of this document is to provide review of the literature from 2010 to 2014, with short description of the most significant publications. Reviewed literature includes projects reports, scientific articles, journal articles, studies, booklets and pamphlets, as well as online publications.

2. Literature review with description

This chapter is structured by the type of publication. For the purposes of this review, publications are divided on four categories:

- reports,
- articles,
- promo and info materials (leaflets, pamphlets, brochures, handbooks),
- official reports and datasets.

In addition, reviews are presented chronologically, allowing easier access for reader. For publications in Slovenian language, original title is provided as well.

2.1. Reports

Some of presented reports are published by Gozdarski Inštitut Slovenije (Slovenian Forest Institute), as parts of an international projects and some are published by other institutions in Slovenia and were collected by internet search. This section will provide short description of the project followed by overview of the report itself.

2.1.1. Regional Profile of the Biomass Sector in Slovenia (2013)



Regional Profile of the Biomass Sector in Slovenia is a country report for FOROPA project. FOROPA is a trans-national project aiming to introduce standards for a forest biomass-based supply chain management and to improve cross-national biomass supply chains. It should strengthen the competitiveness of forest biomass in the energy market in the South East Europe. Project partners are Austria, Bosnia and Herzegovina, Greece, Italy, Romania, Serbia, Slovakia, Slovenia, Switzerland and Ukraine. More information about FOROPA can be found on <http://www.foropa.eu/>

Regional Profile of the Biomass Sector in Slovenia on a detailed way pictures biomass sector. At the beginning general information about condition and structure of the forests are presented followed with description of existing biomass resources. Next chapter is dealing with wood and biomass use in Slovenia including:

- production and demand of biomass (wood chips, firewood, and pellets),
- energetic use of biomass,
- costs of solid biofuels, and
- technical standards.

Fifth chapter provides analyses forest infrastructure and logistics. In that chapter actors as well as three biomass supply chains are described. Last two chapters provide description of main relevant stakeholders and future scenarios. Most of the data used in the report are from 2011 and 2012.

2.1.2. Forest Fires in the Alps (2012) – Gozdni požari v Alpah (2012)



Forest Fires in the Alps is Slovenian report within ALP FFIRS Project. The project aims to improve forest fire prevention in the Alpine Space with a shared warning system based on

weather condition affecting fire potential. Project partners are Italy, Austria, France, Germany, Slovenia and Switzerland. Information about projects are available on http://www.alpine-space.eu/projects/projects/detail/ALP_FFIRS/show/

Slovenian report about forest fires in the Alps first pictures general condition of the forests in the Alps, and forest fires. In the fourth and fifth chapter statistical information about Alpine forest fires are presented, followed by explanation of the system for forest fires forecasting. After that scale of forest fires is explained. After the short chapter how to behave not to start a forest fire, a chapter about future scenarios is presented. Concluding chapter is about forest fires documentation. (Simona Barbarino, 2012)

2.1.3. *Situation Report on Forest Biomass Use in Mediterranean Region (2012)*

Situation Report on Forest Biomass Use in Mediterranean Region is one of the outputs of PROFORBIOMED project. PROFORBIOMED promotes renewable energies in Mediterranean areas developing an integrated strategy for the use of the forest biomass. More information about PROFORBIOMED are available on <http://proforbiomed.eu/>.

Situation report presents situation, problems and opportunities for the development of the forestry biomass chains in six countries: Slovenia, Spain, Portugal, France, Italy and Greece. It is stated in the report that it: "...[C]an be used as a background document for estimations of possibilities for mobilization of additional forest biomass on sustainable way as a contribution to overall renewable energy sources." (Krajnc, et al., 2012, p. I) For each country information is provided about production of wood biomass from forests, wood biomass production chains, use of wood biomass, energy policies and measures, as well as constraints and barriers for development of wood biomass sector. Most of the data for Slovenia are from 2010 and 2011.

2.1.4. *Regional Report on Promotion of New Investments in Wood Biomass Production (2011)*



Regional Report on Promotion of New Investments in Wood Biomass Production is a country report published within The BiomassTradeCentreII project. Aim of the project is increased production and the use of energy from wood biomass. The aim should be achieved using numerous promotional events that will engage identified target groups in investments in production of energy from biomass. More about the project can be found at www.biomasstradecentreII.eu

Regional Report provides description of Slovenian wood biomass market with accent on energy from renewable resources. It also contains information about wood biomass production chains from forests, short rotation forests, as well as other resources (vineyards, orchards, and other agricultural and urban areas). Further on, it explains socio-economic and other constraints. At the end, it describes existing policy measures (policy documents, subsidy schemes, and environmental limitations), and main barriers for further development.

2.1.5. *Study on Biomass Trade in Slovenia (2010)*



Study on Biomass Trade in Slovenia is a country report published within 4 biomass project. This project fosters sustainable usage of biomass by the exchange of best practices and by support to stakeholders. Partners of the project are: Germany, Austria, Czech Republic,

Hungary, Italy, Poland, and Slovenia. Information about project can be gained at <http://www.4biomass.eu>

Study on Biomass Trade in Slovenia gives very detailed description about available biomass potential including: forestry, agriculture, industry, pellets and woodchips, and biofuels. Afterwards, exports and imports, as well as transport of biomass is explained. Last two chapters deal with promotional measures for regional/international trade and political approach to biomass trade. (Vertin & Grmek, 2010)

2.1.6. Report on Heat Production from Wood Biomass – Slovenia (2010?)
- Poročilo o Proizvodnji Toplote iz Lesne Biomase - Slovenija



This report is part of Agri-For-Energy 2 project. The main aim of the project is to promote the use of biomass from agricultural and forestry sector for energy purposes. It addresses the barriers of biomass use, such are: lack of co-operation, information and training and lack of public awareness. Partners in the project are: Austria, Bulgaria, Finland, Italy, Slovenia, and Sweden. Information about project is available on <http://www.agriforenergy.com>

The report itself contains description about situation in the acquisition and use of biomass for energy purposes and the development of that field in Slovenia. Further on, the report illustrates policy frames and the potentials of wood biomass. Last two chapters deal with production technologies and costs of energy, and quality assurance of wood fuels. (Krajnc, et al., brez datuma)

2.1.7. Regional Description of PFOs, Current Supply, Future Potential and Local Barriers to Harvesting Wood Fuel (2010)



Regional description was part of AFO project (Activating private forest owners to increase forest energy supply). As it can be concluded from the project name, it aimed to activate private forest owners to supply more wood fuel for an increasing demand of small and medium scale users. Partners of the project were Austria, Finland, France, Latvia, Slovenia, and United Kingdom. Project description and additional information can be found at <http://www.afo.eu.com>

Regional description first provides general description about private forest owners on national and regional level, followed with chapter on private forest owner's knowledge. Chapter on private forest owner's knowledge explains methodology used for information gathering and data about private forest owner's profile, fuel wood harvest and interests for supplying of heating plants. The second part of the report deals with wood fuel supply and suppliers. At the end of the report future potential wood fuel is analyzed and presented. (Lambergar & Grum, 2010)

2.1.8. MAKE-IT-BE Final Report - Highlights of the action (2010?)



Highlights of the Action is a final report of make-it-be project. The project aimed at delivering agendas for bio-energy promotion by developing and applying decision-making tools that assist in identifying, evaluating and initiating bio-energy chains. Project partners were Austria, Belgium, Germany, Italy, Slovenia, and United Kingdom. As project was concluded in 2011, information about it can be found through Intelligent Energy Europe database (http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1835).

The report itself has six chapters. The first five chapters provide description about: integrated bioenergy planning, the best practices examples, stakeholders, practical support (methodology and tools), and promotion about Make-it-be approach. The last chapters contains information about situation in the four partnering countries. Subchapter about Slovenia provides general information about the region and bioenergy potential, followed by more detailed analysis about biomass potential. Further on, energy demand in the region is described, and new measures for increased usage of wood biomass are presented. The last part of the subchapter is dealing with policy framework and identification of problems. (Make-It-Be, 2010)

2.1.9. Report on Potentials for Wood Biomass Heating (2009) –Poročilo o Stanju na Področju Potencialov Ogrevanja z Lesno Biomaso



Report on Potentials for Wood Biomass Heating is a report produced during Woodheat Solutions project. That project aimed at boosting bio-energy by addressing the barriers of insufficient co-operation, information and training within the agricultural and forestry sector. Partnering countries were Austria, Croatia, Finland, Slovenia, and United Kingdom. More information about project is available on http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1836

Report on Potentials for Wood Biomass Heating is Slovenian country report. For chosen municipalities (Žetale, Oplotnica, and Lovrenc na Pohorju) report offers general information about municipality, wood biomass potentials, usage of wood biomass in the municipality, and possible future development. (Gozdarski inštitut Slovenije, 2009)

2.1.10. Energy Geographic Information System for the RES (2008) - Energetski Geografski Informacijski Sistem za Področje OVE



Energy Geographic Information System for the RES is a final report of the EnGIS project. The project was launched by Public Research Agency of the Republic of Slovenia and the Ministry of Economy within the target research program (TRP) Competitiveness of Slovenia 2006-2013. The aim of the project was to establish energy geographic information system for the RES. The system has been developed for the evaluation of the total energy potential and energy management in Slovenia within the framework of attributive database and GIS. It's the first such information system in Slovenia and the wider area. The results of the project provide a good basis for: reflection on the institutionalization system, the introduction of sustainable processes for data acquisition, evaluation of potentials, and monitoring trends in the use of RES. More about project can be found at <http://www.apc.si/>

The report itself presents a platform for the implementation of the EnGIS project, an overview of the current state in Slovenia, and the methodology for the inventory of the all energy sources. Furthermore, it contains an overview of the status of relevant geographical data in Slovenia, cross-sectoral analysis, definition of database model, sustainable use and the specification for the development of EnGIS system. At the end, it presents pilot project and evaluation of the project results. (Javna agencija za raziskovalno dejavnost RS, 2008)

2.2. Articles

There are many articles about wood production and usage in Slovenia that were published between 2010 and 2014. Most of them are dealing with wood biomass. This subchapter presents review of three selected articles, whereas list of relevant articles is presented in Annex 1.

2.2.1. Different aspects of green wood chips production – case study from Slovenia (2012)

This article was presented in the 45th International Symposium on Forestry Mechanization (FORMEC) in Croatia. Detailed analysis of forest residue extraction was done on two experimental plots. Results showed that that production of green wood chips was less time consuming compared with production of roundwood, leading to the conclusion that the method which optimizes tree bucking and production of green chips is preferable. (Krajnc, et al., 2012)

2.2.2. Wood processing for energy purposes (2012) – Predelava lesa v energetske namene

This is professional article published in *Gozdarski vestnik* (Slovenian professional journal for forestry) in 2012. The article offers detailed description of wood chips production and wood chippers in Slovenia. In addition, it contains a short review of wood usage in Slovenia, and results from survey with wood biomass producers. (Čebul & Kranjc, 2012)

2.2.3. Potentials and perspectives of wood biomass use in Slovenia - Potenciali in perspektive rabe lesne biomase v Sloveniji

This is a professional article published in *Gozdarski vestnik* (Slovenian professional journal for forestry) in 2011. As a previous ones it is dealing with wood biomass used for energy production. The difference is that this article has a nice overview of Slovenian export and import of wood. At the end of the article, authors discuss policy framework for renewable energy sources. (Krajnc & Piškur, 2011)

2.2.4. Roundwood Production, Export and Import (2010) - Proizvodnja, izvoz in uvoz okroglega lesa

As previous articles, this one was published in *Gozdarski vestnik* (Slovenian professional journal for forestry), but in 2010. It gives a short overview of structure and amounts of roundwood production. Furthermore, basic data of export and usage balance are presented. (Piškur, 2010)

2.3. Promo and info materials

Promo and info materials (leaflets, pamphlets) are supporting materials for international projects. Materials presented here are published by Gozdarski Inštitut Slovenije (Slovenian Forest Institute). For purposes of this overview they are divided on catalogues, best practices examples and info materials.

2.3.1. Catalogue of producers of wood logs and chips in Slovenia (2012) – Katalog proizvajalcev polen in sekancev v Sloveniji

This catalogue was published within the BIOMA SSTRADCENTREII project. It contains information of shape and properties of logs and wood chips, and measurement units. Producers

are divided according to the type and capacity of machinery , grouped by statistical regions of Slovenia. Online version is available at http://www.gozdis.si/data/publikacije/25_Katalog_proizvajalcev_polen_in_sekancev_2012.pdf

2.3.2. *Best practices examples*

During the FOROPA project several best practices examples of wood biomass were published. They contain name and address of the company, reason for selection as good/best practice, description of activities and technologies, as well as information about future development and financing. They are all available at <http://foropa.nlcsk.org/index.php/publications-menu/good-practice>

Similar publication were published within BIOMASSTRADecENTER II project. Those examples of good practices contain description of project idea, organizational arrangement model, technology, investment, as well as information about state subsidies. All good practices examples can be found on <http://www.biomassstradecentre2.eu/available-literature/>

2.3.3. *Info materials*

A handbook *Quality Wood Fuels for Everyone - Useful Information for Those Who Heat with Wood (Kakovostna lesna goriva za vsakogar - Koristne informacije za vse, ki se ogrevajo z lesom)* is recently published by Gozdarski Inštitut Slovenije. It contains definition of different kinds of wood fuels, most important characteristics, energetic value, standards, etc. The handbook is available in Slovenian language. (Krajnc, et al., 2014)

2.4. *Official reports and datasets*

This chapter provides an overview of official documents published by governmental bodies of the Republic of Slovenia. Those documents contain official statistical data about wood biomass, and are used as source for other reports and articles presented in this publication.

2.4.1. *Action Plan for Renewable Energy Sources for Period 2010-2020 (AP RES) - Akcijski Načrt za Obnovljive Vire Energije za Obdobje 2010-2020 (AN OVE) Slovenija (2010)*

AP RES was published by Ministry of Infrastructure and Spatial Planning in 2010. It is a strategic document under The Directive 2009/28/ES of the European Parliament and of the Council. The aim of AP RES is to assess and determine the necessary quantitative values of energy from renewable sources by individual sectors and to propose measures which will help to achieve desirable amounts of energy from renewable energy sources. AP RES in five chapters presents : national policies of renewable energy sources, expected final energy consumption in the period 2010-2020, aims and directions for achieving it, individual measures for fulfilling the aims, and impact assessment. (Ministrstvo za infrastrukturo in prostor, 2014)

In addition, Ministry of Infrastructure and Spatial Planning publishes Reports on the progress of Slovenia in accordance with the Directive 2009/28/ES. The last report was published in 2014, and it contains data from 2011 and 2012. It provides description about use of energy from RES, measures taken in period 2011 -2012, progress in evaluating and improving administrative procedures to eliminate the regulatory and non-regulatory barriers to the development of renewable energy, changes in the availability and use of biomass resources for energy purposes, etc. (Ministrstvo za infrastrukturo in prostor , 2014)

2.4.2. The Energy Balance of the Republic of Slovenia for the Year 2013- Energetska Bilanca Republike Slovenije za Leto 2013

Annual energy balance of the Republic of Slovenia is a document that the Government of the Republic of Slovenia adopts each year. It shows the total energy consumption and ways to provide necessary energy for each year. It consists of the realization and evaluation of primary and final consumption of energy in the country for the previous and the current year as well as forecasts of individual energy sources taking into account the primary and final energy. Particularly, it contains a chapter about renewable energy sources with Gross domestic consumption of energy from renewable energy sources as well as share in the final energy consumption in the EU methodology. (Vlada Republike Slovenije, 2013)

2.4.3. SI-STAT data portal - Environment and natural resources

Statistical Office of the Republic of Slovenia manages statistical databases among which is the database on *Environment and natural resources*. The database on environment and natural resources contains datasets on a griculture and fisheries, forestry and hunting, territory and climate, as well as indicators for the environment and energy. Energy database contains, among others, dataset about *Renewables and waste*, which is shown as a table. The data in databases are updated annually. Databases are available on Slovenian and English language. Picture 1 shows screenshot of SI-STAT dataset *Renewables and waste* (Statistical Office of the Republic of Slovenia, brez datuma)

Picture 1. SI-STAT dataset *Renewables and waste*

REPUBLIC OF SLOVENIA

STATISTICAL OFFICE OF THE REPUBLIC OF SLOVENIA

SI-STAT Data Portal » Environment and natural resources

Renewables and wastes

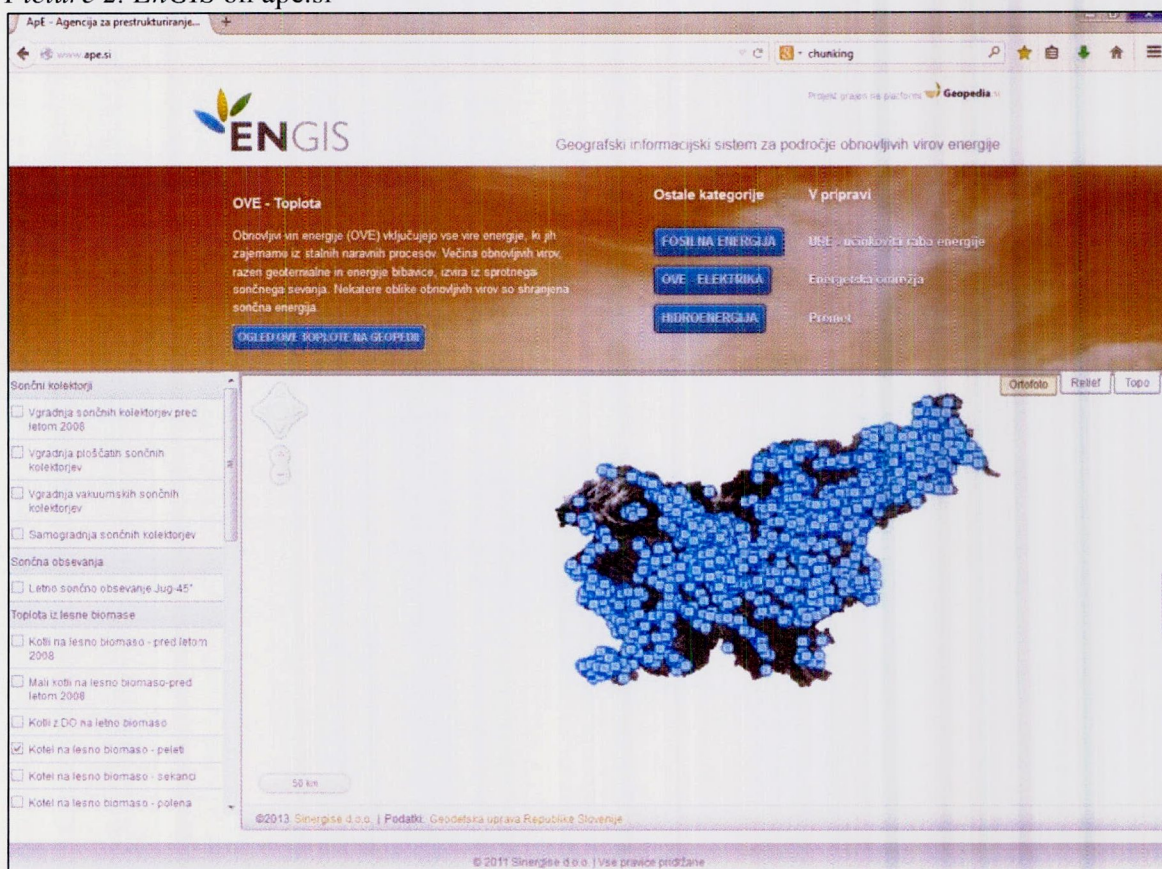
- **Gross electricity production from renewables and wastes (MWh), Slovenia, annually**
Size: 4 Kb [Save file in Px-Axis format (.px)]
 - ELECTRICITY: Gross production - TOTAL, Hydro electric power plants 10 + MW, ... (18)
 - YEAR: 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, ... (11)
 - PRODUCERS: Main activity producers, Autoproducers (2)
- **Gross heat production from renewables and wastes (TJ), Slovenia, annually**
Size: 3 Kb [Save file in Px-Axis format (.px)]
 - HEAT: Gross production - TOTAL, Geothermal, Wood/Wood wastes/Other Solid Wastes, ... (11)
 - YEAR: 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, ... (11)
 - PRODUCERS: Main activity producers, Autoproducers (2)
- **Renewable energy and waste use, Slovenia, annually**
Size: 3 Kb [Save file in Px-Axis format (.px)]
 - ENERGY SOURCE: Geothermal (TJ), Solar thermal (TJ), Wood/Wood wastes/Other Solid Wastes (TJ), ... (12)
 - YEAR: 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, ... (11)
 - TYPE OF USE: Transformation, End use (2)

Source: SI-STAT, 2014 [Online database]

2.4.4. EnGIS system

ENGIS is a Web application, which provides an overview of renewable energy sources in Slovenia. It is a geographic information system that covers the areas of: all natural resources at the regional/local levels in Slovenia, the exploitation of all the potentials of the existing and planned power plants, cogeneration and polygeneration systems based on fossil-fuels, cogeneration and polygeneration systems as well as RES, and recommended sites for the building of power plants cogeneration and polygeneration systems on fossil fuels, as well as on RES. EnGIS system is main outcome of EnGIS project described in subchapter 2.1.10. EnGIS system has following categories: fossil fuels, RES -electricity, RES -heat energy, and hydro energy. EnGIS system can be accessed through <http://www.ape.si/> (Picture 2) or through <http://geopedia.si> (Picture 3).

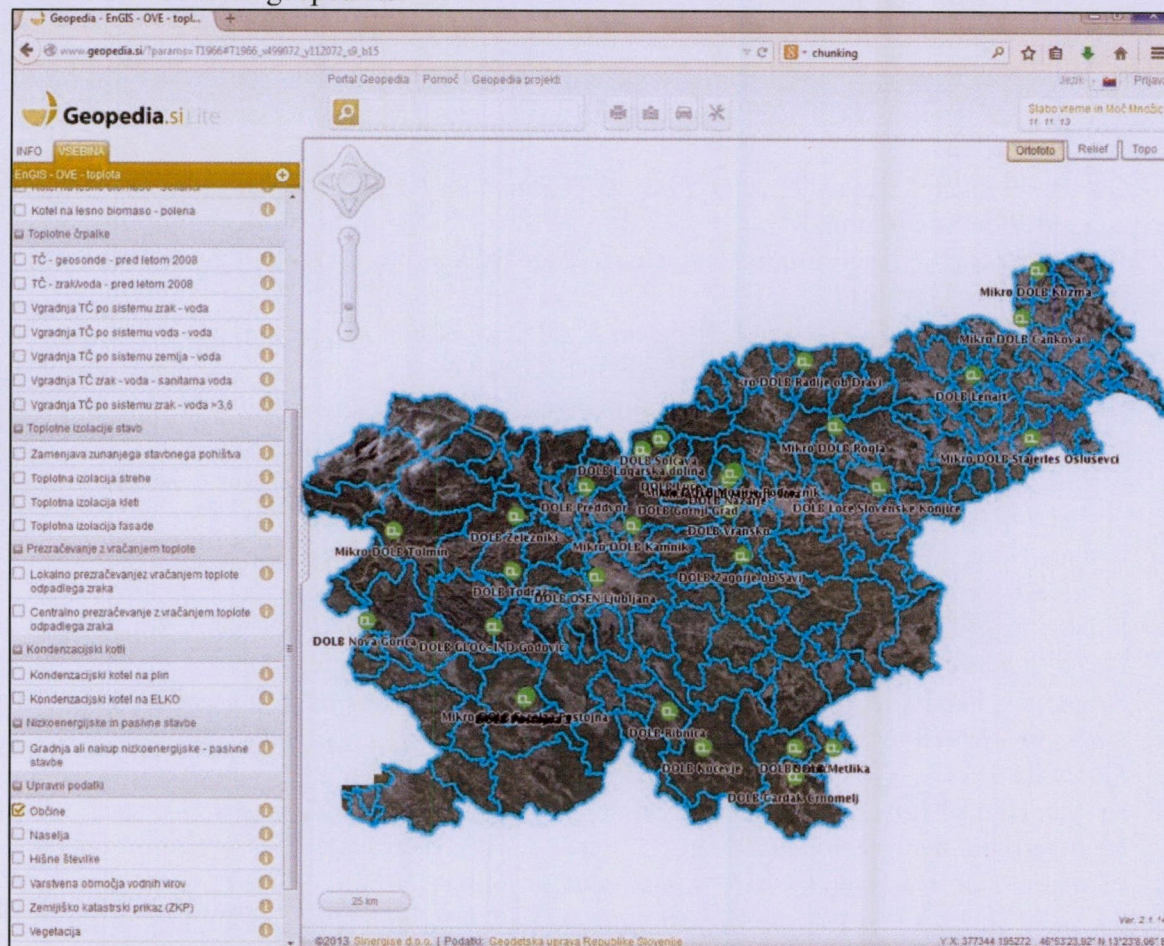
Picture 2. EnGIS on ape.si



Source: APE.si, 2014

The difference between access through APE Web page and through Geopedia Web page is in adding different layers on the map. Geopedia provides better overview of the map, as well as more possibilities in adding layers.

Picture 3. EnGIS on geopedia.si



Source: Geopedia.si, 2014

3. Ending note

As mentioned at the beginning, a lot of literature about wood production and use in Slovenia is available on-line. This report summarizes literature from previous four years, with few exceptions where reports are a little bit older. Nevertheless, exceptions were made due to uniqueness of the reports. In addition, two databases were presented due to their importance. As this is electronic publication, all reports, articles, and promo materials are provided as electronic annex.

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 - <http://www.agriforenergy.com>
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