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Biomass Report - Slovenia

Activity A.T2.1: Biomass potential analysis

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The potential for exploitable organic residue for each participating country listing key aspects such as location, amount, transport options and costs.

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CONTENT

1. METHODOLOGY

In the process of data acquisition for the DanuP-2-Gas project, we have identified some obstacles, specificities, and exceptions that we would like to present in this report. The two most potential biomass types in Slovenia, are certainly woody biomass and animal-human waste sludge. Other different potentials, as are Herbaceous biomass and Aquatic biomass are negligible in our country and aren't worth studying. Why? Slovenia has very few stagnant water bodies. There are some big natural alpine lakes, which were formed after the last ice age, but are located in the only existing Slovenian nature park, *Triglav national park*. Also, much biomass potential cannot be found, in these lakes due to the harsh alpine climate, which highly restricts the formation of different water plants species, algae, plankton etc. Other water bodies are predominantly represented by rivers, streams, bogs, ponds and so on and there is also a lack of biomass potential, or it is highly negligible. Slovenia is also connected to the Adriatic Sea in the southwest, but the length of the Slovenian coast is just over 40 km, and the coast is very densely populated, so there are only few natural accesses to the sea, most of which are used for saltworks or tourist activities. On the other hand, Slovenia is a very agricultural country. People mostly cultivate the plains, in the far east of the country, but there are also a lot of high mountain farms. Most of herbaceous biomass produced privately, is used in the circular process of farming, namely for fertilization, nutrition, fermentation etc. Herbaceous biomass, which is owned by the public authorities (state, municipalities, local communities), such as biomass from green parks in cities and such (types like leaves, mowing residues, small branches etc.), it is however, mostly sold to larger companies, which process it into an organic substrate to be further sold to the end costumers.

We have successfully recognized our country's animal and human waste biomass providers and wood biomass providers, and divided them accordingly to the biomass sub-types, presented in the biomass database.

Wood and woody biomass

Slovenia is one of the most forested countries in Europe, with approximately 60% or just over 1.180.000 ha of forest area, covering more than half of the country. In terms of forest cover, Slovenia is ranked third in EU, just behind Sweden and Finland. The forest stock mainly consists of temperate broadleaf and mixed forests. In some places. Coniferous and deciduous forest can also be found, but the micro picture is constantly changing, due to the excessive and century-old deforestation activities.

The forest ownership in Slovenia is, on the other hand profoundly complicated and very dispersed. A large proportion of the national timber stock is represented by church and state-owned forests, which are rarely properly maintained. Natural disasters such as

hurricanes, windstorms, sleet, rime ice, etc., also contribute to the poor condition of these forests. The rest of the forests are very well maintained, but are owned and divided among many big, medium-sized, and small farmers, private individuals, natural persons, and companies.

We did quite a lot of research linked to gathering and arranging data. Firstly, we've completed an extensive market research. Phone calls were made directly to the providers, and the providers were also contacted by e-mails. It looked like that we were facing a systematic problem at the time, which was that the providers were not as responsive as we had expected. The "Strange thing" about our country's wood biomass system is that it is fairly complicated, due to the dispersion of ownership, already mentioned in the previous paragraph. Therefore, the sales process is completely dependent on sole situation, and it is poorly administratively archived. The wood production is mostly, driven by micro farms, with a negligible annual production of wood biomass, which are looking to earn a small profit. Thus, larger private or state-owned companies are hired to cut down the trees, or the trees are cut down by the owners themselves. Mentioned companies are usually hired only for felling, harvesting, and cutting wood, then, the small quantity it is rather sold by the farmer. But sometimes it is different. As already described, it depends on each individual situation. So, the wood is sold directly by the owner or by the intermediate company. This is where the companies that buy from primary producers are next in line and come into play. We are talking about the same story at this stage. These are also smaller self-employed entities or small companies with only one to three and maximum of five employees, which at the state level and from the point of view of our study, are out of the question because their production or sale is certainly less than a ton per day and all their output is already in use and is not idle, to be sold, transported or used in a hub or P-2-G system at all. Even if it would be idle, the daily quantities would still be too low.

Other major deals are struck by bigger and more competing state or private companies, that do not publish wood biomass production data and do not even keep it in the books, because the law is also not so much restrictive for the wood biomass (to be accurately dated and included in the inventory). Nevertheless, it is even more difficult because all the data is presented in the amount called "bulk meters", which weight can significantly vary in the different moisture levels. In terms of our research, this was nothing more than a misleading variable. Besides the amount, the price is also something too often marked as "business secret" or too much dependable on the amount ordered in the deal itself and supposedly also depends on each individual situation.

We have also contacted the *Slovenian forestry institute* (slo. "Gozdarski Inštitut Slovenije"), which has been monitoring biomass production and collecting data since the year of 1991. It is a public research institution of great national importance that conducts and uses research on forests and forest landscapes, forest ecosystems, wildlife

ecology, wildlife hunting, forest management and other uses of resources and services provided by forests. The institution has been pretty much collecting similar data as we did, but they have done it from the year of 1991.

They have immediately understood our problems as they also have the same problems with obtaining up-to-date and correct data. For this reason, they normally present only the data in the form of average annual quantities and average annual prices. Due to the difficulty of obtaining data, we also found it difficult to identify the main actors that are now registered in our biomass database. Nevertheless, with the help of the *Slovenian forestry institute* and as part of our extensive market research, we were able to collect some important information.

Which information on the amount and the prices, were we able to get?

We did collect some rounded quantities related to the size of the sawdust providers from the *Wood Chain Manager portal* available at:

https://wcm.gozdis.si/sl/podatki/zemljevidi/2021061013090299/zemljevid-zagarskih-obratov/

As the producers were ranked in classes according to production in m^3, we took the average amount of production for each class and calculated the annual amount of sawdust in tons. The calculation was based on the assumption that the average density of wood in Slovenia is approximately 300 kg / m^3 and that for every cubic meter of wood sawn by the mills, 15 % of sawdust remains are produced.

The prices for all types of woody biomass, except for the prices of pellet industry (half of which is listed directly as a trade price) and wood residues (which, prices we couldn't get), are defined as the rounded and average prices, directly operated on the Slovenian wood market. Prices thus vary according to different situations and can vary up to 50%. The prices vary according to transport, location, quantity, quality, knowledge, and the negotiation will of the producer (seller) and a consumer (buyer). The prices are also monitored by the *Slovenian forestry institute* and are available at this link:

https://wcm.gozdis.si/sl/podatki/cene/podatki/2021100415210921/cene-lesnih-goriv/

The quantities for the products were pretty much impossible to obtain. Not only that the providers of the wooden biomass did not want to cooperate, but most of them do not also even know the data on the annual quantities or how to calculate it at all, so even if they are ready to share, and already share the data, the one is quite approximate and rounded up, so it does not reflect the actual situation in the company or on the market. In addition, the production of these products, solely depends on the market demand. All the information they were able to provide us with, was that they produce more than one ton of the product per day. And that the production highly variates, because it is

dependent on the "additional COVID demand", which has been very vague for the last three years, since the COVID-19 epidemic erupted.

The data on the wood chip producers was obtained from the *Catalogue of Wood Chip Producers for the year of 2012,* for which dr. Nike Koležnik of the *Slovenian forestry institute* is in charge, and through which we will be also happy to update the current data, once the data for the year of 2022 is out. Dr. Koležnik promised to have the new catalogue ready, by the end of the 2022. The current version, however, is available at this link:

https://dirros.openscience.si/IzpisGradiva.php?id=7370&lang=eng

The data on the pellets and briquettes production and sales, was mostly guaranteed, by the market research, done on the internet, by direct phone calls, and by e-mails sent to the potential entities.

The data on wood-based raw materials (logging) and the data on logging residues (stems, branches, foliage, bark etc.) was also guaranteed by the extensive market research, and in addition, also by the communication media (phone calls, e-mails), and using https://www.mojgozdar.si/ portal, on which the data of the number of contractors in forest industry is collected and monitored. The portal is managed by the *Slovenian forestry institute.,* and the project is being financed by the *Ministry of Agriculture, Forestry and Food of Republic of Slovenia.*

Some data on the average raw woody biomass transport, was secured by the portal WCM Gozdis, which is annually updated by the *Slovenian forestry institute*. The prices are monitored daily, and are available at this link in the form of an arithmetic mean:

https://wcm.gozdis.si/sl/podatki/cene/podatki/20211004152102 86/cene-gozdarskih-storitev/

Mostly, the prices available on the national wood market are given in the form of € / m^3, so given a highly variable weight of wood, which varies according to moisture and wood density, the price in the form of € / tkm is very difficult to determine and generalize, especially now in early 2022, when we are witnessing a high level of inflation. Only the biggest national forestry company *SIDG – Slovenski Državni Gozdovi*, had the prices determined in the target form. In addition, the country is so small, that the wood is transported only up to 200 km aways and no further. In practice, however, the raw wood transported by heavy trucks (logs), is transported only a few km from the felling location, certainly under 100 km, which is why the prices, vary so differently. The prices were available at this link:

file:///C:/Users/Matev%C5%BE%20%C5%A0ilih/Downloads/Cenik%20prevozov%2016.11.2021%20(1).pdf

Given the current situation in the global economy, inflation, etc., our expert opinion or assessment was that the average price of transport of various wood assortments in the country of the Republic of Slovenia varies around 0.15 € / tkm. For example, transporting 20 tonnes of wood, would cost approximately 600 €, if it was transported to a location approximately 200 km away. But that is only a rough estimation, which can significantly vary, especially nowadays.

Mostly, all the variables, presented in the table (prices, amounts, transport prices) were defined and generalized, by our expert assessment or opinion and were given as AVERAGE values, with only few exceptions. The same goes for the wood properties described (e.g., moisture level, bulk density, hemicellulose levels etc.).

Animal and human waste biomass

The most potential in the field of animal and human waste biomass was identified by the human waste biomass type, in the form of waste sludge (Dehydrated matter - human faeces and other waste sludge). Other types of animal and human waste biomass are negligible in Slovenia. Why? Municipal and industrial organic waste is mostly purchased by the organic processing companies, that produce various kinds of soil substrates and fertilizers, and is thus not idle. Several companies in Slovenia are engaged in the processing of organic waste into different substrates (E.g., Humko, d.o.o., Koto d.o.o. etc.). However, besides that, there is so little organic municipal and industrial waste available annually, that there is no major potential, that can be identified, or it is just negligible. The remains of animal carcasses, livestock, and other remains of the meat industry are mostly ground into bone meal and are then further used in the process of animal feed production, which is not carried out by any large company in Slovenia. The manure, as a type of biomass, also represents a great potential in Slovenia, but not now, maybe somewhere in the future. Many operating small and mid-sized farms, engaged in livestock farming, can be noticed in Slovenia, but a great majority of this farms, uses the manure, to fertilize their own pastures, meadows, and fields. The use of artificial fertilizers for the fertilization of the just mentioned agricultural areas in Slovenia is only an exception, which is implemented in the absence of manure, thus the manure is also not idle.

In the light our research, only the potential of biomass obtained from sewage sludge is applicable and was taken into account. The sewage system in Slovenia is developed by the European standards and is maintained by public entities. In Slovenia, Public utility companies are responsible for the operation of public utility network and treatment plants in the most cases (e.g., Public utility company of Velenje). The treatment plants are stationed on the strategic locations. Dehydrated waste sludge is gathered at the final stage of the water treatment process. Mostly private companies in Slovenia are involved in the transport and collection of dehydrated sludge from the treatment plants, e.g. – Koto d.o.o., Saubermacher d.o.o., and public, CeROD d.o.o., etc. The dehydrated sludge

has no price of its own, nor it has the transport price. Public utility companies, that collect the sewage sludge in treatment plants have to pay a takeover price to the mentioned transport companies. Before 2019, almost all the waste sludge produced in Slovenia was transported to Hungary, where it was used as an important secondary biomass source. But in the same year, Hungary stopped the import of waste sludge, and all the public utility companies in Slovenia, were left without a solution. Not even the government helped, and the takeover prices increased by 2 to 3 times. Nowadays, three years after, we still do not have a comprehensive solution, so most of the waste sludge, produced in Slovenia is totally idle. However, during this time, some municipalities and companies were able to demonstrate good practices in the field of waste sludge management. For example, in the Municipality of Celje, a co-incineration plant has been set up, where up to 5,000 tons of dehydrated waste sludge can be burned annually. In the town of Puconci, on the far east side of the country, dehydrated sludge is mixed with ash, and a substance called CEROPIT is formed. This substance is very sticky, but organic and it is thus further used in the stratification process of landfilling the waste. The company has a permit for transforming 9,000 tons of waste sludge annually. 3,600 tons are provided from their own local treatment plants, and the rest is imported, from other municipalities in the country. So, there is still a lot of idle waste sludge on the market that would be immediately suitable for further use in the P-2-G hubs.

The data on the amount of dehydrated sludge produced in Slovenia, was obtained from the annual business reports of the public utility companies, described in the database. Communication media (phone calls, e-mails) was also used to contact the companies. Only average quantities of dehydrated sludge produced annually, are given.

2. BRIEF DESCRIPTION OF SLOVENIAN BIOMASS LANDSCAPE

As described before, Slovenia is a very small country, but is nevertheless reach in wood and woody biomass. Idle amounts of waste sludge, also represent a good potential, which can be used to generate energy, in P-2-G hubs, to be stored in the form of gas. No other major and highly significant biomass potentials in the Republic of Slovenia were identified in this study. However, in the future, the country of Slovenia will face a shortage of at least a third of the annual production of electricity and also some amount of heat, which are both still being provided from carbon sources, especially with the continuous operation of Šoštanj Thermal Power Plant, which is scheduled to be closed by the year of 2033 at the latest. It will be necessary to properly restructure the entire Slovenian energy system as soon as possible. Amongst other things, the Government of the Republic of Slovenia envisages the additional use of nuclear energy. Other biomass potentials could be further used mainly in micro-location scenarios. For example, larger farms could use their own biomass potentials by operating small biogas plants. At the same time, the simultaneous use of biogas and solar energy or any other renewable energy source, could make them self-sufficient. The use of biomass in other major public contexts (e.g., in P-2-G hubs) is mainly dependent on the state's new energy-mix guidelines and future legislative framework, which will be crucial, to be detailly developed in the future, with adding some extra and innovative financing schemes, subsidies, loans, etc., to exploit the now-negligible biomass sources and to ensure the highest possible degree of national energy independence.