Interreg
Danube Transnational Programme
DanuP-2-Gas

Deliverable D.T2.1.1

Biomass Report (Slovakia)

Activity A.T2.1: Biomass potential analysis

August, 2022

Project co-funded by the European Union funds (ERDF, IPA)
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DOCUMENT CONTROL SHEET

Project reference	
Full title of the project	Innovative model to drive energy security and diversity in the Danube Region via combination of bioenergy with surplus renewable energy
Acronym	DanuP-2-Gas
Programme priority	Priority 3
Programme priority specific objective	SO 3.2 Improve energy security and energy efficiency
Duration	01.07.2020 – 31.12.2022
Project website	www.interreg-danube.eu/danup-2-gas
Project coordinator	TZE

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

Document Details	
Title of document	Biomass Report (Country)
Action	WP T2 Transnational Infrastructure and Biomass assessment & Pre-feasibility Studies
Deliverable	D.T2.1.1
Delivery date	August 2022

Version	Date	Author	Organization	Description
V1	10.5.2022	Dominika Fukerová	PP7 NARA-SK	1st version
V2	15.8.2022	Dominika Fukerová	PP7 NARA-SK	2nd version

IMPRINT

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- ERDF PP1 Energy AGency of Savinjska, Koroška and Šaleška Region (SI)
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- IPA PP1 Regional Agency for Socio – Economic Development – Banat Ltd (RS)

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CONTENT

1. METHODOLOGY

The diversity of biomass sources in Slovakia is wide. Almost all components of organic biomass are represented except seaweed. However, since the concept of biomass as a resource is a new concept in Slovakia, it was difficult to get to specific sources, processors or distributors. No official statistics have the data to the extent that the DanuP-2-Gas project requires. To fulfil the task to the extent that we managed, it first took several months of official emails to various institutions that we believe could or should have some data, but our attempts were not very successful. We contacted the affected ministries, institutions covering individual segments of agriculture, energy, water management or waste.

Therefore, we continued with a detailed search for any data sources separately for individual types of biomass and in different places.

The data on wood and plant biomass was obtained from the URSO (Office for the Regulation of Network Industries). It is an overview of biomass suppliers for electricity producers, who obtain biomass by purchase, for the year 2021. We received the data together with the selling price per ton of matter. We identified data on locations from the address of the processor's seat, but some addresses therefore do not correspond to the specific location of the biomass source.

The data on kitchen waste and sludge was obtained from the statistical office, and therefore no names are associated with them, only localities (districts, regions). As we are not aware of any significant processor of organic waste for energy purposes, we assume that these resources are currently unused and thus have no selling price. The same applies to sewage sludge.

However, despite the amount of biomass still unused, the need to return nutrients to the soil must also be taken into account.

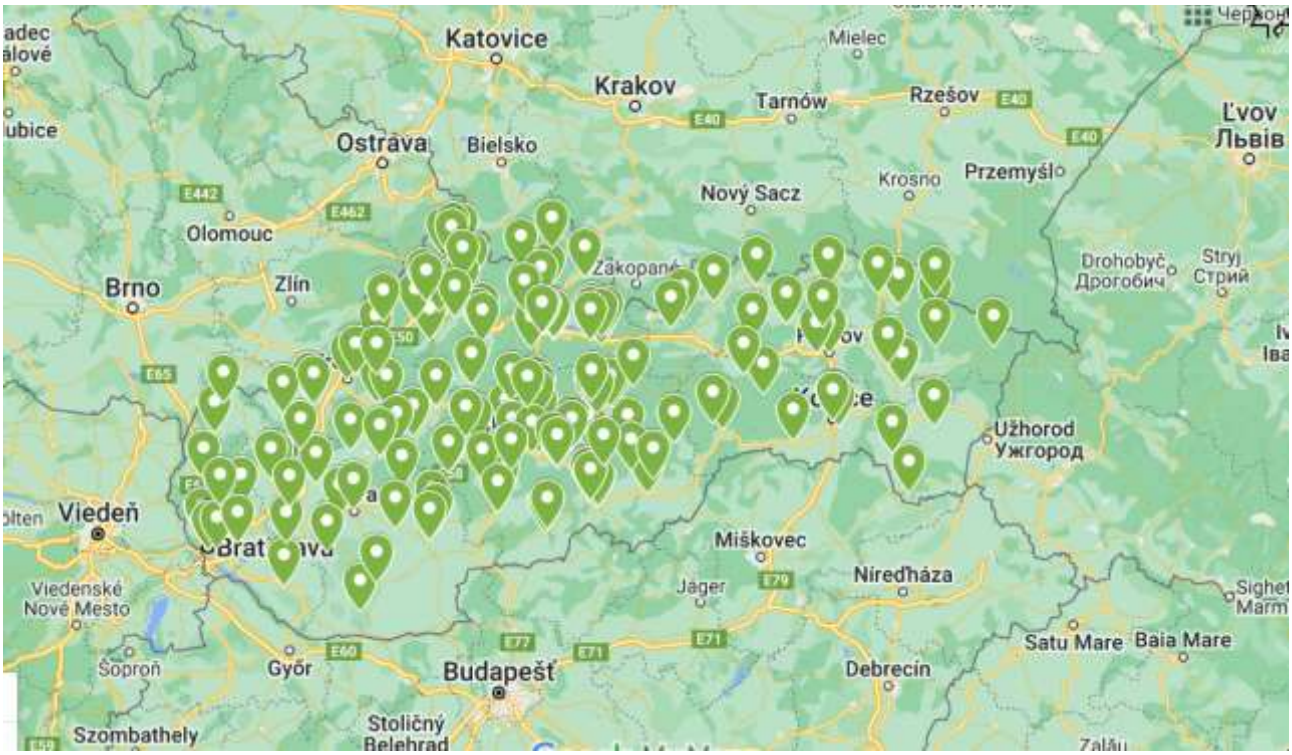
To date, we do not register any production of biochar in the Slovak Republic.

Regarding the collected species and subspecies of biomass, we have 3 species represented in the table with their subspecies:

Wood and woody biomass - Wood-based raw materials (logging), Stems, branches, foliage, bark (logging residues), Pellets, briquettes, chips

Herbaceous biomass - Straws (barley, wheat, sunflower etc.),

Animal and human waste biomass - Municipal / industrial organic waste, Sewage sludge



Pic.1: The overview of collected sources of biomass in Slovakia, DanuP-2-Gas

As for identification the transport hubs, we operated with the current intermodal centres in Slovakia and two main ports along the Danube River.

We calculated the price for transporting 1 ton of biomass based on a consultation with a logistic company, and it takes into account the recent sharp increase in fuel prices. At the same time, however, this price depends on many factors, such as the total amount of transported material in one delivery, the location and type of roads, the method of loading and unloading, the type of vehicle used, etc. The price was therefore set at EUR 1.7 per ton of transported material.

2. BRIEF DESCRIPTION OF SLOVAK BIOMASS LANDSCAPE

The conditions of Slovakia for the energy use of biomass, as in the rest of EU is the most promising among renewable energy sources. The share of technically usable potential of biomass in Slovakia and the current use is to be seen in the table below. However, this table is from 2003 and the numbers may have slightly changed. According to the Ministry of Agriculture, energy from biomass could cover 30% of total energy consumption in 2050.

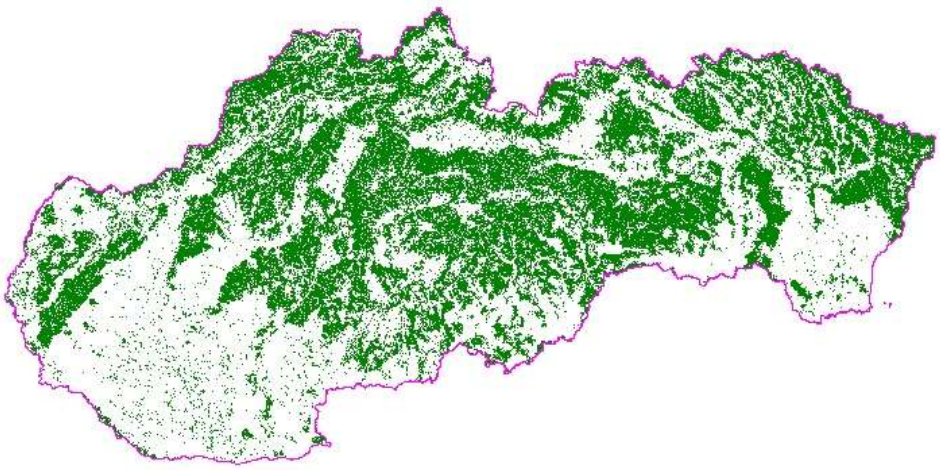
Type	Technically usable potential	Current use	Unused potential
	TJ (GWh)/year		
Geothermal energy	22 680 (6 300)	1 224 (340)	21 456 (5 960)
Wind energy	2 178 (605)	0	2 178 (605)
Solar energy	18 720 (5 200)	25 (7)	18 695 (5 193)
Small hydropower plants	3 722 (1 034)	727 (202)	2 995 (832)
Biomass	60 458 (16 794)	11 491 (3 192)	48 967 (13 602)
Forest biomass			
By 2010 - 1 370 000 tons	10 180 (2 828)	1 778 (494)	8 402 (2 334)
After 2010 - 2 724 000 Tons	20 242 (5 623)		
Out of which: Energy crops			
By 2010	1 635 (343)	372 (103)	1 263 (240)
After 2010	5 006 (1 391)		
Wood processing industry	17 570 (4 881)	9 497 (2 638)	8 073 (1 880)
Agricultural biomass	32 708 (6 586)	216 (60)	32 492 (6 526)
Energy use of waste	12 726 (3 535)	4 504 (1 251)	8 222 (2 284)
Sludge from the WTP	828 (230)	47 (13)	781 (217)
Municipal waste	6 390 (1 775)	1 325 (368)	5 065 (1 407)
Other waste	5 508 (1 530)	3 132 (870)	2 376 (660)
Biological fuels	9 000 (2 500)	1 188 (330)	7 812 (2 170)
Together	112 636 (31 288)	19 159 (5 322)	93 477 (25 966)

Water power plants	23 785 (6 607)	18 335 (5 093)	5 450 (1 514)
Together	153 269 (42 575)	37 494 (10415)	115 775 (32 160)

Tab.1: Usable potential of renewable energy sources for energy purposes (2003), source: Mariaš, M., Bella M.: Renewable energy sources in Slovakia, Energia 2, 2003, p. 44 – 46

HERBACEOUS BIOMASS

Slovakia is one of the most forested countries in Europe. The share of forests is up to 41% of Slovakia's area and has a growing tendency. by 2020 it represents 2,024,600 ha. Compared to 1990, it increased by 1.5 percent. Composition consists of coniferous (41.7%) and deciduous trees (58.3%). As seen on the picture, the distribution of the forests is almost across the whole country. 43.2% of forests belong to the state (LESY SR) and 56.8% are non-state forests. As seen from the database, the lowest price of woody biomass is set by the state forests.



Pic.2: Forrest cover of Slovak republic

According to the document "Integrated National Energy and Climate Plan of the Slovak Republic for the years 2021-2030", the main sources of fuel wood biomass are forest land, long-term unmanaged agricultural land overgrown with forest trees and residues after wood processing in the wood processing, furniture and pulp and paper industries. The area of forest land increased between 2000 and 2017 from 2,006 to 2,019 million. ha. The stock of wood with a thickness of more than 7 cm without bark increased from 410.0 to 480.3 million during this period. m3, the annual growth of wood of the above dimension increased from 11.2 to 12.0 million. m3. The actual annual timber harvest ranged from 6.2

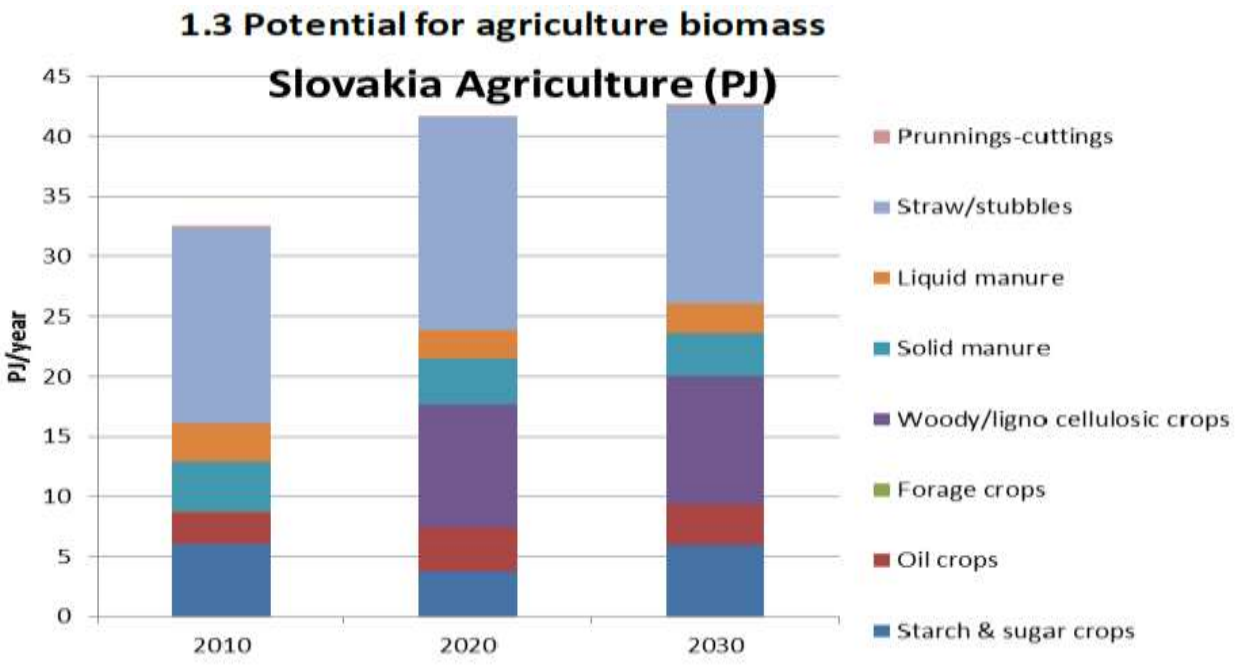
to 9.8 million. m3. The share of calamitous mining in the total mining amounted to 35 to 65%. The stock of carbon in living above-ground tree biomass increased from 166.3 to 187.3 mil. t and in live underground biomass from 36.1 to 40.5 million. t. Carbon reserves in dead biomass increased from 35.7 to 39.4 mil. t. As a result of the effects of climate change and the subsequent growth of calamitous logging, between 2000 and 2017, the share of conifers in the total recorded wood stock decreased from 41.0 to 37.2%, the share of hardwoods increased from 59.0 to 62.8%. Changes in the species composition of forests cause deterioration of the qualitative structure of stocks. The share of log assortments in the total harvesting of conifers is on average 54% and 37% for hardwoods. The mentioned changes in the qualitative structure of wood and the development of stocks affect the production possibilities of forest fuel biomass. In the period from 2020 to 2030, the planned annual timber harvesting will reach 8.9 to 9.0 million m3 of wood thicker than 7 cm, which represents 11.2 to 11.4 mil. t of above-ground tree biomass (including bark and wood up to 7 cm thick). The size of the annual supply of fuelwood biomass, mainly in the form of wood chips, currently reaches approx. 0.45-0.55 million. t. The annual usable potential of fuel wood biomass on forest and non-forest land and solid residues after wood processing will be in the range of 5.1 to 5.5 million t. by 2030.

Another type of herbaceous biomass is the leftover biomass from agriculture. For the purpose of this project, we will briefly mention post-harvest residues, that can be used either directly in the cogeneration plant or indirectly by using them in the animal agriculture and later digest them in the biogas plant. In 2007, 40% of the production of post-harvest residues of the most energetically suitable agricultural crops (cereals, rape) represented approximately 1,955,908t. By burning such a quantity of biomass, it is theoretically possible to obtain approximately 27.4 PJ of combustion heat. It is a potential that was at that time only minimally used in Slovakia, and that too was straw that was mostly burned directly in agricultural objects.[1]

In the territory of the Slovak Republic, permanent grasslands also represent an important source of biomass, especially in foothills and mountain areas after the suppression of livestock production. However, there is a problem of processing such amounts of biomass. One of the possible solutions is the energy use of grass phytomass, as solid fuels in the form of briquettes, pellets or input raw material for biogas stations.

Other subtypes of herbaceous biomass such as fruits, seeds, leftovers from kilns are not much discussed yet in Slovakia and their potential is used minimally or only by the producers themselves.

1: https://www.enviromagazin.sk/enviro2009/enviro4/12_polnohospodarstvo.pdf



Pic.3: The composition of agriculutural biomass potential for energy use. Source: Biomass policies project, SIEA

ANIMAL AND HUMAN WASTE BIOMASS

The main document defining the waste management strategy is the "Waste Management Program of the Slovak Republic 2016-2020". In this document, it is stated that the planned goals in the previous waste management plan (2011-2015) were not achieved, and it is stated that the goal for 2013, which is to reduce the disposal of biodegradable waste to 50% of the level of 1995. The goal of recycling 35% of municipal waste by 2015 has also not been achieved. The plan for the period 2021-2025 is not yet available. However, in this document there is a set of measures in which national goals are set. Reduction of the amount of biodegradable waste in mixed municipal waste is to be reduced by 60% by 2025 compared to the situation in 2016. According to the survey of several Slovak villages, the amount of biodegradable waste is around 40% of the communal waste. To extract this reusable composition, there is a regulation valid from 1 January 2021, according to Act 79/2015 Coll. section 81, paragraph 21, that every municipality has the obligation to introduce and ensure the implementation of sorted collection of municipal waste for biodegradable waste.

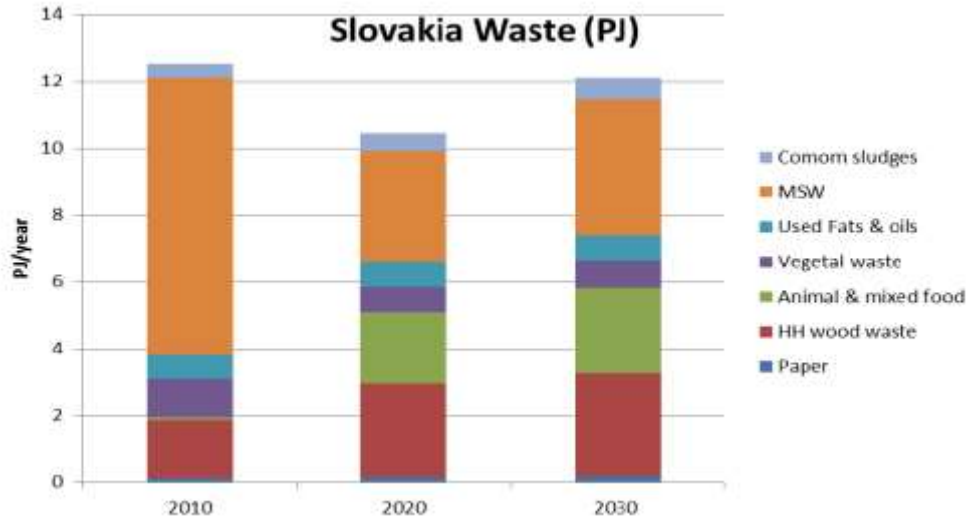
According to § 11 of Decree no. 371/2015 Coll., which implements some provisions of the Waste Act, facilities for the recovery of biodegradable waste are distinguished according to the technology used:

- composting plants and other facilities with an aerobic process for the recovery of biodegradable waste;
- biogas stations and other facilities with an anaerobic process for the recovery of biodegradable waste.

Biogas plants are also a place where animal manure and other animal waste is transformed into energetic use. However, we did not get access to sources or statistics regarding animal waste.

According to the document prepared by the Ministry of the Environment of the Slovak Republic in February 2022 entitled "Situational report on the disposal of municipal wastewater and sewage sludge in the Slovak Republic for the years 2019 and 2020", in 2020 the total production of sludge in the Slovak Republic represented 55,519 tons of dry matter. 48,490 tons of sludge dry matter (87.34%) were evaluated. Of this, 36,562 tons of sludge dry matter (65.86%) were used in soil processes: - 26,403 tons of sludge dry matter (47.56%) were used for compost production - they were used in other ways in soil

processes (reclamation of landfills, areas, production of growing substrates, etc.) 10,159 tons of sludge dry matter (18.30%), - sludge was not applied directly to agricultural and forest land this year. In addition, 11,928 tons of sludge dry matter (21.48%) were biologically processed and energetically recovered. 2,302 tons of dry sludge (4.15%) were deposited in landfills, and 4,727 tons of dry sludge (8.51%) were temporarily stored in the premises of the WWTP.



Pic.4: The biodegradable waste potential for energy use in Slovakia. Source: Biomass policies project, SIEA

The trend that can be observed in Slovakia is, that the potential of biomass as a source of energy is slowly being discovered. The most developed industry that process biomass in Slovakia is the wood-processing and forest industry. There is already number of companies that process leftovers from logging and furniture production into pellets, other use the wood chip for energetic use.

There is an ongoing problem connected to plants using wood chip for heating in Slovakia. Before 2019, these companies were getting subsidies for chip originating from any kind of wood, even the quality one. Huge amounts of Slovak forests were logged only to be burned in heat plants. In 2018, Slovakia approved that forest wood biomass should not be considered a renewable energy source anymore. In present, a similar regulation is on the table in the European union itself.

This is a very important testament. There are voices that say that the emissions from burning raw wood are higher than those from coal and that the concept of biomass should be reconsidered.

In Slovakia, there is still very big number of households that use wood for heating their homes. Slovak forests are one of the most preserved from the whole European Union, but for this state to remain it is very important to set priorities considering wood that is being logged.

On the other side, biodegradable waste and sewage sludge is highly undervalued source of energy that has not yet been discovered. Some of the sludge and manure is being used by biogas plants, but since the regulation to separate the biodegradable waste started only last year, the potential for Power-to-gas projects is big.

In any case, despite the huge potential that biomass holds as a source of energy in Slovakia, we must not forget the crucial condition to be taken into account. The biomass taken from forests and fields must not be processed to the detriment of the need to return nutrients to the soil for natural regeneration of the soil. This would lead to soil degradation, loss of the humus layer, erosion and a gradual decrease in the ability of the soil to produce additional biomass. Therefore, measures should be introduced about the amount of biomass left on the soil and it´s prioritization over the use of artificial fertilizers.