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Biomass Report (Germany)

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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

For the biomass database, all available amounts of biogenic wastes and residues were collected and clustered according to the biomass database for Germany. The data was mainly obtained through two main sources. The first source is the database "Hausmüll in Bayern" ("Domestic waste in Bavaria", 2019), which is provided by the Bavarian State Office for the Environment and counts the amount of all domestics wastes in Bavaria, including domestic biogenic wastes. In the corresponding report, "bio waste" is defined as the combination of municipal and domestic green waste and waste from the organic garbage can (i.a. domestic food and kitchen waste).1 However, the database does not display the concrete usage of these wastes, which makes it difficult to determine whether the sources are idle. The current main recycling routes will be explained in chapter 2.

The second source for biomass data collection was provided by the German Biomass Research Centre that created a biomass atlas, displaying different biogenic waste sources in Germany. For the database, the biomass sources for Bavaria were selected and adapted to the classification of the biomass database template. The amounts of wastes are given in tons of fresh mass.2

National and international databases such as Statista and Eurostat were also reviewed, however, they usually only display summed up amounts without concrete locations. Further, the identification of biogenic waste owners turned out to be rather difficult. Thus, the cities in which the biowastes incurred are listed as owners and should be contacted in case of interest in using these resources. The same problem occurred with the estimation of prices.

Further, companies such as breweries, paper manufacturers, etc. were contacted.

The amounts of moisture and costs were provided according to online sources.

Animal manure

For animal manure, three different types were collected: Bovine manure, bovine dung and bovine liquid manure. The moisture contents are estimations according to experts' opinions given on specific websites and reach levels of 92% (manure)3, 75% (dung)4 and 98 (liquid manure)5. The costs were calculated according to the equivalent of artificial fertilizers and range from 5€/t fresh mass (liquid manure) to 15€/t fresh mass (manure).6 In Germany, the costs have risen lately. Thus, the prices might not be accurate anymore and need to be revised for individual cases.

Sewage sludge

The data source of the German Biomass Research Centre provided the amounts of sewage sludge in tons dry mass. Therefore, the moisture content for sewage sludge indicate 0%. In Germany, the cities

[1] Hausmüll in Bayern (2019), p. 36
[2] Links to the altases: https://webapp.dbfz.de/
[3] https://www.landwirtschaftskammer.de/landwirtschaft/ackerbau/duengung/guelle/duenger/guelleinhaltsstoffe.htm
[4] https://www.biogaseffizienz.info/optimierung-und-sanierung/htk-festmist-nebenprodukte.php
[5] https://www.landwirtschaftskammer.de/landwirtschaft/ackerbau/pdf/naehrstoffgehalte-organischer-duenger.pdf
[6] https://www.lwk-niedersachsen.de/bezst-emsland/news/38733_Wie_viel_ist_die_G%C3%BClle_wert
https://www.landwirtschaftskammer.de/landwirtschaft/ackerbau/duengung/guelle/duenger/guelleinhaltsstoffe.htm

and municipalities pay for the disposal of sewage sludge, an average of 100€/t. Therefore, the price is negative.7

Municipal biowaste, waste wood and green waste

The prices for municipal biowaste, waste wood and green waste could not be determined and need to be assessed for individual cases. Usually, the cities and municipalities collect the waste and exploit it thermally, energetically or for compost production.

Cereal straw

For cereal straw, the amounts were provided in dry mass, so the moisture content is 0%. The straw prices range from ~90€/t to ~125€/t, so an average price of 107€/t was provided.

Disclosure

The authors collected the biomass data to the best of their knowledge and judgement, but do not guarantee the correctness and completeness of the data, nor can they be hold legally responsible for any actions taken upon usage of the database.

Licences

The following data was used and is displayed in the Altas Tool:

DBFZ Dashboard biogene Rohstoffe in Deutschland (BETA-VERSION), Accessed on 09.12.2022.

Bayerisches Landesamt für Umwelt, Energieatlas Bayern, https://www.energieatlas.bayern.de/, Accessed on 09.12.2022.

Bayerisches Landsamt für Umwelt, Hausmüll in Bayern, Bilanzen 2019.

2. BRIEF DESCRIPTION OF THE GERMAN BIOMASS LANDSCAPE

2.1 ROLE OF BIOENERGY IN GERMANY

A significant share of energy produced in Germany is supported through renewable energy of varying types. Renewables in 2020 were reported to have been responsible for the production of an annual record of 46% of power consumption in Germany. Just two years prior to this feat, in 2018, Germany as a global powerhouse of industry and technology managed to utilize the produced bioenergy from biomass and biogenic waste to cover 8.1% of its entire primary energy consumption. When it comes to renewable energy sources in Germany, bioenergy holds two-thirds of the share as the major representation. Ranging from the use in various industrial applications to energy generation fuels in many different sectors for the country, coupled with the secondary utilization of waste from crops, biomass certainly plays a key role in the agricultural arena of the country. Moreover studies speculate that by 2050, Germany could derive more than a quarter of the primary energy through domestic biomass.[8]

[7] https://kostencheck.de/klaerschlammentsorgung-kosten
[8] Bioenergy in Germany (2020), p. 1

However, since food and feed production is given priority over energy crop production and the amount of agricultural lands cannot be extended much more, the focus needs to be on usage of biogenic wastes and residues. As the Agency for Renewable Raw Materials (Fachagentur Nachwachsende Rohstoffe, FNR) states in their dossier for basic energy data in Germany, the primary energy consumption accumulated to a total of 12.832 PJ, of which 8.6% were produced through biomass. However, biogenic waste materials make up only 1% of the total energy production.[9] A significantly low statistic, this figure certainly does not do justice to the potentials of such waste materials, specifically factoring in the large quantities that are not utilized in the proper way. To that end, various efforts have been made to organize and categorize not only the different types of biomasses that are procured throughout Germany, but also how their subsequent wastes can be handled, for proper disposal and more importantly for extraction of energy that would otherwise go to waste. Referenced from the study of Review of Biomass and current utilization by Andre Brosowski et. al, it is speculated that around 1.000 PJ could be produced yearly through the use of biogenic residues and waste in Germany, satisfying up to 7% of the current primary energy consumption, and more so up to at the least 13% of the target consumption.[10]

2.2 POTENTIALS OF BIOGENIC RESIDUES IN GERMANY

Logging residues

In Germany, wood is one of the major biomass resources for energetic usage. Only 58% of harvested wood is used, while 28% consist of logging residues (14% harvesting losses). However, not all the logging residues can be used for energetic purposes, since it is needed as nutrient of the forest soils. The share of the remaining residues is unknown. Further, in 2013, two thirds of waste wood (e.g. old furniture, doors, wooden boxes) in Germany was used energetically. [11]

Roadside greenery

Fehrenbach et. al. (2019) calculated the potential of roadside greenery in Germany based on the length of the highway and federal road networks. They conclude that the potential of roadside greenery lies at around 1 Mio. t FM for stalks and 160.000 t FM woody biomass. The authors state that roadside greenery does not play a significant role in the German energy system, but on local level it might have importance, depending on local conditions.[12] Data of roadside greenery could not be found for the biomass database, since it is not collected. The authors thus advise users to contact cities and municipalities in order to get informed of local potentials of roadside greenery.

Other biogenic wastes by Fehrenbach et al.

In their study, Fehrenbach et al. additionally provide information on the estimated potentials of the following biogenic wastes (for 2020):

Source	Amount / year
Straw	12.4 mio t
Animale manure	85 mio t (manure, »Gülle«) 40 mio t (dung)

[9] FNR (2020), p. 7
[10] Brosowski (2021), p. 16
[11] Drossart/Mühlenhoff (2013), p. 12-13
[12] Fehrenbach et. al. (2019), p. 125-126

Harvest residues	7.9 mio t
Municipal biowaste	6 mio t
Green waste	6 mio t
Waste wood	5.8 mio t (energetic exploitation)

All these amounts count for Germany as a whole and are not indicated according to their specific locations. An overview of all potentials, including estimations for 2030 and 2050, can be found in Fehrenbach et al. pages 139-140.

2.3 CURRENT EXPLOITATION OF BIOGENIC RESIDUES

In 2015, 67-85% of all biogenic wastes and residues were exploited for material or energetic use. According to experts, 13.9-48.2 million tons dry mass can be mobilised in the future, mainly cereal straw, logging residues, bovine dung and manure and green waste.[13]

According to the Bavarian State Office for the Environment, out of 4.32 million t of recyclable material (including waste paper (978,000 t), glass (307,000 t), wood (335,000 t), light packaging (282,000 t), green waste (1.21 million t), municipal biowaste (740,000 t) and other recyclable material (468,000 t)) 1.88 million t were used for biological exploitation in 2019. In general, recyclable waste material is used for energetic purposes, production of secondary resources, compost and shredded material.[14]

Sewage sludge in Bavaria is mainly used for thermal and energetic purposes (~80%). However, 38% of the Bavarian sewage sludge is not processed in Bavaria.[15] There is great potential to exploit these amounts directly in Bavaria.

3. REFERENCES

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[13] Bringezu et al. (2020), p. 36
[14] Hausmüll in Bayern (2019), p. 86
[15] Hausmüll in Bayern (2019), p. 88

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