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Poland

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1 Introduction on bio-waste management in Poland

In order to address the challenges related to the sustainable use of natural resources, climate change, and biodiversity protection, a radical change in the patterns of production, consumption, processing, storing, recycling and disposal of biological resources would need to be made. Although the notion of using renewable energy sources for energy generation is by no means new and the direct use of waste biomass in incineration and co-incineration with carbon has already become a common way of reducing greenhouse gas emissions, this area is still being refined and adjusted, also at the regulatory level. Since Poland is obligated to reach a 15% share of renewable energy in total energy consumption by 2020, it is worth pointing at biowaste as the new renewable source of energy.

2 National concept/strategy on bio-waste management

The National Waste Management Plan 2022 (Polish: KPGO 2022) has a legal basis in the Act of 14 December 2012 on waste (Dz. U. of 2013, item 21 with later amendments), which states in art. 37(3) that waste management plans should be updated not less frequently than every 6 years. KPGO 2022 includes the recycling targets for municipal waste, allowing the decision makers to schedule and implement appropriate actions both at national and regional level, which should help to attain these goals.

Ensuring a unified selective waste collection system, as well as introducing separate collection for green waste and other types of biowaste, will enable an increase in the volume of source separated municipal waste and will allow to maintain good quality of collected waste, which has an effect on their recyclability and, in turn, the ability to achieve targets for preparing for re-use and recycling. The need for a unified selective waste collection system is, among others, the result of insufficient levels of source separated municipal waste.

Waste hierarchy presented in the Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3, with later amendments) forms the starting point for waste management plans.

3 Source separated collection of bio-waste

Even though biodegradable fractions make up to 45–47% of mixed municipal waste, fractions that are defined as biowaste according to the new regulations represent not more than approximately 34%. Due to a water content exceeding 20–60%, or even 90%, and a variable composition of biomass, much of which is contaminated with fats, diverging approaches to storing and managing biowaste are applied. None of these approaches reflect the principle of extending the value chain by converting waste into high quality products and this is because of the pervasive use of co-incineration, composting, and landfilling. The new waste management policy is set to reduce the amounts of municipal solid waste sent to landfills to 50% in 2013 and 35% in 2020 in relation to the volumes of waste generated in 1995.

Incineration is yet another way of handling waste, which usually implies co-incineration of non-separated biowaste for electricity and heat cogeneration along with condensation of water vapor from exhaust gases. This is the preferred approach in case of local municipal waste streams, which is counterbalanced by the

mechanical-biological processing with the purpose of burning produced biomethane in anaerobic digestion plants.

Through implementing the regulations set out in the directive 2008/98/EC on waste the procedures for using biofuels and bioliquids produced from biowaste become liberalized, thus improving availability and competitiveness of these substances in relation to other potential fuels being used for electricity generation. Restrictions pertaining to storing biodegradable waste necessitate the move towards the new methods of managing them, which gives the opportunity not only to achieve much lower unit costs of biofuels and bioliquids but also to generate additional income.

4 Bio-waste treatment (recycling, material/energy recovery)

Various scenarios and strategy papers give estimates of the volumes of biomass resources that can be used for energy purposes in Poland. Given current technology trends, which make use of biomass in energy production, it may be assumed that applying cogeneration (producing electricity and heat in the same process) and trigeneration (producing electricity, heat and cooling in the same process) on a greater scale in the future will be able to significantly improve the management of biowaste resources in Poland and will substantially contribute to the realization of both national and Community climate and energy policy objectives.

According to the National Action Plan for RES (NAP) it is projected that biomass for energy purposes will be sourced mainly from three sectors, i.e. a) biomass from forestry, b) biomass from agriculture and fisheries, c) biomass from waste, including biowaste. Such biomass may be used for energy generation by means of conversion processes into liquid fuels and their subsequent usage in the production of electricity and/or heat. Biomass from forestry and biomass from agriculture and fisheries will be of utmost importance for the energy sector. It is however not expected for the by-products from fisheries to play any major role as bioenergy raw materials. These are mainly used in the pharmaceuticals and animal feed industries. The utilization rate of this waste group will continue to increase as the requirements for diversion of biowaste from landfills are implemented.

Biodegradable garden, kitchen, and food waste represent approx. 88 million tons in total municipal waste generated each year in the European Union and therefore have major potential impacts on the environment. Estimates provided by the Ministry of Economy in the National Action Plan show that the volumes of waste coming from the food and drink industry in the European Union amount to 37 million tons annually.

5 Application and market

5.1 Biomass from municipal waste

The volume of biodegradable municipal waste is expected to decrease slightly over the 2015–2020 period due to population projections indicating a population decline between 2010 and 2020. It should be noted that using municipal waste for energy purposes (with some additional support in the form of green certificates) has become possible with the entry into force of the new regulation, which provides a clarification on the concept of biodegradable fractions. Taking into account the possibility of using such substances, special attention should be paid to a fraction defined as kitchen waste of plant and animal origin, garden waste, and green waste.

5.2 Biodegradable fraction of industrial waste

One of the ways of utilizing biodegradable industrial waste for electricity generation is by burning organic substance dissolved in black liquor commonly used in the pulp and paper industry.

5.3 Residues and wastes from preparing and processing of foodstuffs of animal origin

Slaughterhouse wastes are the biggest waste group (37%) produced by the meat industry. According to data supplied in the National Action Plan, the remains, e.g. bones and hides, constitute 27% of slaughtering animals' weight. Residues and waste materials arising from preparing and processing of foodstuffs of animal origin collected in Poland contain predominantly pig remains (62%), poultry remains (13%), feathers (13%), and blood (10%). It is recommended to use these for energy purposes as substrates in biogas production. The most valuable residues from the meat industry, which can be used for energy purposes, are animal fats, which are, however, in short supply on the Polish market. Therefore of future importance could only be waste fats (not intended for consumption) linked to the disposal of animal wastes in high temperatures. The amounts of waste fat produced this way are estimated at approximately 80–100 million liters.

5.4 By-products and residues from processing of products of plant origin, including waste fruit, vegetables, and edible oils

Fruit processing by-products and residues have the biggest share in this group. It should be emphasized that most by-products and residues from vegetable production are either left behind on the fields or sold together with vegetables. Out of this waste group the energy sector commonly uses e.g. pellets made from fruit pomace (juice press residue), which are burned loose, or pomace used as a substrate in a biogas plant or, alternatively, in a distillery. Substandard or expired products could potentially be used in the production of biogas or ethanol (in the process of fermentation). Vegetable fats are an interesting stream within this biomass group. Both raw oils (non-compliant with the norms pertaining to human consumption) and spent oils from agri-food industry could be used for energy purposes. So far the collection of used frying fats in Poland has been poorly organized. It could potentially yield approx. 100 million liters per year.

5.5 By-products and residues from the dairy industry

The main energy raw materials from the dairy industry are whey, wash water, materials not fit for further processing in a dairy or products non-compliant with norms and quality requirements, as well as expired products. Among residues generated by the dairy industry whey is of particular interest as, whenever there in an excess of it on the market, it can be used in biogas and ethanol production. According to the Ministry of Economy's data provided in the National Action Plan it is estimated that the volume of whey produced in Poland is approx. 2 billion liters per year, which could be used to produce 198–560 GWh of energy per year (through methanogenesis).

5.6 Waste from the bakery and confectionery industry

It is considered that waste from the bakery and confectionery industry can be used locally for energy purposes. For instance, bakery products returned from shops could be made into pellets and used as fuel. Bearing in mind a wide definition of waste biomass it should be noted that pulp based on waste generated by the bakery and confectionery industry may be used either as a pure fuel for electricity generation or as a component in its production.

5.7 By-products and residues from alcoholic beverages production

Within this group residues from the spirits industry are most widely used for energy purposes. One of the by-products of industrial-scale ethyl alcohol production is stillage coming from distilleries which produce distillate (with a 10:1 ratio of stillage to distillate). Assuming a steady consumption of ethyl alcohol in Poland at about

120 million liters per year, production processes could yield yearly approx. 1.2 billion liters of stillage containing fusel oils.well.

6 Expected trends and developments

It is predicted that the share of biodegradable fraction in municipal waste stream will increase on average by 0.5% per annum. Because of the following goals: 1) reaching a 65% recycling rate for municipal waste by 2030; 2) reaching a 75% recycling rate for packaging waste by 2030; 3) reducing the volumes of landfilled waste to a maximum of 10% by 2030, as set out in the proposal for the Circular Economy package published by the EC, MBP installations and other installations servicing mixed municipal waste will turn to purifying source separated waste, whereas the biological portion will be mixed with green waste and other types of biodegradable waste.

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1. Krajowy Plan Gospodarki Odpadami 2022
2. Bioodpady jako nowe źródło energii odnawialnej, Arkadiusz Majoch, Magdalena Monika Jabłońska Instytut Nafty i Gazu, NAFTA-GAZ, ROK LXIX, Nr 9 / 2013
3. KPGO 2022 Impact Assessment

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About GWDA sp. z o.o. (GWDA Co Ltd.)

GWDA is a Polish company, combining long-term experience with a modern look at the environment. Our company has been providing urban waste water treatment services for Piła for over 20 years, doing so under the principle of sustainable development, emphasizing the relationship between economic growth and environmental and human health. Based on waste organic matter we produce a range of high quality, certified products with fertilizer properties, assuming that sludge is not just waste, but a material based on which you can produce extremely valuable products for the environment. We are highly efficient composting plant with innovative thermomodernization of buildings, modern heat pumps recovering energy from sewage, own supply from a photovoltaic farm bringing us a dual status of Regional Waste Management Facility in the Wielkopolska Region in Poland. GWDA is a member of Polish Biorecycling Association and GlobNORM.