

**THEMATIC ANALYSIS
IN THE FIELD OF BIOWASTE IN
(Świętokrzyskie region, Poland)
INVENTORY OF EXPORTABLE GOOD PRACTICES
&
INVENTORY OF SITES, FACILITIES, AREAS AND INSTRUMENTS
TO BE IMPROVED DURING THE COOPERATION
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1. Introduction

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2. Regional Context

As of July 1, 2013, as a result of amendments to the Law of September 13, 1996 on maintaining cleanliness and order in municipalities, a comprehensive municipal waste management system began to function in the Świętokrzyskie region. From now on it is the municipalities that are responsible for the collection and management of municipal waste, while the costs of operating the system are covered by the fees collected from residents. In the Świętokrzyskie region, the bio-waste fraction accounts for about 30% of all municipal waste. It is estimated that 1 resident of the province in 2022 generated 131 kg of bio-waste. In accordance with the directions contained in the EU waste management policy for the introduction of mandatory separate collection of bio-waste and national regulations, as of July 1, 2021, a system of collecting this waste was implemented in each municipality.

Bio-waste is mainly processed at 6 Regional Waste Management Plants (RWMP), which include 6 waste composting plants and 1 methane digestion plant. In 2021, 19,300 Mg of bio-waste was processed at these facilities.

- 3 RWMP produce a soil conditioner from bio-waste
 - RWMP Janik has been producing "AGROJANIK COMPLEX" since 15.11.2011.
 - RWMP Janczyce since 09.12.2020. - "AGROCOMPOST"
 - RWMP Końskie since 24.02.2023. - "SOIL IMPROVER KOŃSKIE"
- 1 RWMP as a result of methane fermentation from bio-waste receives biogas used for electricity and heat production.

RWMP's managers have more than 10 years of experience in operating plants for processing municipal waste, including bio-waste. RWMP Janik has been producing soil improver for more than a dozen years, while RWMP in Promnik has been producing biogas from bio-waste since 2016. Bio-waste (mainly food and kitchen waste from restaurants, stores and also food processing waste) is also managed at an agricultural biogas plant in Piekoszów, which has been in operation for years. The waste is used to produce biogas, which is used to generate energy

and heat, as well as the digestate, which is used to produce an organic fertilizer called "PLONEX BIS." Another agricultural biogas plant is planned to be put into operation soon in Gołoszyce, which will ensure the use of biomass from agro-food processing and livestock farming, waste from agro-food processing, etc. obtained from local production and processing plants and farms to produce biogas used for energy and heat production. The digestate, meanwhile, will be used in agriculture as a substitute for fertilizer.

Considering the fact that the Świętokrzyskie Voivodeship has an agricultural character, and bio-waste accounts for the largest share in the municipal waste stream, its management plays an important role in, among other things, meeting the requirements imposed by the EU, i.e. achieving levels of preparation for reuse and recycling of municipal waste. It should be emphasized that waste prevention and recycling of bio-waste is an extremely important element of a closed loop economy (GOZ). Therefore, it is important to develop infrastructure for bio-waste management, including "at source" composting. In the Świętokrzyskie Voivodeship, the system of home composters is gradually developing - the number of residential properties is increasing, in which bio-waste is managed "at source." In 2021, about 48% of the province's residents had home composters (155,341 units), in which 59.6 thousand Mg of bio-waste was managed. Numerous actions and campaigns are carried out in the province to educate the public about the benefits and sense of selective collection of bio-waste and to popularize home composting of bio-waste or other use of bio-waste, such as for feeding animals. Good practices and solutions are constantly being sought to further develop the infrastructure, including an increase in the number of composters in the province, as well as to improve the quality of the resulting compost. An important incentive for residents of the province to manage the bio-waste they generate is a partial exemption from the municipal waste management fee for composting bio-waste in a backyard composter. The above exemption is based on the Law on Maintaining Cleanliness and Order in Municipalities of September 13, 1996.

The document supporting the implementation of EU and regional environmental policies aimed at waste prevention and reuse is the Waste Management Plan for the Świętokrzyskie Province (WPGO). In the financial aspect, on the other hand, it is the 2021-2027 Regional Program European Funds for the Świętokrzyskie (FEŚ).

3. Inventory of Good Practices to be shared during the cooperation

Local Good Practices on Community Composting

Title: Production of an organic soil improver

Location of the practice:

- RWMP Janik - Janik, 1 Borowska Street, Kunów 7-415
- RWMP Janczyce – 50 Janczyce, Baćkowice 27-552
- RWMP Końskie – 145 Spacerowa Street, Końskie 26-200

Short summary: In the Świętokrzyskie Voivodeship, out of the 6 RWMPs, 3 have a decision from the Minister of Agriculture and Rural Development to market organic soil conditioner. As a result of composting bio-waste coming mainly from households (grass, leaves, branches, kitchen waste), as well as parks and gardens from the area of 44 municipalities, the following products are obtained:

- „AGROJANIK COMPLEX” (RWMP Janik 15.11.2011 r.),
- „AGROKOMPOST” (RWMP Janczyce 09.12.2020 r.),
- „POLEPSZACZ GLEBOWY KOŃSKIE” (RWMP Końskie 24.02.2023 r.).

These products are used in field, vegetable and orchard crops, as well as in ornamental plants and lawns. They are especially recommended for use in soil reclamation. This is because they increase soil fertility by enriching the soil with organic matter and nutrients, mainly nitrogen, phosphorus and potassium. The use of the above-mentioned products has a positive effect on improving the physical and chemical properties of the soil, thereby increasing the yield and improving the condition of the plants, as well as their quality, thanks to the appropriate nutrients.

Responsible organization:

- Waste Neutralization Plant "Janik" Ltd., 91 Sienkiewicza Street, Ostrowiec Świętokrzyski 27-400,
- Intercommunal Municipal Waste Management Plant Ltd., 50 Janczyce, Baćkowice 27-552,
- Municipal Utilities Company in Końskie Ltd., 145 Spacerowa Street, Końskie 26-200

Title: Biogas production

Location of the practice: RWMP Promnik - Promnik, 62 St. Tekla Street, Strawczyn 26-067

Short summary: The dry methane digestion facility ensures the management of biodegradable waste generated in the entire region of the 4 municipal waste management, which includes 18 municipalities in the Świętokrzyskie Voivodeship. This installation makes it possible to solve the problem of managing this type of waste and at the same time recover energy from it. In the process of dry fermentation, biogas is produced and methane is utilized energetically by burning it, and consequently the production of electricity and heat. The production of biogas takes place in a continuous mode. The resulting biogas goes to a cogeneration unit, which produces enough electricity and heat for the plant's needs.

Responsible organization: Waste Management Company Ltd. in Promnik, 62 St. Tekla Street, Strawczyn 26-067

Local Good Practices on Individual Composting

Title: Composting in home composters

Location of the practice: rural municipalities and rural parts of urban-rural municipalities of the Świętokrzyskie Voivodeship

Short summary: The Świętokrzyskie Voivodeship has an agricultural character and biodegradable municipal waste in rural areas is mostly collected and managed by residents on their own. It is estimated that 1 resident of the province managed "at source" in a home composter 125 kg of bio-waste in 2020, and 128 kg in 2021. In 2021, about 48% of the province's residents had home composters (155,341 units), in which 59.6 thousand Mg of bio-waste was managed. In comparison, 19.3 thousand Mg of bio-waste was processed in the RWMP during the period. It should be noted that the number of residential properties with home composters is gradually increasing. The compost obtained is used for the residents' own needs in crops and gardening. Given the agricultural nature of the province and the fact that bio-waste is a significant group of municipal waste, its management plays an important role in achieving

municipal waste recycling levels. Therefore, it is extremely important to develop the management of bio-waste "at the source".

Responsible organization: residents of rural municipalities and the rural part of urban-rural municipalities in Świętokrzyskie Voivodeship.

Local Good Practices on Centralized/Industrial Composting and Anaerobic Digestion

Title: Management of bio-waste in agricultural biogas plants

Location of the practice: – **Biogas Plant in Piekoszow** (6 Czarnowska Street, city: Piekoszów, municipality: Piekoszów, county: kielecki),

Biogas Plant in Gołoszyce (Gołoszyce 8A, municipality: Baćkowice, county: opatowski)

Short summary: At the Bartos Combined Heat and Power Plant - Biogas Plant in Piekoszów, bio-waste (mainly food and kitchen waste from restaurants, stores as well as food processing waste from food processing) are used to produce biogas used for energy and heat production. The digestate, on the other hand, is used to produce an organic fertilizer called "PLONEX BIS." Another agricultural biogas plant is planned to be commissioned soon - the Biogas Plant in Gołoszyce, which will ensure the use of biomass from from agri-food processing and livestock farming, waste from agri-food processing, etc. obtained from local production and processing plants and farms to produce biogas used for energy and heat production. The digestate, meanwhile, will be used in agriculture as a substitute for fertilizer.

Responsible organization: Biogas Plant „Heat and power plant Bartos Ltd.”. in Piekoszów,

Local Good Practices on Prevention of Organic Wast

Title: Educating the public on correct consumer attitudes, among other things

Location of the practice: Świętokrzyskie Voivodeship

Short summary: In order to prevent organic waste, including reducing the amount of food waste in the province, environmental education of the public is being carried out, including in terms of correct consumer attitudes. Both provincial, county and municipal authorities initiate and conduct numerous information and education campaigns, as well as cooperate with food banks. An example is the environmental education campaign conducted under the slogan: "Together we create EKOświętokrzyskie". In the case of activities related to counteracting food waste, a number of actions were conducted by the Kielce Food Bank and the Świętokrzyski Food Bank. The activities of the food banks focus on counteracting food waste and promoting the idea of zero waste. Promoted consumer attitudes include making sensible purchases, sharing food, e.g. with relatives or neighbors, using an eatery, using various apps, e.g. "Too good to go," using food waste to feed pets, or managing biodegradable waste (including food waste and other bio-waste) in home composters.

Responsible organization: Provincial, district and municipal governments, food banks

Local Good Practices on Regulation for Composting

Title: Partial exemption from the municipal waste management fee

Location of the practice: Świętokrzyskie Voivodeship

Short summary: In accordance with national regulations under the Law on Maintaining Cleanliness and Order in Municipalities of September 13, 1996, the Municipal Council, by way of a resolution, exempts in part from the municipal waste management fee property owners composting bio-waste constituting municipal waste in a backyard composter. The municipal council determines the amount of such exemption, which is often a significant incentive for residents to manage the bio-waste they produce in backyard composters.

Responsible organization: Municipal Council

**Local Good Practices on Training of Master Composters and
Engagement of Citizens and Organizations of the Rural Areas in Composting**

Title: Activities to increase awareness and involvement of residents in the composting of bio-waste

Location of the practice: Świętokrzyskie Voivodeship

Short summary: In the Świętokrzyskie region there is no institution of so-called "master composters" - volunteers who have government support and educate the residents of their localities about proper composting. This is undoubtedly a good practice that is worth implementing on our national soil. However, other efforts are being made to raise awareness and engage residents in the composting of bio-waste. There are regular information and education campaigns conducted by the authorities of the province, counties and municipalities, concerning rational waste management, including individual composting, meetings with residents - workshops, lectures, educational stands are organized at festivals and picnics, and information is published in local newspapers, brochures, websites or information boards. A good practice in the area of education, which can become an inspiration for our partners, can be the functioning of a special department at the Municipal Waste Management Plant in Rzędów, which deals with environmental education and directs its activities to the residents of the municipality. An important role is also played by inspections carried out by the Provincial Inspectorate for Environmental Protection in Kielce on the conduct of information and education campaigns by municipalities.

Responsible organization: Provincial, district and municipal governments, Environmental Protection Inspection, entrepreneurs

Local Good Practices on Good Use and Different Uses of Compost and Digestate-based Products

Title: Use of compost and digestate to improve soil fertility and soil reclamation

Location of the practice: Świętokrzyskie Voivodeship

Short summary: Soil improvers (AGROJANIK COMPLEX, AGROKOMPOST, POLEPSZACZ GLEBOWY KOŃSKIE) are used in crops and horticulture to fertilize garden plants, vegetables, trees, shrubs, ornamental plants and lawns, as well as to mulch the soil under plants. This is because they increase soil fertility by enriching the soil with organic matter and nutrients, mainly nitrogen, phosphorus and potassium. The use of the above-mentioned products has a beneficial effect on improving the physical and chemical properties of the soil in degraded areas, thereby increasing yields and improving the condition of plants, and at the same time their quality, thanks to the appropriate nutrients. Compost produced in home composters is used by residents for their own needs in crops and gardening. Also, the digestate, in turn, due to its high nutrient content, can be used as an aid to plant cultivation.

Responsible organization: RWMP Janik - Janik, 1 Borowska Street, Kunów 7-415; RWMP Janczyce – 50 Janczyce, Baćkowice 27-552; RWMP Końskie – 145 Spacerowa Street, Końskie 26-200; RWMP Promnik - Promnik, 62 St. Tekla Street, Strawczyn 26-067

Local Good Practices on Smart Composting in Rural Area

Title: N/A

Location of the practice: N/A

Short summary: Although the Świętokrzyskie region cannot claim to have good practices in smart composting, there is no shortage of initiatives in this area. At RWMP in Promnik, work is underway on the feasibility of the HTC hydrothermal carbonization method for organic waste, which involves converting organic biomass into solid fuel - biocarbon, a renewable biofuel for various industrial applications.

Responsible organization: N/A

4. Inventory of sites, facilities, areas and instruments to be improved thanks to the cooperation

Local Resources to be improved thanks to the cooperation

Name:	<ol style="list-style-type: none"> 1) composting infrastructure, 2) education of the public on bio-waste management, 3) financial instruments
Type of resource	<ol style="list-style-type: none"> 1) composting and digestion facilities operating within the RWMP, 2) education of residents of the Świętokrzyskie region, 3) Program "European Funds for Świętokrzyskie 2021-2027".
Short description of the need for improvement:	<p>Raising public awareness and convincing people of the validity of the measures taken to prevent bio-waste, its selective collection and management is a prerequisite for achieving high levels of selective collection of this waste. That is why it is so important to carry out regular actions and campaigns to educate the public about the benefits and sense of selective collection of bio-waste and to popularize home composting of bio-waste. It is important to undertake actions to increase the involvement of citizens and organizations in rural areas in composting. Good practices and solutions are being sought that will contribute to the development of infrastructure for bio-waste processing as well as the achievement of better and better results by residents in managing bio-waste "at source".</p> <p>It is assumed that the implementation of the project will help municipalities to achieve the aforementioned levels and will make it possible to expand the knowledge of bio-waste management "at source", so that residents of our region make the best use of this waste on their own, in accordance with the rules of GOZ.</p>

	<p>Moreover, as a result of the project implementation, the instrument of regional policy will be improved, i.e. the program entitled "European Funds for the Świętokrzyskie 2021-2027". It will include provisions regarding bio-waste management in rural areas in the part regarding project financing in the field of municipal waste management.</p>
<p>Responsible organization:</p>	<p>RWMP Municipal and provincial authorities</p>

5. Conclusions

1. The significant raw material, including energy potential of bio-waste is recognized

According to the idea of a closed-loop economy (GOZ), products, materials and raw materials should remain in the economy for as long as possible, and waste - if already created - should be treated as secondary raw materials to be recycled, processed and reused. Therefore, there is a constant need to search for and identify new solutions for the processing of biowaste in order to maximize the use of its raw material and energy potential, thereby saving natural resources, according to the GOZ trend.

2. In the Świętokrzyskie region there are good solutions in the field of bio-waste processing, which can be an example to be applied to other EU regions

- production of soil conditioner (AGROJANIK COMPLEX, AGROKOMPOST, KOŃSKIE SOIL IMPROVER),
- production of biogas used to produce electricity and heat,
- production of compost in home composters, used by residents for their own needs,
- further investments are planned in the construction of biogas plants, based on the fermentation of bio-waste, as well as the further development of a network of backyard composters.

3. Other solutions to increase the efficiency of bio-waste composting are constantly being sought, especially of an innovative nature

Currently, the possibility of using the HTC method of hydrothermal carbonization of organic waste in RWMP in Promnik, which consists in converting organic biomass into solid fuel - biocarbon (hydrocarbon) - a renewable biofuel for various industrial applications, is being recognized. Process water with fertilizer properties is also obtained by this method. Also worthy of wider recognition is the neighborhood/collective/public composting system learned during the study visit to Spain, which is not known and widespread in our region. It is also interesting to promote backyard composting and educate the community about composting with the help of volunteer composting champions.