Feasibility study and environmental and social audit for the construction of a biogas facility to use organic waste

Project background

Name of applicant	Specialised environmental enterprise 'Rada'
Project info/Project name	Feasibility study and environmental and social audit for the construction of a Biogas facility to use organic waste and chipping machinery to use mixed solid residue waste
Contractor	Ramboll Finland Oy
Project duration	February-September 2021
Contract value	EUR 130,000

Project summary

1 **Project summary**

The objective of this assignment was to prepare a Feasibility Study (FS) for the construction of a biogas plant for biodegradable organic waste and a solid waste chipper for the generation of recycled biomass using agricultural by-products and woody by-products from industries. During the assignment, it was decided to also investigate the potential application of a bio-drying plant for the reduction of municipal solid waste (MSW). The beneficiary of this assignment was a Ukrainian small private enterprise, RADA, that collects, stockpiles and processes MSW in several municipalities in the Kyiv region.

The scope of the FS was to investigate in detail the technical, economic, legal, social and environmental issues of the project under development and assess the project's implementation arrangements and risks. At the beginning of the project, the biogas plant was designed to operate with MSW as the sole feedstock.

Source separation of waste is not an established practice in Ukraine, and there is currently no example of biogas production from MSW or source-separated organic waste (SSOW). Source separation of MSW should therefore be introduced gradually in Ukraine to ensure the feasibility of the biogas plants using biodegradable organic waste in the future.

In summary, the overall implementation concept most suitable for RADA was to install bio-drying for the MSW as the first step of MSW treatment. In the mid-term perspective, separate collection of organic waste could be organised and a biogas plant constructed after, for example, 5 years. In the 5 years following the construction of the biogas plant, the plant could gradually start receiving more SSOW and, finally, in the 11th year be in full operation on SSOW. Full operation on SSOW makes biogas facilities feasible even under Ukrainian economic and sanitary conditions.

2 **Project conclusions**

The study evaluated feasibility for: (1) a baseline scenario representing the present stage of waste collection with no source separation and MSW as the sole feedstock, and for (2) a transition scenario representing a future where source separation of waste is gradually implemented and the plant is operated first with a mixture of MSW and SSOW and finally with only SSOW.

Based on the financial assessment, the baseline scenario would not reach positive cash flow or break even during the twenty-year assessment period. However, the transition scenario would be financially feasible, and the cash flow calculation

shows that with the assumptions used the project would reach positive cash flow from the first year.

3 Impact on Human Rights and the project's Sustainable Development Goals (SDGs)

The introduction of a biogas system in the energy and waste management value chain has a positive impact on SDGs 7 Affordable and Clean Energy and 13 Climate Action. Biogas is clean energy with a positive environmental impact. It reduces the demand for black carbon-based fuels, such as traditional biomass and fossil fuels. The project positively impacts on human rights by supporting improvements in energy availability, infrastructure and living standards, ensuring environmental sustainability and energy security, so all consumers, including vulnerable groups, have access to affordable, reliable and modern energy services based on renewable fuels.

For the climate, biogas has positive impacts as it reduces GHG emissions when it replaces other energy sources. An additional impact, including reduced deforestation, is achieved when alternative feedstock, such as MSW, is used. With the right technological solutions, it also reduces MSW landfilled in dumpsites and contributes to circular economy targets.

The project contributes to the following SDGs:

4 Project deviations

During the assignment, it was decided to investigate also the potential application of a bio-drying plant to reduce MSW and the amount of waste sent to landfills. Using MSW as a feedstock, the amount of material is hardly reduced in the process and the digestate has to be discarded to landfill. An alternative solution to anaerobic digestion is the process of bio-drying, which is a biological aerobic process applied to MSW. Bio-drying corresponds to composting. The bio-drying plant output is a dry product that can be further refined.
Based on the feasibility study and financial assessment, the cash-flow calculations indicate that with the assumptions used the bio-drying case would reach positive cash flow during the twenty-year period.

5 Project lessons learnt

Lessons learnt

The project demonstrated the importance of biogas as a solution for using MSW and SSOW for the production of clean energy, while at the same time protecting the environment, and improving waste recycling and the sanitary conditions of the overall MSW process.
Biogas as a renewable and non-polluting energy source can greatly contribute to reducing GHG, as biogas plants have the potential to reduce the need for other traditional fuels.
The project also helped RADA to understand the applicable technical concepts for the implementation of a biogas facility and to select a realistic long-term project plan. The main issue is that source separation of waste is not an established practice in Ukraine and there are currently no examples of biogas production from MSW or SSOW, nor is there any unified regulation for using digestate from biogas plants as a fertiliser or soil improver. The solution for RADA had to be to combine the process with a few transition stages to ensure environmental, technical and economic benefits.

Benefits of the project

The project improved cooperation between Finnish and Ukrainian experts on the important clean energy topic of biogas. The project contributed to the following FUTF targets:
a. Consultation on policy – the FS study covered the importance and impact of source separation of waste, which is not an established practice in Ukraine. RADA and the municipality now understand better that source separation must be introduced in the future in Ukraine and the Kyiv region.
b. Consultations on the technological solutions – RADA had the chance to learn about the EU standards and approach to biogas project implementation.
c. An introduction to new technology helped RADA to select a realistic transition concept for project implementation.

d. Training and transfer of expertise and experiences in the biogas field and organised workshops that demonstrated how international funds are used to look at potential investment projects with the emphasis on the importance of an environmental audit.
Finnish content – Finland is highly experienced in source separation of MSW and the operation of biogas facilities. The project improved Finnish experts' understanding of the market conditions in Ukraine and opened opportunities for further cooperation.

Effectiveness of the project

The project was implemented successfully, and the project deliverables complied with the FS targets and the FUTF objectives, including promoting cooperation between Finland and Ukraine and identifying opportunities for projects. The project created additional opportunities for RADA to approach potential international investors. An international-level FS is a key document required by investors to establish a dialog on investment project financing. RADA's team increased its capacity to prepare the necessary documentation for investment project implementation.