

Measuring the potential of landfill biogas production in Ukraine for clean energy and environment

Project Background

Name of applicant	Melitopol City Council
Project Info/Project Name	Measuring the potential of landfill biogas production in Ukraine for clean energy and environment
Contractor	Doranova Oy
Project duration	December 2021 – September 2022
Contract value	€ 109,800.00

Project Summary

1 Project summary

This project demonstrated ground-breaking new technology developed by DST, a so-called 3D tomographic measurement technology that can be used to identify all biogas sources and total biogas production potential in landfills in Melitopol, Ukraine. A lack of knowledge of where collection infrastructure should be positioned limits biogas use and existing methods are economically infeasible. This project provided a concrete demonstration of how biogas sources can be identified from the surface, at low cost and with actionable accuracy, to boost local renewable energy production.

The project has provided detailed and actionable information about biogas potential in Melitopol landfills in Ukraine based on 3D tomographic images of material volumes inside the landfills.

The knowledge is useful for two reasons:

- 1) Abundant biogas formation in landfills is a risk factor, with flammable methane mixed with other harmful or toxic substances potentially being released.
- 2) With sufficient information about the amounts and locations of biogas in landfill, its release and use in energy production can be accurately controlled.

Results show the potential for significant amounts of landfill gas and possible areas for landfill gas collection with a high degree of accuracy. They also identify highly sensitive areas, where moisture levels are very high, indicating landfill leachate leakage into the ground water rather than the presence of methane gas.

2 Project conclusions

Biogas formation in landfills poses a risk for the potential release of flammable methane mixed with other potentially harmful or toxic substances. Landfill gas needs to be controlled, collected and used for energy. Landfill gas is a low-cost source of local renewable energy, and one that is direly needed to increase global energy independence. New approaches, such as the 3D scanning method tested, that can provide more information on the location of potential gas hot spots, offer economic, environmental and social benefits both locally and globally.

Sensitive areas can be detected using the Deep Scan Tech 3D scanning technology, which helps to provide sufficient detail about the amounts and locations of biogas generation in landfill to plan its controlled release, collection and use in energy production. A further environmental benefit is the substitution of fossil fuels for biogas, a renewable form of energy. Thus, the project can play a significant role in climate change mitigation.

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

The project contributes to the following SDGs:

1. No poverty – alleviating energy poverty by providing a local low-cost source of gas and boosting the local economy and employment.
2. Good health and well-being – reducing the risk of harmful emissions from landfills.
7. Affordable and clean energy – creating a local low-cost source of renewable energy.
8. Decent work and economic growth – creating local jobs in biogas collection and

energy production.

9. Industry, innovation and infrastructure – boosting local energy industry and infrastructure with the use of innovative measurement technology.

11. Sustainable cities and communities – improving cities’ landfills and energy infrastructure.

13. Climate action – providing a source of renewable energy and reducing uncontrolled methane emissions from landfills.

17. Partnerships for the goals – creating a partnership spanning Finland and Ukraine and private and public sector actors to advance the goals listed here.

Overall, the project positively impacts the following SDGs:



4 Project deviations

No significant deviations over the course of the project.

5 Project lessons learnt

Lessons learnt

The ability to successfully collect biogas from landfills depends on the ability to locate the most productive areas. In landfill conditions, it is critical to identify existing hotspots for methane production and where they might develop in the future based on local material contents and conditions such as humidity and temperature. The process of analysing biogas production potential is greatly improved when 3D tomographic images of the internal structure of the landfill, quickly produced from the surface, are available for planning climate mitigation measures.

Benefits of the project

This project was a technology demonstration case, which provided successful and useful results that identify landfill methane pockets. This project has demonstrated the use of electric tomography technology on location in Ukraine. The same approach can be replicated and scaled up for use in all landfills – not only in Ukraine but worldwide. The project has also demonstrated the economic feasibility of a non-invasive method of gas exploration, the cost of which is projected to be well below the profitability threshold for energy producers looking for sources of biogas.

Effectiveness of the project

The project was implemented successfully and the project deliverables met both the FS targets and FUTF objectives, including promoting cooperation between Finland and Ukraine and identifying project opportunities.

Given that globally, landfills represent the third largest anthropogenic source of methane, a very potent greenhouse gas, there are significant potential environmental benefits of applying the novel scanning method for landfill gas exploration, monitoring and optimisation of production.