



LANDFILL GAS – FROM GREENHOUSE GAS EMISSIONS TO GREEN ENERGY

Case study from Melitopol landfill, Ukraine

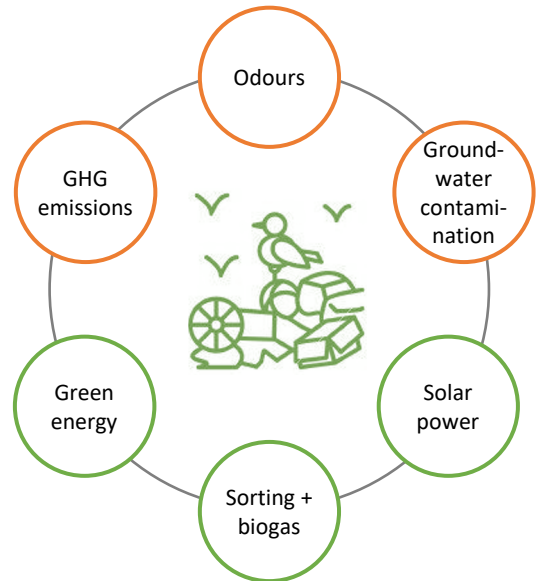
Green energy from landfills

Landfills cause environmental pollution such as greenhouse gas emissions, odours, groundwater contamination and nuisance to nearby properties.

With appropriate technologies the majority of the pollution can be managed, prevented and turned into business opportunities.

Energy production from landfill gas (LFG) is among the best ways to reduce methane emissions in a profitable way.

Instead of escaping into the air, LFG can be captured, converted, and used in renewable energy production.



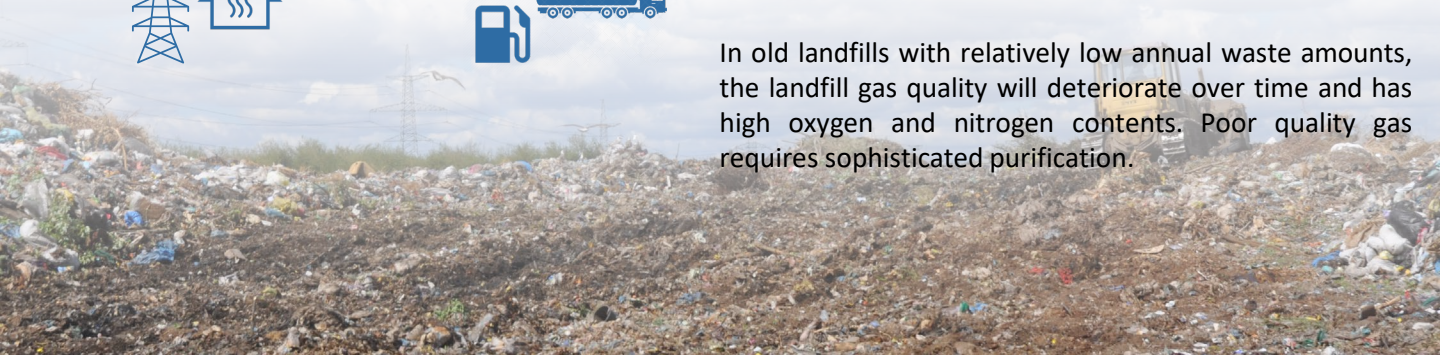
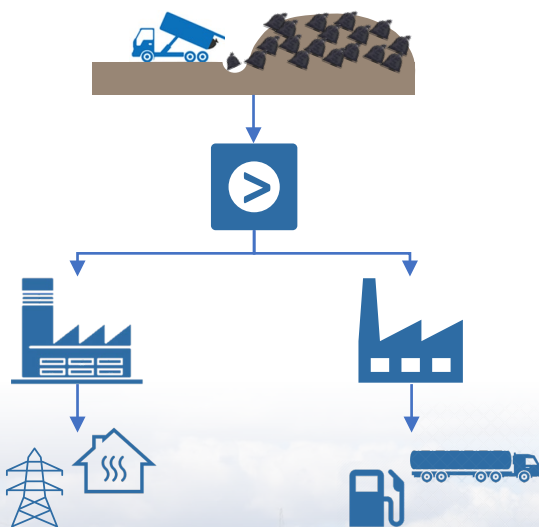
Landfill gas in brief

The conversion of organic waste to LFG (methane and carbon dioxide) is conducted by micro-organisms.

LFG is a natural by-product of the decomposition of organic material in landfills and composed of roughly 40-60% methane and 40-60% of carbon dioxide (CO₂). Methane is a potent greenhouse gas With a 100-year global warming potential and 28 to 36 times more harmful than CO₂.

LFG can be extracted from landfills by covering the landfill with proper materials, building gas collection wells and transport pipelines. The pumped gas can be utilised in electricity or heat generation. Good quality gas can also be purified for vehicle usage.

In old landfills with relatively low annual waste amounts, the landfill gas quality will deteriorate over time and has high oxygen and nitrogen contents. Poor quality gas requires sophisticated purification.

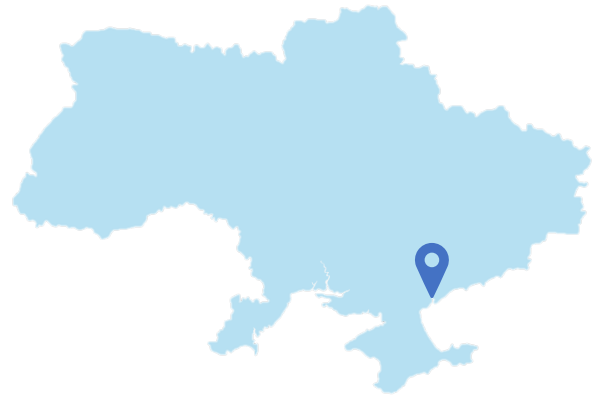


Development case: Melitopol landfill

Melitopol city is located in South-East Ukraine and is the administrative centre for the Melitopol district of the Zaporozhye region.

Population of the city is 154,840 inhabitants.

Melitopol landfill is situated 15 km south from Melitopol city. It currently serves about 200,000 residents including Melitopol and surrounding villages. It is the only landfill in the region and started operations in 1960's. Landfill receives municipal solid waste (MSW) and construction waste.



15 hectares of waste fill

~45 000 tonnes of MSW annually

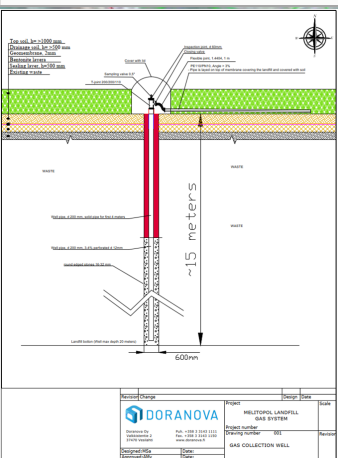
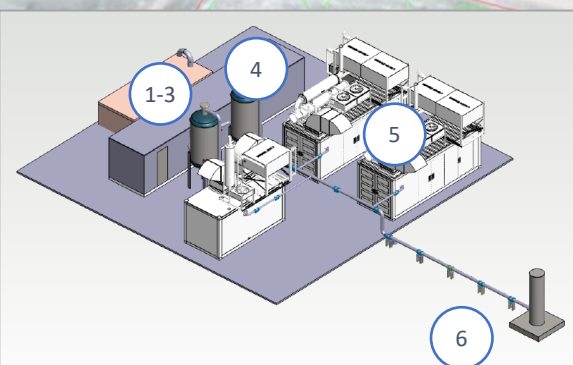
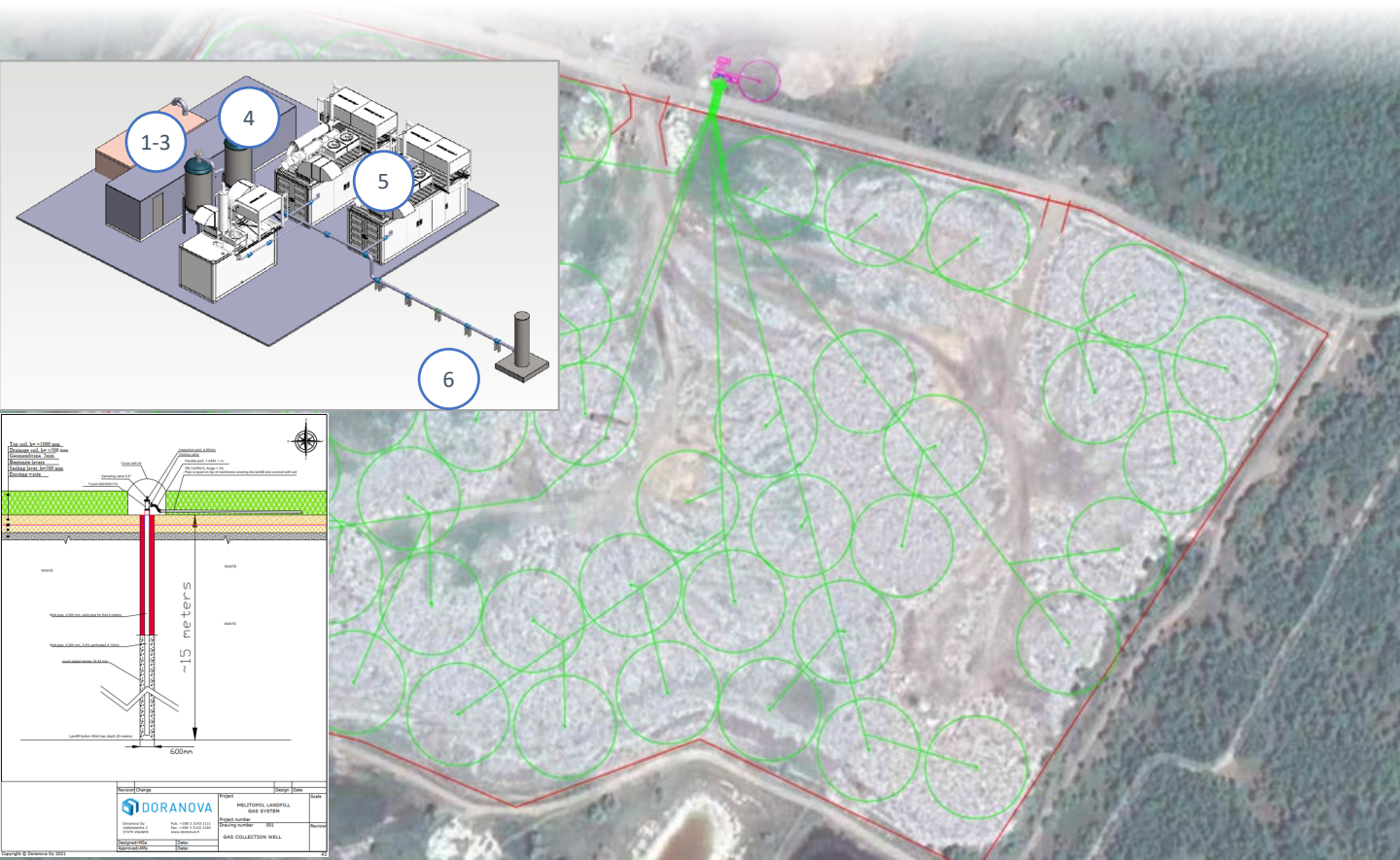
~4 million tonnes of MSW in total

20-30 % of food waste

1. Collection
2. Drying & Pressurisation
3. Quality analysis
4. Filtration
5. Combined heat and power (CHP) units
6. Flare

On landfills with long history and relatively low annual waste amounts, the importance of efficient gas collection wells and proper surface layers increases.

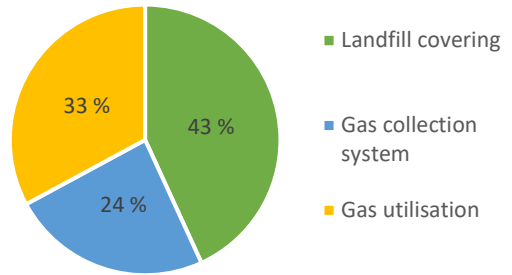
LFG collection wells are either horizontal or vertical. Vertical wells have an impact radius of ~25 meters. Thus to cover the full area, 50 wells are needed. Wells are connected to gas infrastructure (i.e. CHP units) with pipes.



LFG simulations combined with degasification tests executed on landfill indicate that gas extracted from Melitopol landfill can power 600 kW CHP unit. Annual electricity production would be close to 600 MW. Additionally, a same amount of heat can be produced for heating purposes.

A total investment of EUR 3 million is required to build a state-of-the-art LFG facility to Melitopol. With green electricity tariffs, the payback time is close to 10 years.

Breakdown for the EUR 3 million investment



Impact summary for Melitopol landfill



582 MW/annually of green electricity



25,000 tonnes of CO₂-eqv/a reduction



Less odours and leachate water emissions

Future of waste management

LFG capturing and utilisation is one of the first steps on the road to sustainable waste management.

If waste production cannot be prevented, reusing, recycling and waste utilisation should be maximised.

With the integration of municipal solid waste (MSW) sorting, reusing, recycling, advanced biogas production and incineration of the remaining waste fractions, the total carbon footprint of the waste management can be minimised.

