Mitigation Activity Idea Note

Landfill Gas Capture & Utilization — Ukraine

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UKRAINIAN CLIMATE OFFICE

This document is one in a series of concise, public-facing briefs to help potential actors understand selected mitigation options observed in Ukraine's evolving carbon-market landscape. Each MAIN follows a consistent format covering the activity description, technologies, expected impact, financing and carbon-market applicability, and key risks. MAINs are generic archetypes: they do not endorse or name specific companies, technologies or locations. See the MAINs overview page for the full set.

Project Description

ACTIVITY OVERVIEW

The proposed project involves retrofitting an active municipal landfill with a gas-capture system for landfill gas (LFG). The retrofit will include installation of vertical and / or horizontal gas-extraction wells, collection headers, condensate management systems, a blower / compressor station, and a flare station (or, where technically and economically viable, a gas engine or boiler for use of the captured gas to produce electricity and / or heat). The primary mitigation objective is to abate methane emissions, a potent greenhouse gas, by capturing the gas that would otherwise migrate to the atmosphere and oxidising (via flare) or utilising it, and secondly to improve local air-quality conditions (reducing odours, volatile organic compound emissions, fugitive gas escape) around the landfill site.

IMPLEMENTATION SCHEME

The implementation begins with gas-potential testing (measuring methane concentrations, flow rates, vacuum response in test wells). Based on test results a staged well-field expansion is planned (**phase 1**: pilot wells; **phase 2**: full well-field). The flare or blower / compressor station will be commissioned once collection is sufficient; if thermal / electric use is viable then a gas engine-generator or boiler will be added. Continuous metering of gas collected, gas composition, condensate, and flow to flare / use equipment will be installed. Odour control and environmental monitoring (air quality, groundwater / leachate monitoring, soil gas) will be incorporated throughout. A community engagement and communications plan will also be implemented to inform local stakeholders.

OWNERSHIP & GOVERNANCE

The project may be implemented either by the municipality owning the landfill, or via a public–private partnership (PPP) or special purpose vehicle (SPV) created for the project. Transparent revenue-sharing agreements will be established for any electricity and heat offtake, and for any carbon credits generated by the project. All necessary environmental permits will be obtained from Ukrainian authorities and the local community relations plan will include regular updates, grievance mechanism and stakeholder consultations.

STAKEHOLDERS

Key stakeholders include: the municipal waste operator (owner of the landfill), engineering-procurement-construction (EPC) contractor or technology provider, the offtaker(s) for electricity or heat (e.g., municipal services or local industry), financiers (debt or equity providers), and an independent verifier to audit gas collection and emissions monitoring. Additional stakeholders include regulator(s), local municipality government, and civil society / community groups living near the landfill.

LOCATION

The projects are to be located at municipal landfills across Ukraine which currently lack active gas-control systems. Siting will respect safety setbacks, gas-migration pathways and local land-use conditions (e.g., residential proximity, groundwater sensitivity). The selection will prioritise older landfills with high estimated gas generation potential yet low collection efficiency.

STATUS

The project is at the scoping / pre-feasibility stage. The next step is to proceed to detailed design following gas-potential testing and permit applications.

Technologies / Solutions

The well-field design will consider spacing and depth of wells based on landfill size, age of waste, waste composition and expected gas generation curves. Condensate traps will remove liquid water from the gas stream to prevent corrosion and ensure flare / engine reliability. An enclosed high-temperature flare will be installed to oxidise methane (CH_4) into carbon dioxide (CO_2) and water, thereby reducing the global-warming potential (GWP) of the emitted gas. A blower / compressor station will draw gas from the well-field into the header system. If viable, a gas engine (genset) or boiler will convert the gas into electricity and / or heat, thereby displacing grid electricity or other heat fuels. A Supervisory Control And Data Acquisition (SCADA) system will monitor and control operations. A Continuous Emissions Monitoring System (CEMS) may be required to measure emissions at the flare and ensure compliance with regulatory limits.

MITIGATION LEVER

The mitigation levers are: (a) direct methane capture and destruction or use (thus avoiding methane's high GWP effect); and (b) indirect reductions by displacing grid electricity or heat fuel (thereby reducing CO_2 emissions associated with that grid or fuel). Methane, the primary constituent of LFG, has approximately 28-34 times the GWP of CO_2 over 100 years, so capturing methane yields strong emission-reduction benefit.

Expected Impact

The annual emission-reduction potential varies significantly depending on site characteristics (age, waste composition, historical disposal rate, previous gas release). Key performance indicators to publish include: annual flare operating hours, methane concentration of collected gas, destruction efficiency of flare (typically > 98 %), volume of gas utilised in engine / boiler, and grid-electricity or fuel offset achieved. Independent audits will verify these data.

CO-BENEFITS

In addition to greenhouse-gas (GHG) mitigation, the project will reduce odour nuisances, improve vector (insect / rodent) control, enhance landfill-site safety (by reducing subsurface gas accumulation and off-site migration), and may provide electricity / heat for municipal services (improving energy reliability). The project also supports the transition of Ukraine's waste-management sector toward higher environmental performance.

Financing and Applicability to Carbon Finance

COST PROFILE

The capital expenditure (CAPEX) includes well-field drilling / installation, collection header piping, blower / compressor, the flare or engine / boiler, metering and control systems. Operation expenditure (OPEX) covers maintenance, condensate disposal, power for compressors, routine environmental monitoring, reporting, verification and compliance fees. Key barriers include variable gas-flow rates (especially in older landfills), regulatory permitting delays, uncertain tariffs or offtake for electricity / heat, and uncertain carbon-credit revenue. Enablers include carbon-finance revenue for methane abatement, concessional financing (grants or low-interest loans) and PPP models leveraging municipal infrastructure.

CARBON POSITIONING

The project is under certain circumstances a candidate for methane-avoidance crediting under the Paris Agreement- Article 6.4 Mechanism (also called the Paris Agreement Crediting Mechanism, PACM). Under Article 6, methodologies (systematic approaches to quantify emission reductions) are being developed and approved by the Article 6.4 Supervisory Body (SBM). For a landfill-gas capture / use project, the methodology aligned with the A6.4 standard was as first PACM methodology adopted in October 2025 under the name *A6.4-AMM-001: Flaring or use of landfill gas*[1]. The carbon-market mechanism can act as a financial bridge: it mobilizes revenue from sale of emission-reduction credits to help accelerate project implementation, thus aligning the sector with ambitious national and EU-standard waste- and emissions-policy goals ahead of full regulatory enforcement.

Risks and Challenges

Major risks include declining feed gas flow over time (as waste decomposes), handling of condensate (liquid extracted from gas stream) which must be disposed or treated, community acceptance (e.g., odour or flare noise concerns), and downtime of flare or engine equipment (leading to uncontrolled emissions). Mitigation measures include phased well drilling (to match gas production), redundant systems (back-up blower / compressor), robust condensate management system, proactive stakeholder engagement (community consultations, grievance mechanism), and preventive maintenance schedules.

From the regulatory context of Ukraine: although the new Law of Ukraine on Waste Management (No. 2320 IX) adopted 20 June 2022 came into force 9 July 2023 and introduces the waste-hierarchy, extended producer responsibility and planning systems.[2] Ukraine's reform aims to align with EU waste directives including prohibition of operating landfills lacking biogas collection by 2030.[3] However, enforcement remains challenging in Ukraine due to infrastructure deficits, institutional capacity and ongoing conflict. The war adds particular uncertainty to permitting, investor confidence and institutional stability. For carbon-credit projects the challenge is securing a host-country decision to authorize credits under Article 6.4, and maintaining monitoring and verification in a difficult operational environment.

1. https://unfccc.int/sites/default/files/resource/A6.4-SBM019-A02.pdf
2. https://www.tuv.com/regulations-and-standards/en/ukraine-the-law-of-ukraine-no-2320-ix-on-waste-management-of-june-20-2022.html
3. https://cms-lawnow.com/en/ealerts/2023/05/ukraine-initiates-waste-management-reform

Implementation Roadmap

(18–30 months)

Month 0–6

Conduct gas-potential testing (pilot wells), perform concept design of well-field and gas collection system, initiate environmental and permitting process (including alignment with Ukraine's waste-management law, local authority consultation, grid / heat offtake engagement).

Month 7–18

EPC (engineering-procurement-construction) of well-field, gas-collection headers, blower / compressor station and flare / engine. Commission the flare, validate gas-collection performance, perform compliance testing.

Month 19–30

Optimise operations, integrate energy utilisation (electricity / heat) with municipal services or grid if viable, carry out verification of performance (gas volumes, methane destruction / destruction efficiency) and if pursued, register the emissions-reduction activity under a suitable A6.4 methodology, generate carbon credits, and channel revenue to accelerate further expansion or replication.

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