

# Methane Emissions from the Waste Sector, and Mitigation Levers



## Information Note

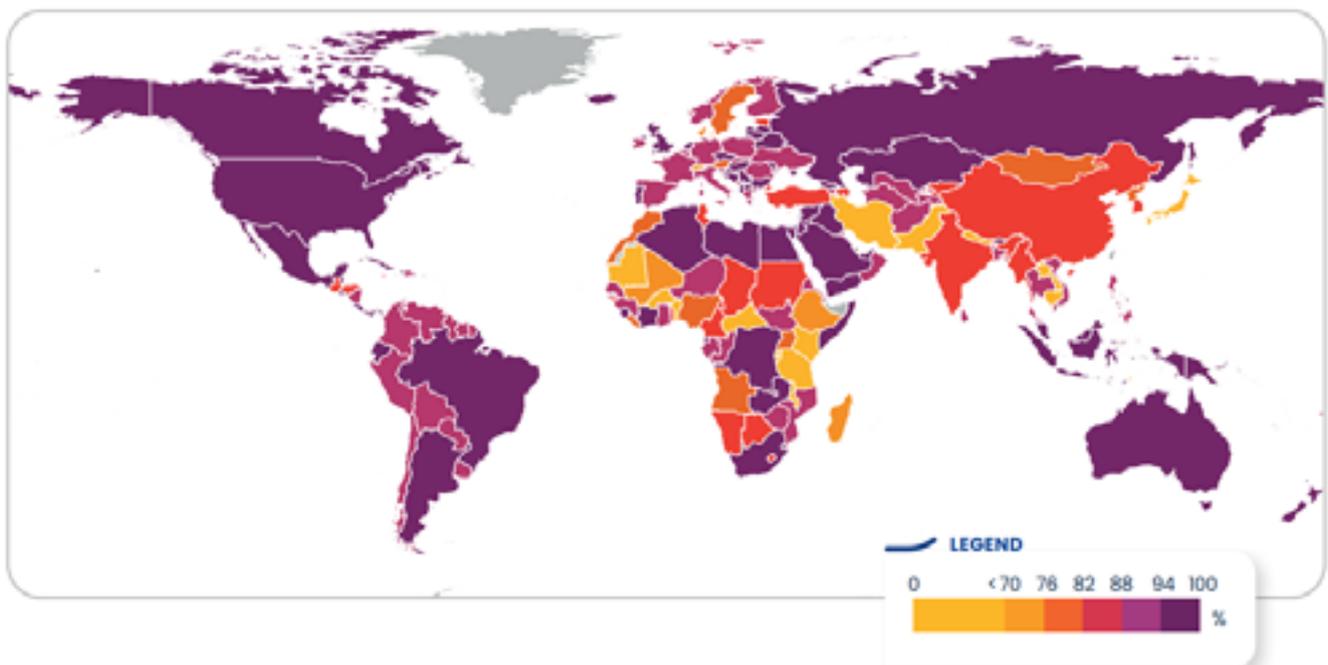
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### Methane and the waste sector

Methane ( $\text{CH}_4$ ) is a powerful Greenhouse Gas (GHG) and a short-lived climate pollutant (12 years on average). Its global warming potential is 84 times greater than that of  $\text{CO}_2$  over a 20-year period and 28 times greater over 100 years (FSWP et al. 2025). Despite increased international attention to this issue, atmospheric methane concentrations have more than doubled since the pre-industrial era and continue to rise (UNEP and CCAC 2021).

Methane emissions come from both natural and anthropogenic sources. According to recent estimates, approximately 60% of methane emissions are human-induced (Idem.). The waste sector accounts for approximately 20% of these global emissions, or about 68 Mt  $\text{CH}_4$ /year, behind agriculture (40%) and the fossil fuel sector (35%) (Idem.).

Global GHG emissions from the waste sector are largely dominated by methane, as shown in **Map 1** (FSWP et al 2025). These represent approximately 90% of total emissions from the “waste sector” (UNEP 2017), as defined by the IPCC, which does not account for emissions from energy recovery – accounted for under the “energy sector”.



**Map 1:** Contribution of methane emissions to total emissions from the “waste sector” in %

Source: FSWP et al. (2025), p. 17.

Reducing methane emissions from the waste sector should be a priority and would have a direct and rapid impact on climate change, helping to limit short-term warming while generating co-benefits for air quality, health and the environment.

## The source of methane emissions from the waste sector

Methane emissions come from the decomposition of organic matter under anaerobic conditions, i.e. in the absence of oxygen (FSWP et al. 2024). Organic waste (food waste, green waste, paper/cardboard, wood, etc.) decomposes in the absence of oxygen and produces «landfill gas», composed mainly of CH<sub>4</sub> and carbon dioxide (CO<sub>2</sub>) which leaks into the atmosphere if no capture measures are put in place (FSWP et al. 2024).

## The main levers for reducing methane emissions from the waste sector

Reducing methane emissions from the waste sector requires improving organic waste management, following the internationally recognised waste management hierarchy and the principles of Environmentally Sound Management (ESM) of waste, defined by the Basel Convention guidelines (HWP 2023). Priority should be given to upstream action (reduction and prevention of waste), followed by sorting at source for separate treatment, and finally improving the operating practices of engineered landfills. These main levers are detailed below.

### Reducing food and organic waste production (upstream)

This involves limiting the amount of organic matter entering the waste management system, in particular by reducing food waste during production (overproduction), distribution (unsold items) and consumption (food waste). Less organic waste produced means fewer methane emissions.

### Generalise sorting at source and separate treatment of organic matter

Implementing sorting at source of the organic waste stream, followed by specific treatment with low GHG emissions, would significantly reduce the amount of organic waste sent to landfill and optimise its material and energy recovery. There are two biological treatment systems specific to organic waste that produce low methane emissions (Bogner et al. 2007):

- **Composting of organic and green waste** involves transforming the organic fraction of waste into fertiliser or compost that can be used in agriculture, in green spaces or by individuals to enrich their soil. This method requires effective sorting at source, but when properly implemented, it transforms waste into a useful resource for agriculture and individuals. The key point to watch out for is the quality of sorting to avoid diffuse pollution by the spreading out of compost on the soil.
- **Methane production (or anaerobic digestion)** is a process that breaks down organic matter in anaerobic (airless) conditions. This results in the production of **biogas** (CH<sub>4</sub> and CO<sub>2</sub>) and a liquid residue called «**digestate**». Biogas can be recovered in the form of heat, electricity and biomethane when purified. Digestate, when produced from high-quality sorting at source, can be used as fertiliser or soil amendment in agriculture (Ademe 2023).

For cardboard and wood, **material recycling schemes** can be set up for the non-polluted fraction to manufacture recycled cardboard and particle board. These channels impose strict specifications on the accepted waste, which are necessary for the quality of the recycled products. Such schemes also produce waste rejects from the treatment processes.

For the rejected fraction of these schemes, energy recovery in wood-fired boilers, in Refused Derived Fuel (RDF) manufacturing facilities or in Waste-to-Energy (WtE) facilities producing heating and electricity for cities, avoids the landfilling of residual organic materials. When energy recovery is not possible for various reasons (cost of facilities, energy market), the rejected fraction must be landfilled in engineered landfills that comply with ESM.

## Apply good landfill practices to minimise methane emissions from landfills

For organic waste destined for landfill, a major reduction lever is to improve the management and operational practices of engineered landfills. These practices minimise methane emissions into the atmosphere and provide an opportunity to recover biogas as a source of heat, electricity or biomethane when purified (FSWP et al. 2024).

These best practices are the following:

1. Stabilising fermentable organic matter to limit methane emissions in the very short term, before the landfill gas capture system is put in place (composting or anaerobic digestion for contaminated waste that cannot be used as soil amendment);
2. Implementing an early capture system during the operational phase;
3. Quickly install a final cover and a capture system, using an impermeable cover;
4. Operate in bioreactor mode, maintaining optimal humidity to accelerate methane production once the capture system is in place;
5. Provide adequate maintenance and monitoring;
6. Improve the recovery of methane in the captured gas;
7. Treat residual methane emissions throughout the waste decomposition process (Lair et al. 2024)

The implementation of these best practices could capture approximately 80% of the methane produced over a period of fifty years. The remaining 20% escapes into the atmosphere (Idem.). Recovered landfill gas can be:

- **Flared**, which converts  $\text{CH}_4$  into biogenic  $\text{CO}_2$  and reduces the short-term climate impact,
- **Used** after purification into biogas to produce heat or/and electricity via cogeneration engines,
- **Purified** into biomethane to be injected into natural gas networks as a substitute for fossil fuels (CCAC, n.d.).

### We call for ...

... Full recognition and integration into international climate discussions of the waste sector, and in particular its potential for rapid methane emission reduction. This means giving it a stronger place in initiatives and negotiations on methane and including quantified targets for ESM of waste in Nationally Determined Contributions (NDCs). By strengthening the place of the waste sector in the global climate agenda, states and international institutions can achieve rapid emissions reductions while generating major co-benefits for health and the environment.

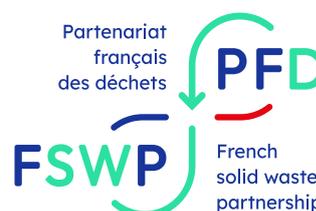
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