

Biogas in the UK: potential risks and how to prevent them

March 2026

Background

Methane is a potent greenhouse gas, around 80 times more powerful than CO₂ over short periods (ie around 20 years). It has already driven approximately half a degree of global warming. In the UK, agriculture and landfill sites are responsible for 55 and 31 per cent of methane emissions respectively, largely from cow burps, stored slurry and decomposing organic waste.¹ Cutting these emissions, or capturing the methane before it escapes, is critical to meet the targets of the Global Methane Pledge, of which the UK is a signatory.²

The UK also relies on fossil gas, which provided 37 per cent of the country's energy in 2024.³ Dependence on fossil gas is estimated to add around £300 per year to the average household energy bill.⁴ While gas will remain an important energy source for heating homes, powering industry and hard-to-electrify sectors, the government is looking for ways to decarbonise the gas grid and boost energy self-sufficiency.

Biogas and its purer form, biomethane, are produced by the anaerobic digestion (AD) of slurry, food waste and crops. They have a dual benefit: capturing methane emissions by diverting organic waste into sealed AD tanks instead of allowing it to decompose openly, while providing a lower carbon alternative energy source to fossil gas. While biogas is unlikely to completely replace fossil gas, the Green Gas Support Scheme (GGSS) is providing the incentive to increase production.⁵

However, although preferable to fossil fuel, biogas is not without risk. Weak safeguards could increase methane leakage, ammonia pollution and pressures on the land, particularly from energy crops, undermining its environmental benefits.

In this briefing, we examine the risks of expanding the GGSS and recommend how to ensure using biogas leads to real climate and environmental benefits, including mandating leak detection and AD plant

repairs, maintaining or strengthening the 50 per cent cap on using energy crops as feedstock, exploring the use of energy cover crops and clarifying the guidance on digestate management.

This briefing is intended for decision makers with an existing knowledge of biogas and biomethane. For a general introduction, see our companion briefing [‘Biogas in the UK explained’](#).

The risks of biogas production

1. Methane leaks

Problem

Biogas production can reduce methane emissions compared with untreated slurry or landfill waste, as the gas is captured and stored. However, AD is not free of methane leaks: emissions can occur across the process, including from digesters, when upgrading equipment and in storage and gas handling infrastructure. Studies have estimated between one and 13 per cent of the methane generated at AD sites may be lost through leakage, with on-farm plants particularly prone to higher and poorly detected emissions.^{6,7}

Leaks are especially concerning when energy crops are the feedstock, as they are effectively additional, unlike leakage from slurry or landfill waste that would have occurred anyway.

Given methane’s high short term global warming potential, even small losses can significantly diminish the climate benefits from biogas production. If biogas were to supply 120TWh of energy to the gas grid by 2050, as is proposed, our analysis suggests methane leakage could reach around 418kt per year, nearly twice the UK energy sector's recorded methane emissions in 2020.⁸

While UK regulations require waste-fed AD operators to manage their fugitive emissions, operators that do not handle waste product and use purpose grown crops for feedstock are exempt from leak detection and repair (LDAR) requirements. In addition, the GGSS does not mandate LDAR, set leakage limits or require routine monitoring and reporting.

Mitigation

Leaks can be substantially reduced through regular LDAR programmes, involving routine monitoring and prompt repair of equipment. Evidence from EU monitoring programmes suggests that robust LDAR requirements, combined with best available technologies and good operational practices, can limit leaks to around 0.5 per cent of production.⁹

2. Ammonia pollution

Problem

Ammonia is a major pollutant, driving nitrogen deposition that damages land and water ecosystems. Around 84 per cent of sensitive habitats in the UK exceed critical nitrogen loads, ie the threshold beyond which habitat conditions start to decline.¹⁰ Ammonia also contributes to the formation of fine particulate matter (PM2.5), a harmful air pollutant which increases rates of respiratory and cardiovascular disease.

Ammonia is released during the AD process as microorganisms break down nitrogen-rich organic feedstocks. Emissions depend on the feedstock's nitrogen content, as well as the pH and temperature. Spreading resulting digestate as a fertiliser is another way ammonia is released into the environment and can lead to pollution. However, assessing its net impact on pollution is complex as digestate can replace synthetic fertiliser which also generates emissions. As a result, the impact depends on how much synthetic fertiliser is displaced and the specific practices of digestate use of each farm.

Ammonia emissions from AD have doubled over the past decade and now account for eight per cent of all UK emissions of this pollutant, and these are projected to rise to 11 per cent by 2030.¹¹ Without stronger controls, expanding biogas production could undermine UK air quality and biodiversity targets.

Mitigation

Effective mitigation measures exist across the digestate lifecycle. During storage, tanks can be covered to prevent ammonia loss. At the land application stage, low emission spreading techniques such as trailing shoes can be used to limit the digestate's exposure to the air, alongside nitrification inhibitors. The Clean Air Strategy commits to all digestate storage being covered by 2027 and a wider uptake of low emission spreading, but the targets are not binding and enforcement is weak.

Upstream measures can also reduce emissions. Acidifying high nitrogen feedstocks, such as slurry, lowers pH and can significantly reduce ammonia formation, as demonstrated in Denmark. While the GGSS requires AD plants to seek reductions in ammonia emissions, support and guidance on methods is limited.

3. Use of energy crops as feedstock

Problem

UK biogas is produced from a mix of food waste, agricultural residues and purpose-grown energy crops. Under the GGSS, up to 50 per cent of feedstock used in any given AD plant may come from crops grown for the purpose. This raises concerns about land use competition with food production and nature. In 2023, around 2.2 per cent of English arable land was used for bioenergy crops.¹² Phasing out crop-based biofuels across the UK could free up enough land to grow grain that would feed 3.5 million people annually.¹³

Growing maize, one of the leading energy crops, poses particular risks, including high fertiliser use, nitrate leaching and soil degradation.¹⁴ The UK biomass strategy discourages the expansion of maize grown for energy, but its cultivation continues as it is difficult to distinguish it from that grown for livestock feed.

Mitigation

Energy cover crops, grown in the intervals between food crops when farmland would otherwise be bare, have been proposed as an alternative. Traditional cover cropping reduces nitrate leaching and improves soil structure. In principle, using cover crops as a feedstock for AD could provide biogas without directly displacing food production, although there are still risks associated with the additional methane emissions from using dedicated energy crops.¹⁵

Harvesting cover crops for AD removes biomass that would otherwise replenish soil organic matter, which is likely to reduce soil benefits. Energy yields are also uncertain and likely to be lower than maize. It is unclear whether this is a viable large scale alternative, and further trials are needed.

Although the GGSS requires at least 50 per cent waste-based feedstocks, proposals to relax this cap risk increasing pressure on land needed for food and nature.

4. Creating 'lock-in'

Problem

Incentivising biogas production may create long term 'lock-in' that reinforces existing high carbon industrial, agricultural and waste systems, rather than supporting a shift to more sustainable models.

- **Manure as feedstock:** subsidies for manure used to create biogas could risk entrenching the current level of livestock farming, at a time when the Climate Change Committee (CCC) recommends reducing cattle and

sheep numbers by 38 per cent by 2050.¹⁶ Our analysis found that additional income from selling manure for biogas could raise a dairy farmer's income per cow by around six per cent.¹⁷ At current rates, these revenues are unlikely to drive significant expansion of livestock numbers, and it could offer a modest supplementary income for farms with narrowing margins.

- **Food waste as feedstock:** incentives for using food waste as feedstock may unintentionally discourage reduction and composting, conflicting with the CCC's recommendation to halve per capita food waste by 2030. While AD can capture methane from organic waste, it does not eliminate upstream emissions associated with producing food that is then wasted, nor the downstream emissions if AD is incomplete. As such, even if most remaining food waste were used for AD, preventing and reducing waste at source is more effective at lowering total greenhouse gas emissions.
- **Infrastructure risks:** investment in large scale AD plants to produce biogas that is upgraded to biomethane risks creating stranded assets. Biomethane is a transitional fuel, but new infrastructure may outlast its role as the energy system moves to low carbon renewable sources. The long term role of gas networks is unclear.

Mitigation

Policy must ensure biogas incentives do not reinforce high waste volumes. This should include aligning biogas incentives with waste reduction targets and introducing time-limited subsidies to ensure they do not encourage long term increases in waste generation.

Policy recommendations

While biogas (including biomethane) can be a lower carbon alternative to fossil gas, more support to encourage it must be paired with tighter regulation and better monitoring to ensure genuine climate and environmental benefits. We recommend the following:

1. Introduce mandatory leak detection and repair (LDAR) requirements for all AD plants, with clear leakage thresholds in operating permits in the GGSS

Methane leakage undermines the climate case for biogas. Making LDAR a condition of permitting, supported by regular monitoring, reporting and independent verification, would ensure consistent standards across the sector. Setting a maximum allowable leakage rate would protect the integrity of biomethane as a low carbon fuel.

2. Maintain or lower the 50 per cent cap on purpose grown crop-based feedstocks and prioritise genuine waste streams, while accelerating efforts to divert organic waste away from landfill

To avoid incentivising the use of land for energy crops, the Green Gas Support Scheme should continue to require that at least half of all feedstocks come from unavoidable waste, such as food waste, slurry and manure. Strengthening policies that divert organic matter from landfill, through local authority collection reform, clearer waste separation rules and enforcement, will help to drive genuine waste reduction rather than crop expansion.

3. Explore the use of energy cover crops rather than purpose-grown energy crops

The potential impacts and benefits of using energy cover crops as an alternative to dedicated energy crops are not yet fully understood. As such, the government should commission or undertake research to determine whether these crops would produce sufficient energy as a biogas feedstock without competing with food production.

4. Provide clear regulatory guidance on digestate application and expand support for ammonia-reduction technologies

The Department for Environment, Food and Rural Affairs (Defra) should introduce binding standards for digestate storage and application, supported by monitoring and enforcement in its Code of Good Agricultural Practice. This could be combined with more financial support for proven ammonia reduction technologies, such as acidification and low emission spreading equipment, through the Capital Grants Programme.

Authors: Matilda Dunn, Chris Clark and Liam Hardy

For more information, contact:
Matilda Dunn, Policy Analyst
mdunn@green-alliance.org.uk

Endnotes

- ¹ R Allen, M Dunn and L Hardy, 2025, *The climate emergency brake: an ambitious plan to cut UK methane emissions*, Green Alliance
- ² HM Government, October 2025, 'The UK's Methane Action Plan',
- ³ Department for Energy Security and Net Zero (DESNZ), 18 December 2025, 'Energy trends'
- ⁴ Energy and Climate Intelligence Unit (ECIU), 10 October 2025, press release, 'Price cap: gas price still adding £300 a year to energy bills'
- ⁵ Changing Markets, 2025, *Biogas in the EU: a policy and financial analysis*
- ⁶ S Bakkaloglu, J Cooper, A Hawkes, 2022, 'Methane emissions along biomethane and biogas supply chains are underestimated', *One Earth*, 5 (6), 724–736
- ⁷ N Howes et al, April 2023, *Methane from anaerobic digestion (MEAD) study*
- ⁸ The Green Gas Taskforce target of 120TWh yr^{-1} of biomethane injection by 2050 was converted to kt CH₄ using a lower heating value of 13.9 kWh kg^{-1} . Assuming biomethane contains 97 per cent methane by volume, this corresponds to 8,374kt CH₄. Methane leakage was estimated by applying a leakage rate of five per cent (the median leakage reported by [N Howes et al, 2023](#)) to the total methane generated. Resulting emissions are reported in tonnes of CH₄.
- ⁹ O Hurtig et al, 2025, 'Mitigating biomethane losses in European biogas plans: a techno-economic assessment', *Renewable and sustainable energy reviews*, 210.
- ¹⁰ Joint Nature Conservation Committee (JNCC), 2025, 'Air pollution: area affected by acidity and area affected by nitrogen'
- ¹¹ National Atmospheric Emissions Inventory (NAEI), 2025, 'Air pollutant emissions data' from 'Annex IV: projected UK emissions for 2025-2050'
- ¹² Department for Environment, Food and Rural Affairs (Defra), 11 September 2025, 'Bioenergy crops in England and the UK 2008-2023'
- ¹³ D Benton, 2022, 'Food security and UK crop-based biofuel use: selected analysis in support of a limit to crop-based inputs', Green Alliance
- ¹⁴ Soil Association, 2015, *Runaway maize: subsidised soil destruction*
- ¹⁵ C Launay et al., 2022, 'Incorporating energy cover crops for biogas production into agricultural systems: benefits and environmental impact. A review', *Agronomy for sustainable development*, 42, 5
- ¹⁶ Climate Change Committee (CCC), 6 February 2025, 'The seventh carbon budget: advice for the UK Government'
- ¹⁷ Milk income was calculated assuming an average annual yield of [8,000 litres per dairy cow](#) and a farmgate milk price in October 2025 of [£0.48 per litre](#). Slurry income was estimated assuming one dairy cow produces [22 tonnes of slurry](#) per year. Each tonne of slurry produces [15 m³ of biogas](#), equating to 342 m³ with an energy content of 1,917kWh per cow per year. At a wholesale gas price of [£0.06 per kWh](#), this would generate around £115 of additional income per cow per year. Costs per cow were estimated on the assumption that the average dairy farm has [216 cows](#) and data from [Defra's farm business dataset](#) that livestock costs for the average dairy farm are £407,300 per year, estimating at £1,885 per cow per year.