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Biogas Insight 1

Delivering the Global Methane Pledge

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Methane has contributed half of global warming to date. Methane action is absolutely critical if we have a hope of keeping our climate goals within reach and preventing the most disastrous impacts of climate change. That's why President Biden and President von der Leyen launched the Global Methane Pledge at COP26 in Glasgow with the goal of reducing global methane emissions by at least 30% below 2020 levels by 2030. The Pledge now has over 120 partner countries and is beginning to making substantial progress on implementation to be announced at COP27.

Biogas has an important role to play both in methane reduction and in providing a source of energy to rival fossil fuels. Manure and organic material in agriculture contributes 3% of global methane emissions while solid waste and wastewater contribute 10% each. Producing biogas via anaerobic digestion is a promising solution to reduce a significant percentage of these emissions as well as the nitrous oxide and

carbon dioxide emissions that also come from these organic wastes. Based on current estimates, the world is only tapping into 1.6–2.2% of the total potential for anaerobic digestion. However, thanks to the work of the biogas industry, installed bioenergy capacity has doubled in the past decade and continues to rise at an impressive rate.

As the world begins to better understand the critical near term importance of methane emissions, it's my sincere hope that biogas continues to grow in prominence as a valuable near term solution to methane emissions with multiple, important co-benefits. Sincerely,

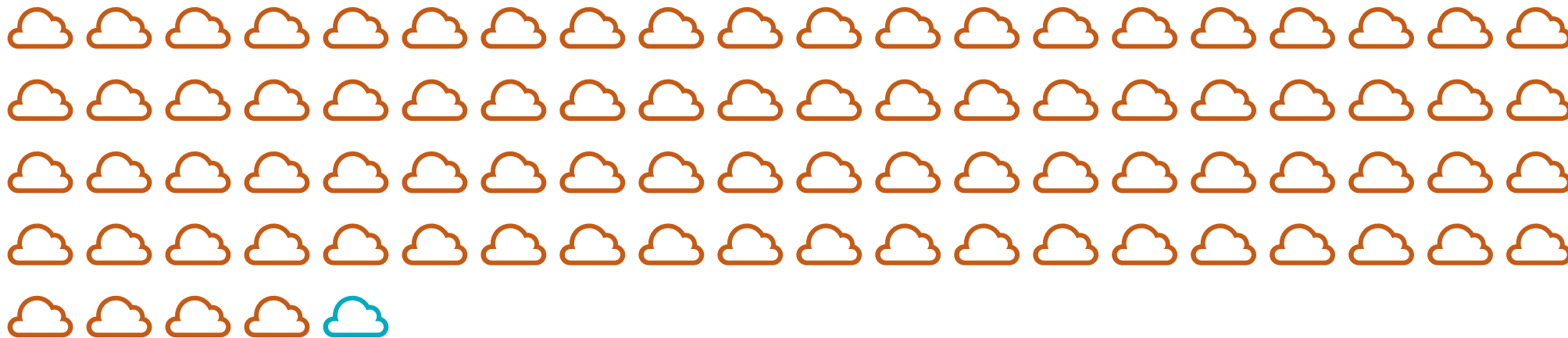
A handwritten signature in dark ink, appearing to read 'Rick Duke'.

Rick Duke, The Senior Director and White House Liaison for the Special Presidential Envoy for Climate John Kerry, and co-chair of the Climate & Clean Air Coalition (CCAC) Working Groups.



A potent greenhouse gas

Over a 20-year period, methane (CH_4) is up to **86 times more potent** than carbon dioxide (CO_2) as a greenhouse gas (CCAC, 2021 www.ccacoalition.org/en/slcp/methane).




86 tonnes
carbon dioxide
=

1 tonne
methane

If released today, the following emissions would result in the **same impact** on global warming over the next 20 years



A potent greenhouse gas

The **332 million tonnes** of methane that were emitted in 2020 will drive the same warming as:

8,300 MtCO₂ over a 100-year period

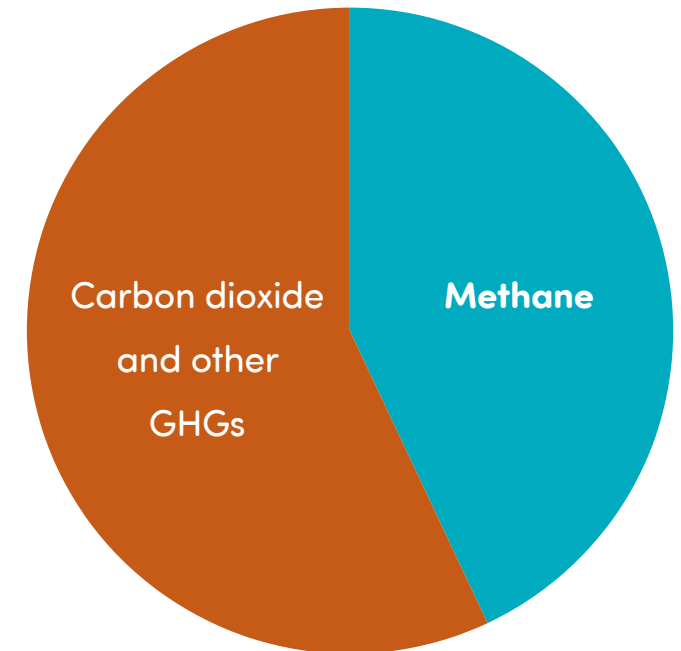
or

28,552 MtCO₂ over a 20-year period

For comparison, 34,800 million tonnes of carbon dioxide were emitted from man-made sources in 2020 (Global Carbon Project, 2020 www.globalcarbonproject.org).

Consequently, methane may be responsible for up to 45% of man-made global warming over the next 20 years.

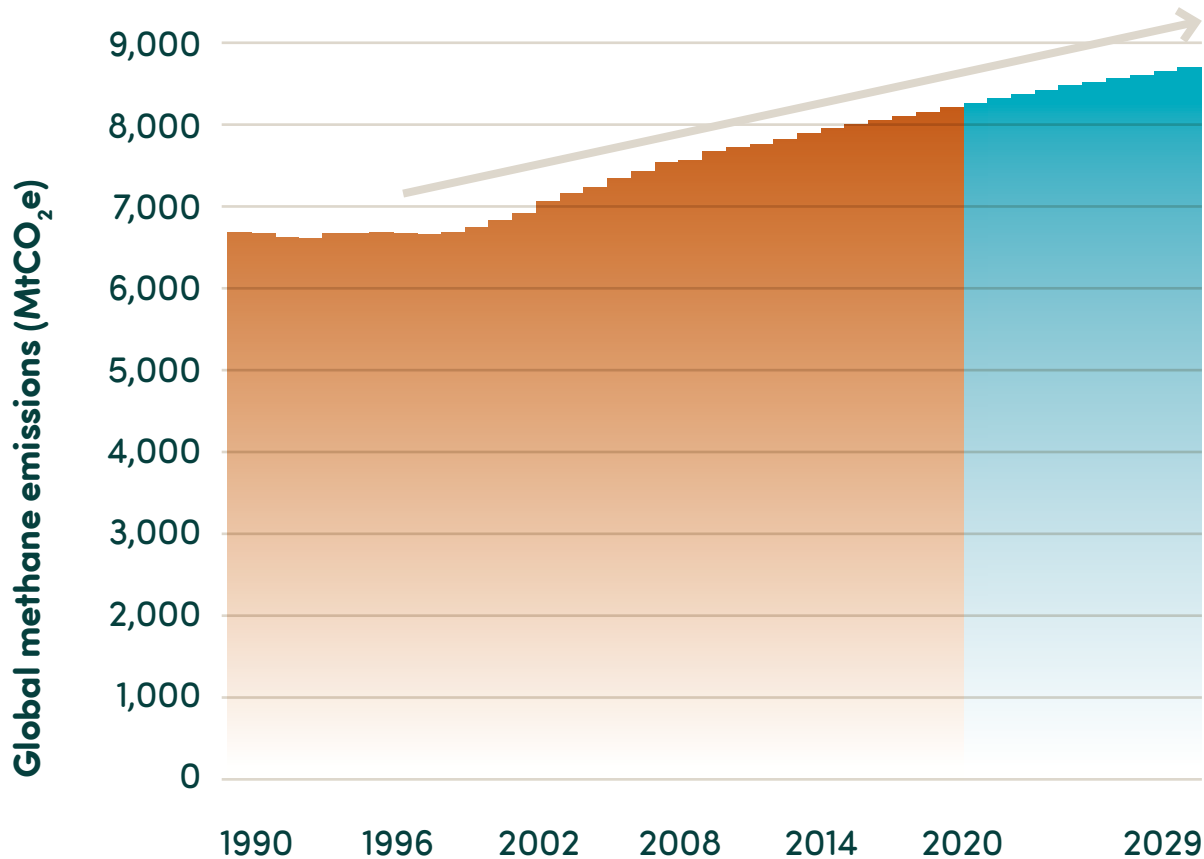
Contribution to global warming over
the next 20 years:



The problem



Annual methane emissions



Since 2000, methane emissions have increased year-on-year.

In 2020, approximately **332 million tonnes** of methane were emitted from man-made sources worldwide (Global Methane Initiative, 2021 <https://bit.ly/3KBR1kl>).

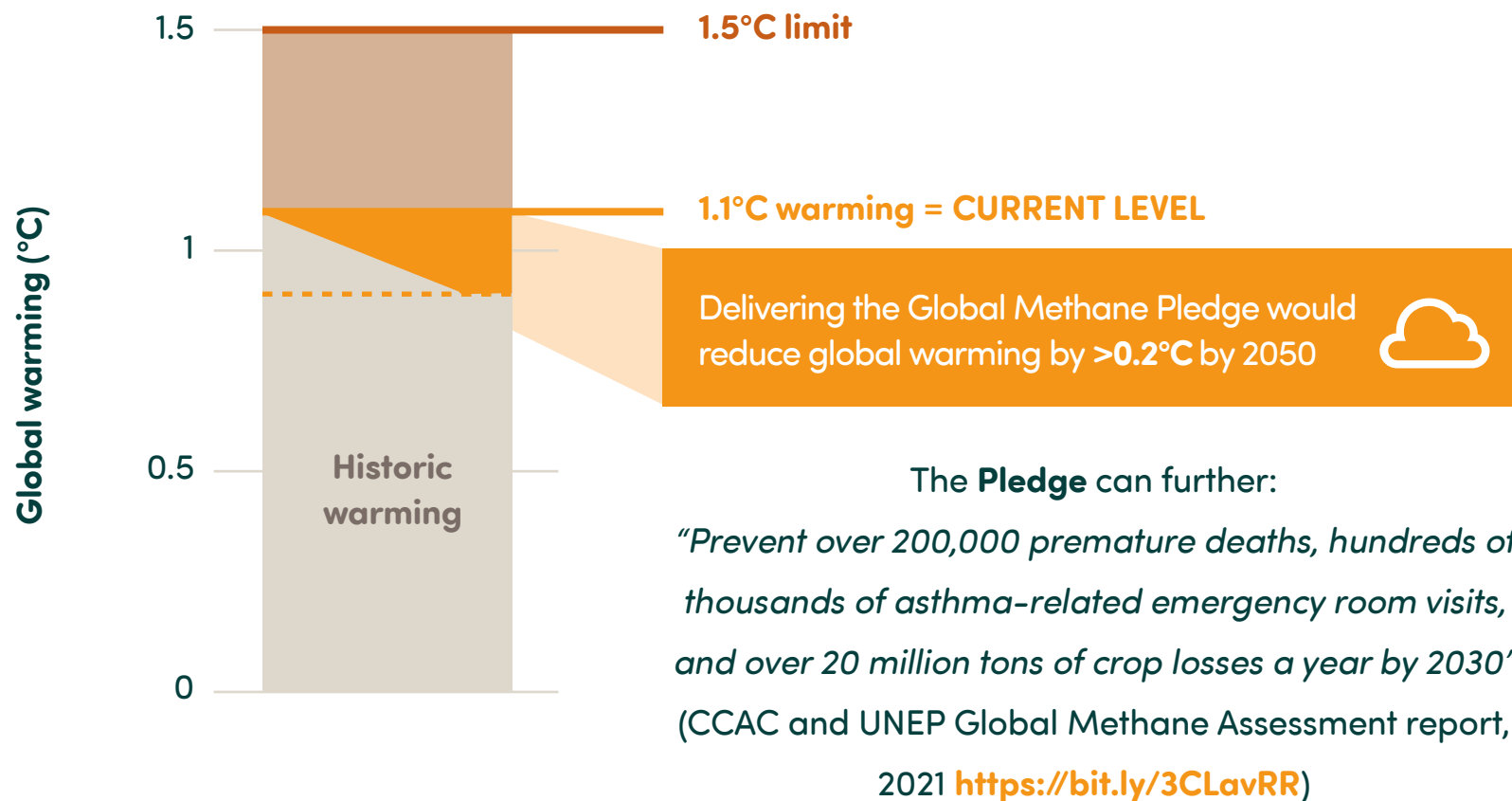
Without immediate action, emissions will continue to increase through the decade.



Global Methane Pledge

To mitigate the most catastrophic impacts of climate change, global warming must be limited to a maximum of 1.5°C – as enshrined in the UNFCCC's Paris Agreement.

Formed jointly by the EU and US, the Global Methane Pledge sets a target to reduce methane emissions by 30% from 2020 levels by 2030.



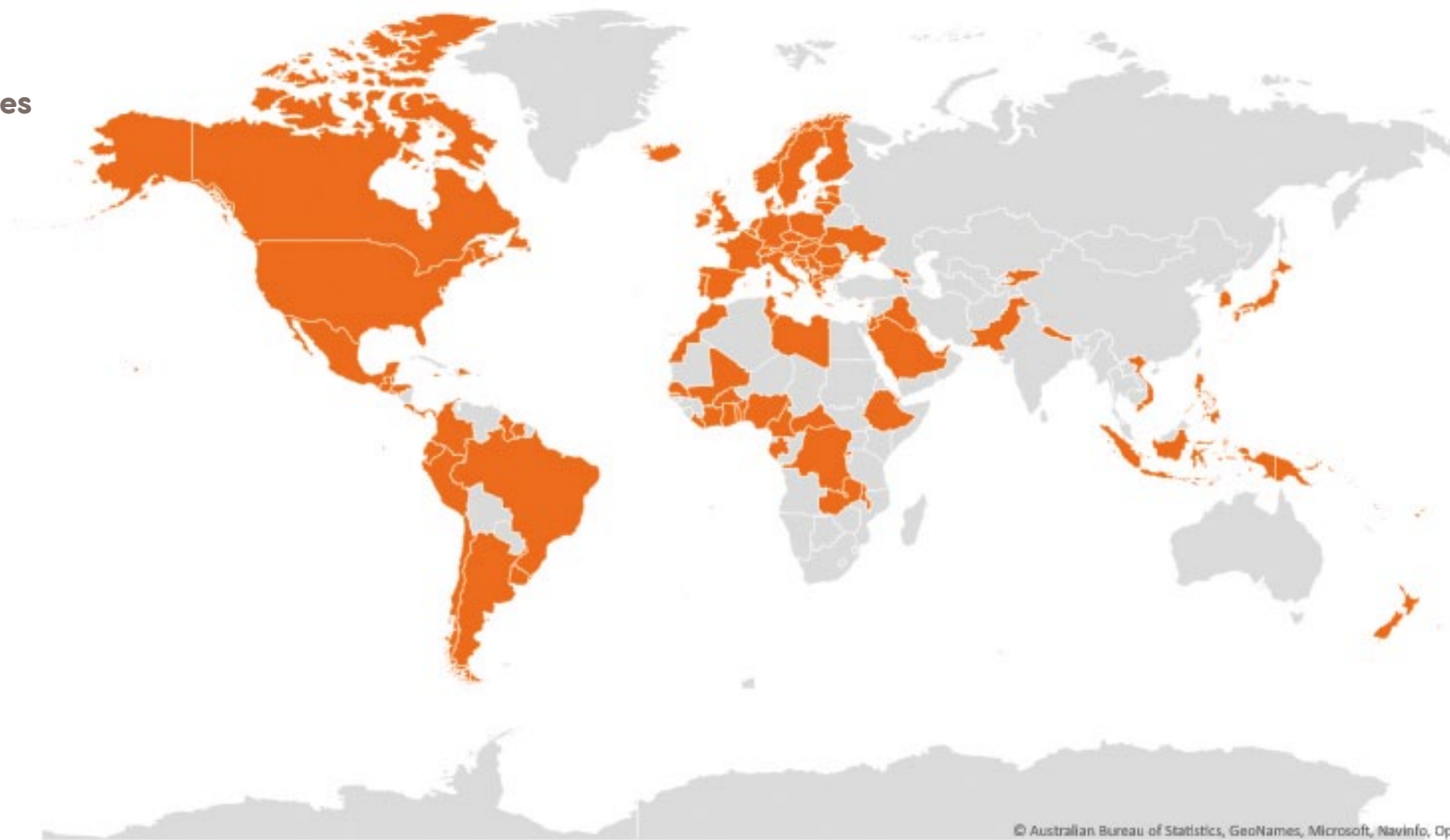


Global Methane Pledge

Launched at COP26, **over 120 countries have signed the Pledge**, committing themselves to the target.

While China represents one notable omission, **signatories represent 70% of the global economy** (European Commission, 2021

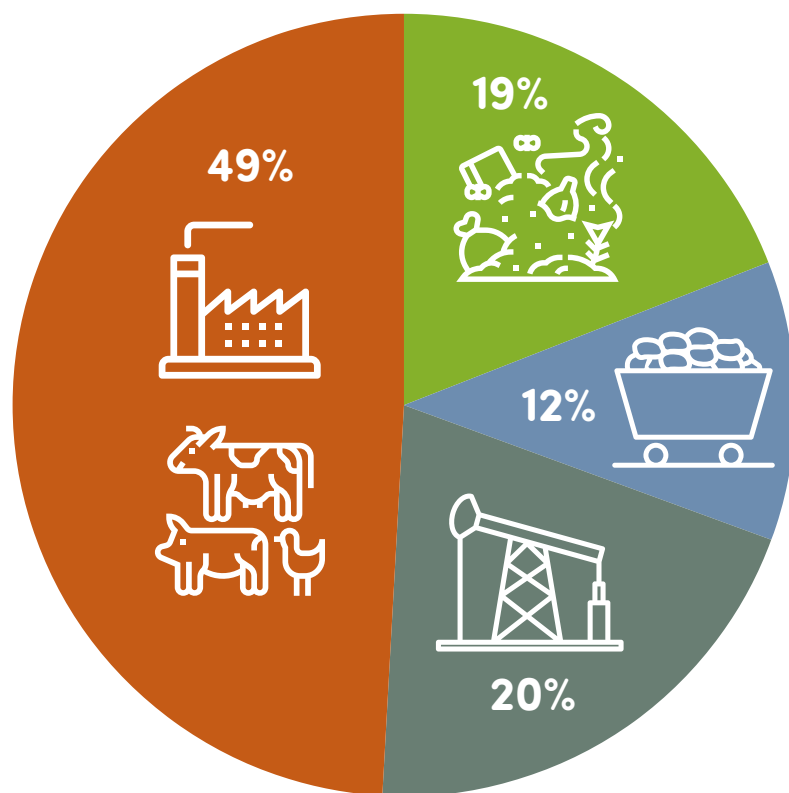
<https://bit.ly/3Q2Pbdu>)



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Sources of anthropogenic methane



Anthropogenic = originating from human activity

Poorly managed organic wastes derived from poor wastes management:

- Untreated sewage
- Storage of livestock manure
- Rotting wastes in landfill

Coal mines

- Methane trapped within coal seams is released during the mining process

Oil and gas

- Fugitive methane escapes throughout the gas network, including gas refining, transportation and use

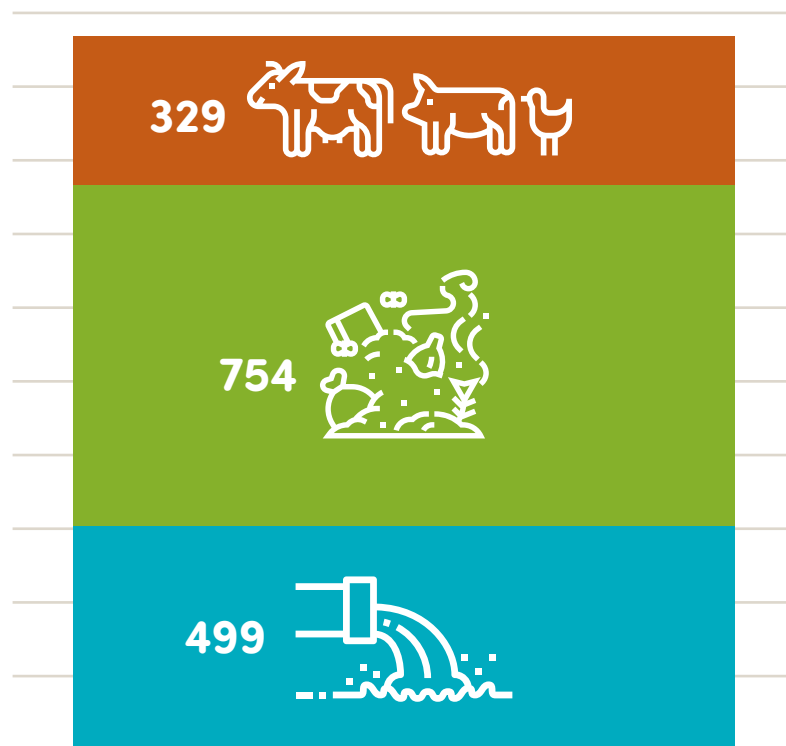
Other sources include:

- Enteric methane from livestock
- Rice farms
- Industrial processes and product use

(Global Methane Initiative, 2021 <https://bit.ly/3KwyXZ8>)



MtCO₂e



Methane emissions from organic wastes

Poorly managed organic wastes emit methane directly into the atmosphere – annually 19% of anthropogenic methane is from the following sources:

Manure management

Cows, pigs and chickens produce over 33 billion tonnes of manure per year. Between 50-90% of these wastes are collected and stored on-farms, where it decomposes and releases methane directly into the atmosphere.

Municipal Solid Waste (MSW)

In 2020, an estimated 1.3 billion tonnes of food was wasted. The vast majority would have ended up in landfill, where it is now releasing around 30 million tonnes of methane.

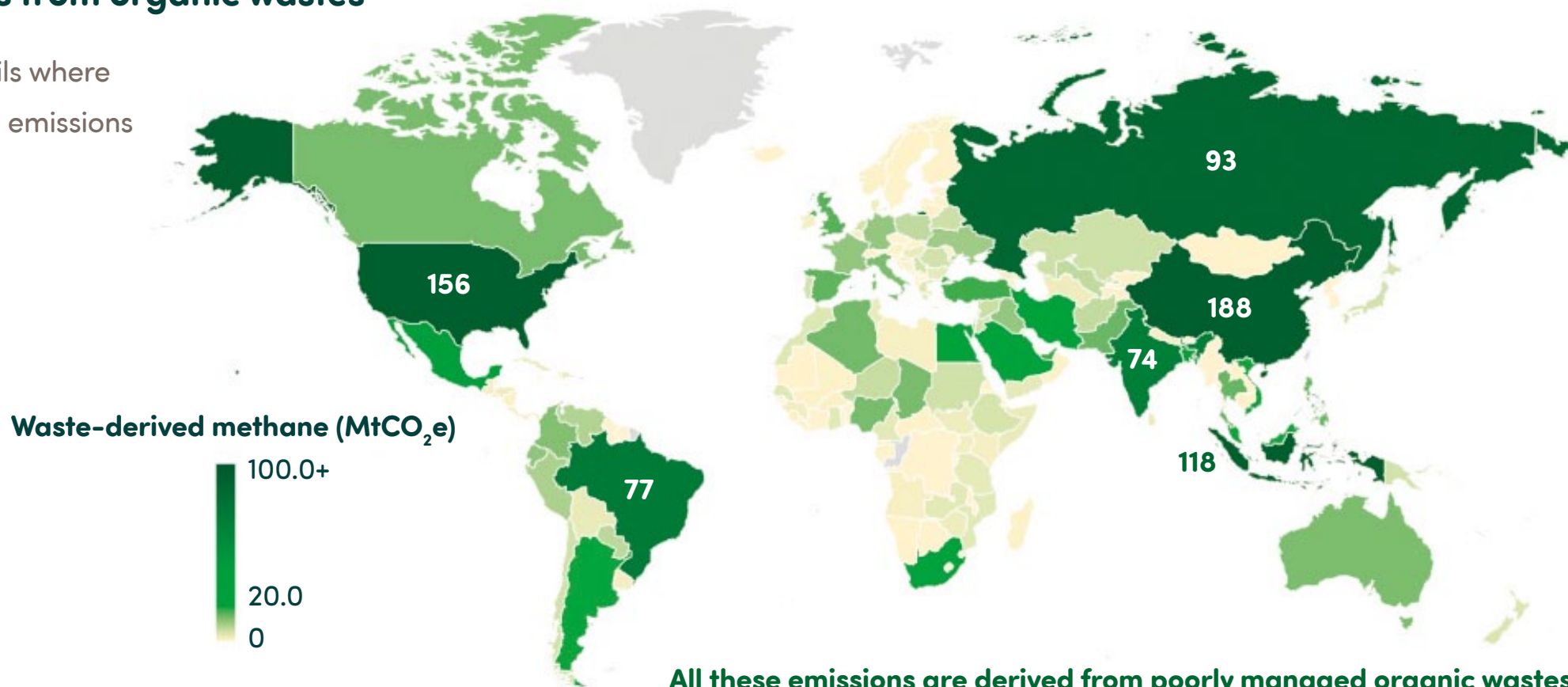
Wastewater

Up to 80% of sewage produced globally is released into the environment with little or no treatment. These wastes emit methane as they rot within water systems.



Methane emissions from organic wastes

The following map details where waste-derived methane emissions are coming from:



All these emissions are derived from poorly managed organic wastes

The solution



Treatment options

Reducing waste is the best route for reducing emissions. However, some wastes are hard to eliminate and therefore must be treated. There are **three main technologies** capable of reducing methane emissions from organic wastes: incineration, compost and anaerobic digestion (AD). However, not all are sustainable...

UNSUSTAINABLE Linear economy →



Incineration

Also known as Energy from Waste (EfW).

Classed as an **unsustainable** technology by the EU, incineration contributes to GHG emissions.

“Don’t invest in solid waste incineration” recommends C40 Cities <https://bit.ly/2OwlC81>, “it is expensive, inefficient, and requires strict environmental regulation.”



SUSTAINABLE Circular economy

Increasing value unlocked from wastes →



Compost

Organic wastes break down aerobically (i.e., with oxygen), thus preventing the production of methane. Compost recycles nutrients found in organic wastes, through the production of a valuable biofertiliser. **However, it does not extract energy...**



Anaerobic digestion (AD)

Organic wastes are broken down

anaerobically (i.e., without oxygen), recycling organic matter into renewable energy, nutrients and bio-CO₂.

Recycling all organic wastes through AD would generate enough biomethane to replace one third of global natural gas consumption. AD can be carbon negative, reversing emissions.

It is crucial wastes are treated using the **most sustainable technology** to extract all available energy and resource.



Recycling organic wastes

All organic wastes can be sustainably treated via **anaerobic digestion (AD)**.

AD is ready-to-use technology recycles organic feedstocks into valuable bio-products, including the following, as well as biomaterials and biochemicals:

Biogas

AD captures biogas and harnesses it as a source of renewable energy. In its original form it can be used to produce electricity or upgraded into biomethane and bio- CO_2

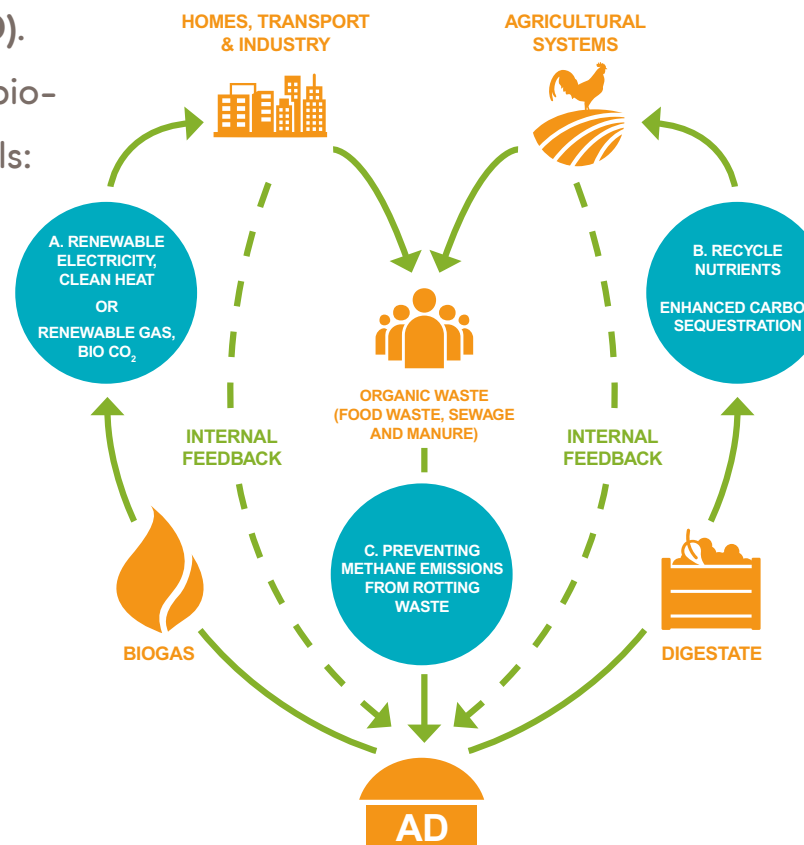
Biomethane

Also known as Renewable Natural Gas (RNG)

This gas is a direct substitute for fossil natural gas. By purifying it and using it in gas grids, boilers, and vehicles it can significantly reduce emissions in hard to decarbonise sectors.

Bio- CO_2

This source of carbon dioxide originates from the atmosphere. Consequently, its use as an industrial gas is carbon neutral, and its long-term storage is carbon negative – actively reversing emissions.



Biofertiliser

Also known as digestate

AD recovers the nutrients found within organic wastes, recycling them into an organic fertiliser. This carbon-rich product can help restore soil health and improve its ability to sequester carbon in soils, all while displacing the need for fossil-based artificial fertilisers.

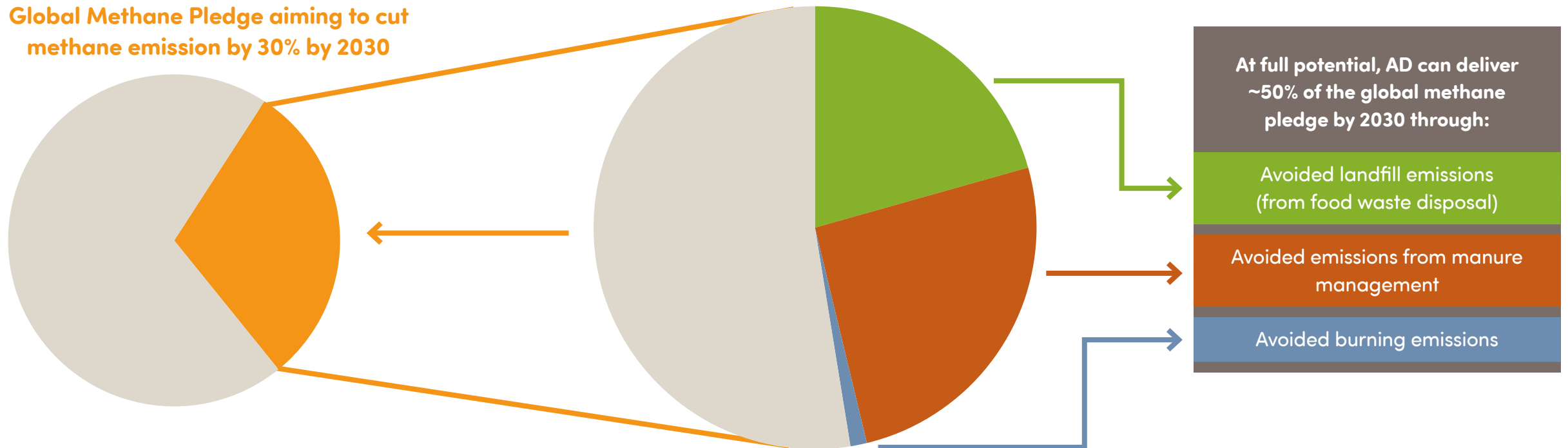


Avoiding methane emissions via AD

Recycling organic wastes via AD avoids methane emissions from uncontrolled organic wastes.

If all readily available and unavoidable organic wastes were treated via AD, around 1,152 MtCO₂e of global emissions would be avoided.

Global Methane Pledge aiming to cut methane emission by 30% by 2030



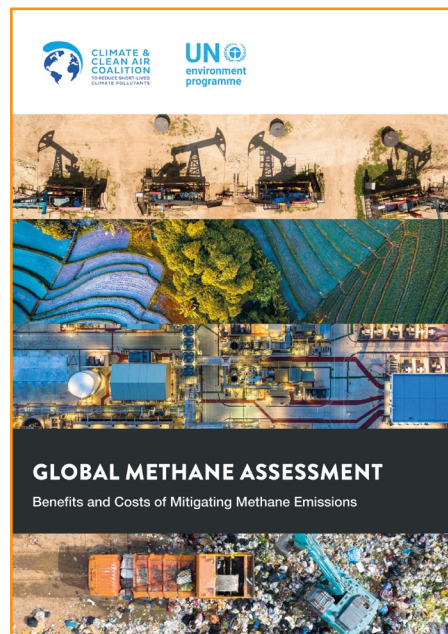


Global Methane Assessment

In response to growing concerns over methane emissions, the **Climate and Clean Air Coalition (CCAC)** and **United Nations Environmental Programme (UNEP)** released their

comprehensive report in 2021. The following details a selection of their key findings:

- Reducing human-caused methane emissions is one of the **most cost-effective strategies** to rapidly reduce the rate of warming
- The global **monetised benefits** for all market and non-market impacts are approximately **US\$ 4,300 per tonne of methane reduced**



TECHNICAL CONTROLS	
WASTE	AGRICULTURE
Municipal solid waste: source separation with recycling/reuse; no landfill of organic waste; treatment with energy recovery or collection and flaring of landfill gas.	Cattle, sheep and other ruminants through enteric fermentation: feed changes and supplements; breeding to improve productivity and animal health/fertility.
Industrial solid waste: recycling or treatment with energy recovery; no landfill of organic waste.	Ruminants and pigs through manure management: treatment in biogas digesters; decreased manure storage time; improved manure storage covering; improved housing systems and bedding; manure acidification.
Residential wastewater: upgrade of primary treatment to secondary/tertiary anaerobic treatment with biogas recovery and utilization. Wastewater treatment plants instead of latrines and disposal.	Rice cultivation: improved water management or alternate flooding/drainage wetland rice; direct wet seeding; phosphogypsum and sulphate addition to inhibit methanogenesis; composting rice straw; use of alternative hybrids.
Industrial wastewater: upgrade of treatment to two-stage treatment, i.e., anaerobic treatment with biogas recovery followed by aerobic treatment.	Agricultural waste burning: ban and enforcement of existing bans.

The report recommends the adoption of biogas technology across the waste and agricultural sectors to mitigate methane emissions

The solution



Full potential modelling



Manure management

Total livestock waste = 33 billion tonnes

*applying 50-90% collection rate and
70% AD uptake*

Collectible waste for AD = 13 billion tonnes

Average 50 kgCO₂e emissions per tonne digested

**Avoided methane emissions =
638 MtCO₂e per year**



Food waste

Total food waste = 1.3 billion tonnes

*applying 50% food waste reduction and
70% AD collection*

Collectible & unavoidable waste for AD =
449 million tonnes

Average 617 kgCO₂e emissions per tonne digested

**Avoided methane emissions =
313 MtCO₂e per year**



Wastewater

World population = 7.9 billion people

*applying 85% collection and 128g per person per
day (wet weight)*

Sewage for AD = 31 billion tonnes

Average 200 kg methane per tonne of waste

**Avoided methane emissions =
201 MtCO₂e per year**

Total = 1,152 MtCO₂e per year



Wider benefits of AD



Energy

- Improve energy security
 - Balance renewable energy networks
- Generate baseload energy
- >12,200 TWh biogas potential

Produce one third of today's global gas consumption



Environment

- Sequester carbon in soils
- Prevent environmental pollution
- Capture biogenic carbon

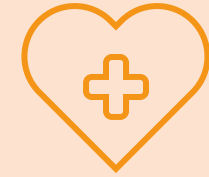
Cut global emissions by over 10%



Economy

- Stimulate ~USD \$100 trillion of investment
- Retrain workers from fossil industry
- Create jobs

Create 11-15 million jobs



Health

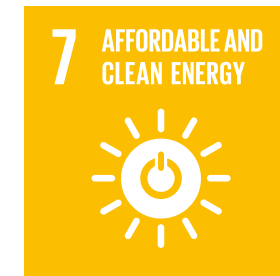
- Provide clean burning fuels
- Avoid contamination of drinking water
- Reduce odour from wastes

Improve local and global health outcomes



Overview of current biogas industry

- AD is already treating over 2% of the readily-available resource-rich organic wastes being produced by humans globally every year.
- In 2016 there were 132,000 biogas plants globally and 50 million micro-digesters producing 387 TWh of carbon neutral biogas annually (*IEA/WBA*).
- The vast majority of first-generation plants produce electricity from biogas, although the trend is towards upgrading biogas to biomethane/renewable natural gas and bioCO₂.
- Deployment of AD **delivers 9 of the 17 SDGs**.





EU Methane Strategy

The EU Methane Strategy (2020) states that almost all anthropogenic methane emissions within Europe are derived from three sources:

- Agriculture 53%
- Waste 26%
- Energy 19%

While the Strategy recognises that the most cost-effective methane savings can be achieved in the energy sector, **it recognises that AD's ability to produce biogas within the agricultural and waste sectors can mitigate the costs of methane emissions reductions.**



*"Non-recyclable organic human and agricultural waste and residue streams can be **utilised to produce biogas**, bio-materials and bio-chemicals. This can **generate additional revenue streams** in rural areas and avoid methane emissions at the same time. **The collection of these waste products will therefore be further incentivised.**"*

EU Methane Strategy (2020)



Satellites

Recognising the importance of methane emissions, several satellites have been launched to detect and monitor fugitive methane emissions worldwide.

Satellites include:

- MethaneSAT
- GHGSat
- PRISMA
- KAYRROS
- GEI-SAT
- TROPOMI
- Carbon Mapper
- IMEO
- Copernicus Sentinel-5P

They can identify specific sources of methane and quantify the amount emitted to atmosphere.

They represent key tools in the identification and monitoring of methane emissions

For example:

Satellite, Copernicus Sentinel-5P, discovered the emission of **8,800kg of methane per hour** from a series of landfill sites near Madrid, Spain. The following image displays these methane emissions on 20th August 2021:



<https://bit.ly/3Tx8ezw>

Conclusion



As a greenhouse gas, methane is **86x more potent** than carbon dioxide over a 20-year period



To mitigate against the worst impacts of climate change, **methane emissions must be cut immediately**



Poorly treated organic wastes are responsible for a fifth of anthropogenic methane emissions



At COP26, over 100 countries signed the **Global Methane Pledge**, which targets a 30% reduction in methane emissions by 2030



Recycling organic wastes via anaerobic digestion (AD) can deliver nearly 50% of the Global Methane Pledge



AD not only reduces methane emissions, but generates biogas, biomethane, bioCO₂, biofertilisers and other valuable bioproducts – thus enhancing a country's **energy and food security**



Case studies

- CCAC; Calls for Proposals



- Brazil; Zero Methane Program & Federal Incentive Strategy



- U.S Methane Emissions Reduction Action Plan



- Global Methane Hub





The Climate and Clean Air Coalition

The Climate and Clean Air Coalition (CCAC) is a global network of over 300 state and industry stakeholders, with the collective aim to deliver rapid reductions in short-lived climate pollutants to protect human health, agriculture and the environment. The CCAC will be instruments in helping countries deliver their commitments to the Global Methane Pledge.



The CCAC aims to:

- Enable transformative action by providing knowledge, resources, technical and institutional capacity to act
- Increase the availability of and access to financial resources to support the successful implementation of mitigation action at scale
- Mobilise support for action through advocacy at all levels of government, the private sector and civil society
- Enhance scientific knowledge to help decision-makers scale up action and promote the multiple benefits of action



CCAC: Calls for Proposals

The CCAC provides direct funding for projects seeking to address short lived climate pollutant in line with the core tenets of the organisation.



Since September 2021, the CCAC has ran four “Calls for Proposals”, providing opportunities for a range of applicants.

Between 2021 – 2022, calls were launched for:

- Proposals to drive transformative action (\$7 million USD)
- Support national mitigation actions (est. \$3 million USD)
- National policy and planning support (\$3 million USD)
- CCAC Action Programme to Address the 1.5 °C Challenge (\$950,000 USD)

“We aim to dramatically increase political ambition and remove critical barriers to implementation to advance SLCP mitigation through transformative action.”

CCAC

Detail of the proposals can be found here www.ccacoalition.org/en/content/calls-proposals



Brazil: Zero Methane Program

In March 2022, the Brazilian government launched the *Zero Methane Program and Federal Incentive Strategy for the Sustainable Use of Biogas and Biomethane* – key levers to support methane reduction and incentivise the sustainable use of biogas and biomethane as renewable sources of energy and fuel.



The Program provides guidelines aimed at:

- Establishing a framework for a carbon market, through measures such as carbon credits, methane credits, carbon stock units, and certified emission reduction credits
- Developing biogas sector agreements (for agriculture, livestock and others).
- Advancing the biomethane supply chain, and
- Developing technologies that consume biomethane, for example cooking, heating, and transportation.

<https://tinyurl.com/3k8vf9pw>



Brazil: Federal Incentive Strategy

The Federal Incentive Strategy aims to achieve the Brazilian Government's objectives by introducing a new incentive package for the biogas and biomethane sector.

These incentives will enable the deployment of new biogas production and upgrading sites, promote initiatives for the supply of light and heavy vehicles, such as buses, trucks and agricultural tractors, and vessels powered by biomethane or hybrids with biomethane, such as green points and corridors and development of scientific-technological research on biogas and biomethane. It also introduces a tax exemption for biogas and biomethane infrastructure.

The measures are expected to facilitate:

- 25 new biogas plants
- R\$7 billion of planned investment
- 6,500 new jobs

<https://tinyurl.com/jeusr2cz>





U.S. Action on Methane

The U.S. Government launched the U.S Methane Emissions Reduction Action Plan alongside the launch of the Global Methane Pledge at COP26.

The Plan lays out the Environmental Protection Agency's plans to significantly reduce methane emissions from a range of sectors. The Plan will predominately focus on action to reduce methane emissions in four key sectors; oil and gas sector; landfills; coal mines; and agriculture.

The Plan will reduce methane emissions, create thousands of high-quality jobs, and improve public health and local air quality for communities around the country. <https://tinyurl.com/2pz63jnc>

In a landmark development for renewables, U.S. Congress passed the Inflation Reduction Act (IRA). The IRA provides tax incentives, grants and other funding mechanisms to help drive investment in clean energy. It is expected to deliver ~USD \$369 billion of investment in clean energy and climate projects and enable a 40% reduction in GHG emissions by 2030.





U.S. Action on Methane



Landfill

- Federal backstop plan on landfills
- Food loss and waste reduction plans
- Boosting voluntary methane outreach programme to achieve 70% methane emissions capture from all landfills around the country



Oil and Gas

- New performance standards and the extension of regulation to cover additional sources of oil and gas
- Develop regulatory, disclosure, and partnership initiatives to reduce poorly maintained distribution lines
- Action on methane leaks as well as venting and flaring



Agriculture

- Creation of an incentive-based “climate-smart” agriculture plan to reward farmers
- Establish a Biogas Opportunities Task Force
- Greenhouse gas measurement initiative to identify and track emissions and carbon sequestration



Coal Mines

- Remediation of abandoned coal mine land
- Potential remediation of other mining sites
- Provide grants for reclamation projects that employ dislocated energy workers
- Engagement with local economic development



Global Methane Hub

The Global Methane Hub is a philanthropic fund to support communities, cities and countries around the world to reduce methane emissions and prevent global warming. It is the single largest private pledge to reduce global methane emissions.



It aims to drive down methane emission by supporting ambitious catalytic investments, laying the groundwork for long-term transformation in hard-to-decarbonise sectors, and delivering quick wins to catalyse action. Action funded by the Global Methane Hub will focus on energy, agricultural and waste sectors.

So far, the Hub has announced support for a number of projects including \$10 million to the CCAC to be distributed to support stakeholders deliver projects as well as a grant of \$5 million to the African Development Bank to abate methane across the country. <https://globalmethanehub.org>

- Launched in May 2022

- Raised ~\$300million from over 20 major institutions

- Funded 16 early action grants worth \$23 million in the first month

- Donated \$10million to the CCAC for actions to reduce methane emissions



WORLD BIOGAS
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Join a winning team and help put the world on track
to keep global warming below 2°C, ideally 1.5°C.

Contact us to find out what value WBA can deliver for you and your organisation.

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