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Connecting the Dots: Climate Change- Methane Emissions- Gas Flaring

Greenhouse gases (GHGs) drive climate change. Methane is the most potent.

Methane is colourless, odourless, tasteless, and highly flammable, making it even more dangerous to manage.

Methane is the second-largest contributor to global warming after CO_2.

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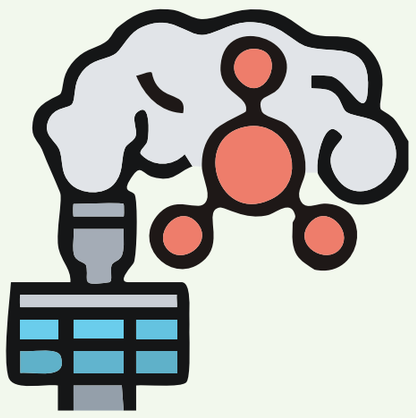
Connecting the Dots: Climate Change- Methane Emissions- Gas Flaring

Methane is responsible for approximately 30% of current global warming.



It is 80 times more effective at trapping heat than CO_2 over a 20 year period (28x over 100 years).

It has an atmospheric lifetime of approximately 12 years.

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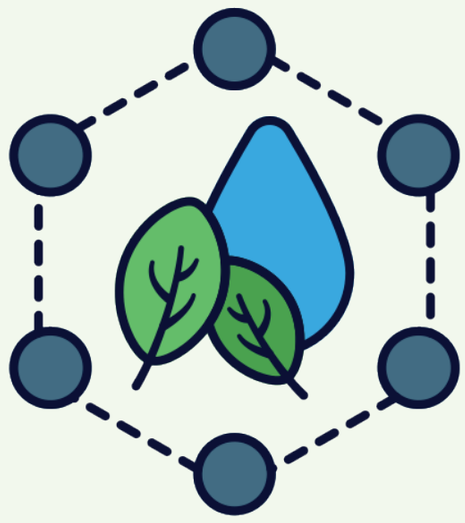
Connecting the Dots: Climate Change- Methane Emissions- Gas Flaring

Major sources of methane include agriculture, landfills, wetlands and oil, and gas operations.



The oil and gas sector is the largest industrial source of methane emissions.

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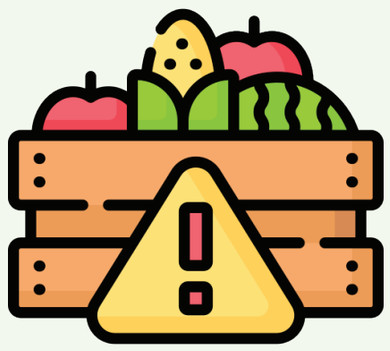
Methane Induced Weather Conditions

Methane traps heat in the atmosphere more effectively than CO_2 resulting in enhanced greenhouse effects.

Increased heat, causing rise in global temperatures, leads to ocean warming, melting of ice, and changing weather patterns.

As a result, extreme weather events such as heatwaves, stronger storms, prolonged droughts, and intense rainfall become more frequent.



The environmental and social fallout include flooding, habitat destruction, economic damage, food insecurity, infrastructural damage, loss of lives.

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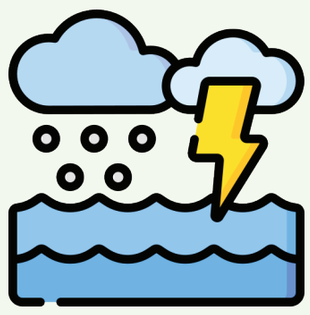
Climate Change Related Weather Events in Nigeria

In Nigeria, flooding has become more frequent and severe, across all parts of the country.



In 2012, heavy rains led to serious floods in most parts of the country, overwhelming water reservoirs and flood contingency measures.

It led to destroyed river banks and infrastructure, loss of property and livestock and flash floods in many areas.

7.7m

People affected by flood in 2012

32 out of 36 states were affected. By the end of October, more than 7.7 million people had been affected by the floods, and more than 2.1 had registered as IDPs.

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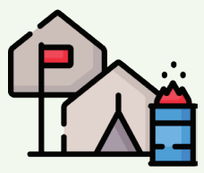
Climate Change Related Weather Events in Nigeria

4.4m
People affected by flood in 2022

In 2022, a decade later, floods affected 4.4 million people across Nigeria, including 2.6 million children

Some 2.4 million people were displaced and took temporary refuge in makeshift Internally Displaced People (IDP) sites, such as schools and health facilities.



2.4m
People were displaced

This impinged on the continuity of basic services.

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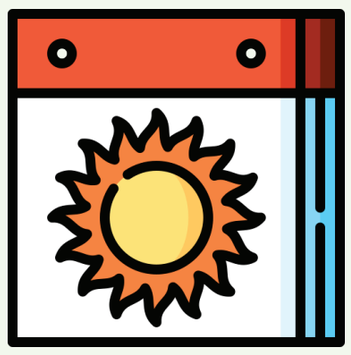
Climate Change Related Weather Events in Nigeria

2024 went down as the warmest year on record due to climate change leading to heat related illnesses, disruption of agricultural output and multiple flood disasters.

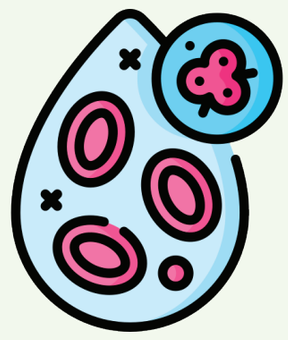


363

Reported Dead

363 people were reported dead and almost 600,000 houses had been damaged or destroyed.

The most flood-affected areas in the South had accounted for the bulk of suspected cholera cases (e.g. Cross River – 718; Bayelsa – 160; Niger – 94).



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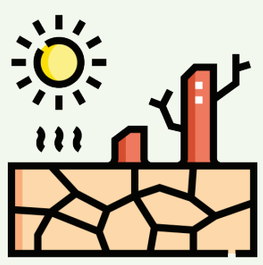
Climate Change Related Weather Events in Nigeria

Before the end of September 2024, floods had left 641,598 persons displaced, 285 people dead, and 2,504 injured.

641,598
person displaced before the end of September 2024

127,544 hectares of farmland and 8,780 livestock were lost.

It is estimated that dessert encroachment advances southward at a rate of 600 metres per annum (Oloukoi et al, 2018).



600m
per annum

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Methane Emission Reduction Efforts in Nigeria

Gas flaring became illegal in Nigeria since 1984, however, in the last 40 years, the practice has continued, while flare out dates has constantly shifted.

In 2019, the National Action Plan on Short lived Climate Pollutants (SLCPs) was developed.

Nigeria is signatory to the global methane pledge.

In 2023, Nigeria adopted Methane emissions reduction guidelines that mandated companies to take action to reduce methane emissions from industrial processess.

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Methane Emission Reduction Efforts in Nigeria

In 2021, updated NDCs target to reduce fugitive emissions in the oil and gas sector by 60% by 2031, conditional on international support.

60%

Proposed reduction in fugitive emissions in the oil and gas sector by 2031

Committed to reduce gas flaring by 100% by 2030 (zero gas flaring by 2030).

100%

Proposed reduction of gas flaring by 2030

95%

Proposed reduction of fugitive methane from leaks

Committed to reduce fugitive methane from leaks by 95% by 2050.

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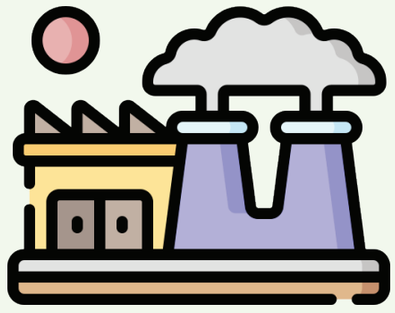
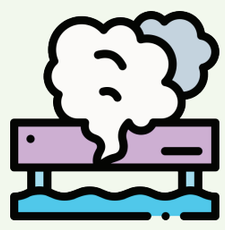
Why Gas Flaring is Crucial to Reducing Methane Emissions in Nigeria

The energy sector accounts for the largest share (60%) of greenhouse gas emissions in Nigeria.

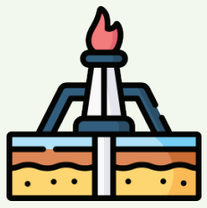


Oil exploitation in Nigeria contributes significantly to Nigeria's total methane emissions, primarily through gas flaring.

Fugitive methane emissions from oil and gas are the largest contributor (37%) to overall energy emissions.



37%
Contribution to overall energy emissions



95%
Methane

Flared gas comprises 95% methane.

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How Much Gas is Flared in Nigeria?

Flare Gas (Billion SCF)	Year	Gas Shrinkage (Billion SCF)
282	2014	677
318	2015	306
288	2016	421
355	2017	567
267	2018	314
265	2019	235
230	2020	115
250	2021	44
188	2022	139
183	2023	124

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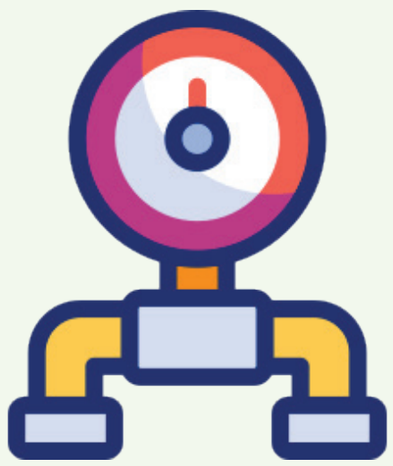
How Much Gas is Flared in Nigeria?

Gas flaring has been on the decline, dropping by 35% over the past decade between 2014 and 2023.

35% ▼



In the first half decade, shrinkage heavily outweighed the volume of gas flared but reduced significantly in the last half decade.

Gas shrinkage refers to gas which is lost from the transportation network.

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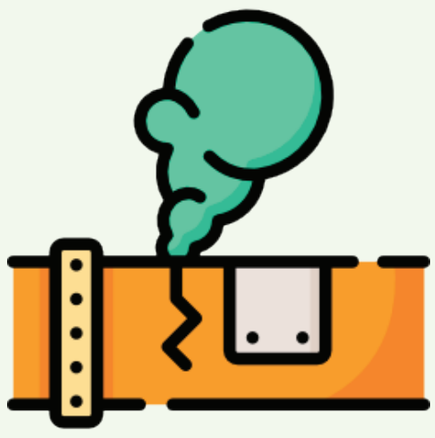
How Much Gas is Flared in Nigeria?



Shrinkage is a combination of Leakage, Own Use Gas and Theft of Gas, during routine operations.

Leakages make up the major share of gas shrinkage.

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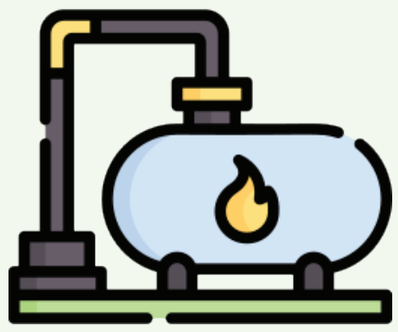
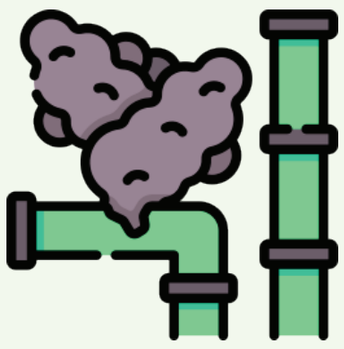
Why Does Shrinkage Matter?

Natural gas is mainly composed of methane, a greenhouse gas far more potent than carbon dioxide in the short term.





Leaks from pipelines and other infrastructure release this methane directly into the atmosphere, contributing significantly to global warming.

Gas is more harmful to the environment when released directly (either through venting or leakages) than when flared.

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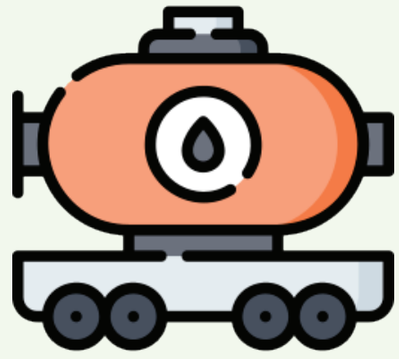
Additional Reasons to Reduce Shrinkage

Understanding and managing gas shrinkage is crucial to ensure the efficient and accurate operation of natural gas transportation systems.



Billing Accuracy: Shrinkage can lead to discrepancies between the gas supplied and the gas billed.

System Balancing: It impacts the ability to balance the gas supply and demand in real-time.

Economic Impact: The cost of replacing lost gas due to shrinkage can affect the overall cost of natural gas.

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Economic Losses to Gas Flaring

Year	Total Gas Flared (MMSCF)	Quantity of Electricity that could have been generated GWh	Number of homes that could have been powered per year	Revenue lost (USD)
2021	252,579	34,040.30	3,176.88	732,479,100
2022	188,442	25,396.50	2,370.18	546,481,800
2023	183,526	24,733.96	2,308.35	532,225,400
2024	192,887	25,995.56	2,426.09	559,372,474
Total	**817,434**	**110,166.32**	**10,281.50**	**2,370,558,774**

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Economic Losses to Gas Flaring

Between 2021 and 2024, more than 817,434 MMSCF (23 trillion litres) of gas was lost to gas flaring in Nigeria.

23trn litres
of gas lost to gas flaring between 2021-2024

If the gas was converted to power it could have generated **110,166 GWh of electricity.**

The electricity could have powered at least 10,281 homes for one year.

10,281
Homes could have been powered

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Economic Losses to Gas Flaring

$2.37bn
in revenue

If the gas was sold, it could have generated at least $2.37 billion in revenue.

Blue Economy

- Aquatic migration
- Eutrophication
- Loss of primary industry

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Economic Losses to Gas Flaring

Farming and Agriculture

- Soil fertility loss
- Reduction in crop yields
- Faunal migration

Infrastructure

- Acid rain
- Rust
- Roof corrosion
- Oil & Gas infrastructure damage

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Health and Environmental Impacts of Gas Flaring

Gas flares have been linked to acidification of rain and waterways through the emissions of large quantities of sulphur dioxide and nitrogen oxides into local areas which combine with atmospheric moisture to form sulphuric acid and nitric acid.

Acidification of waterways and rainfall damages vegetation, insect and animal life.

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Health and Environmental Impacts of Gas Flaring

Some birds and many insects are drawn to bright lights at night and studies have show that gas flares can attract birds and insects to their deaths in large numbers.

Gas flaring emits hazardous pollutants. These include oxides of Nitrogen, Carbon and Sulphur, particulate matter, hydrocarbons and ash, photochemical oxidants, and hydrogen sulphide.

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Health and Environmental Impacts of Gas Flaring

These pollutants are associated with a variety of adverse health impacts, including cancer, neurological, reproductive and developmental effects. Deformities in children, lung damage and skin problems have also been reported.

High concentrations of methane in the air can lead to methane gas poisoning, resulting in suffocation by displacing oxygen.

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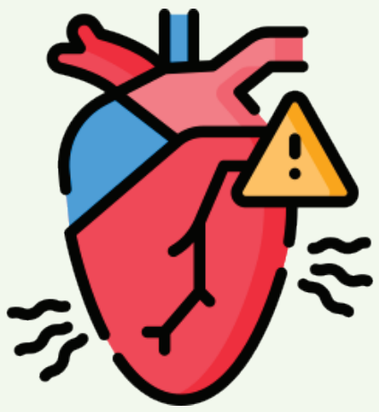
Health and Environmental Impacts of Gas Flaring

Symptoms of methane gas poisoning include mood changes, slurred speech, vision problems, memory loss, nausea, vomiting, facial flushing, and headache.

In severe cases, methane gas poisoning can lead to changes in breathing and heart rate, balance problems, numbness, unconsciousness, and even death.

Long-term effects of methane gas poisoning may include lasting cardiovascular, respiratory, and neurological problems.



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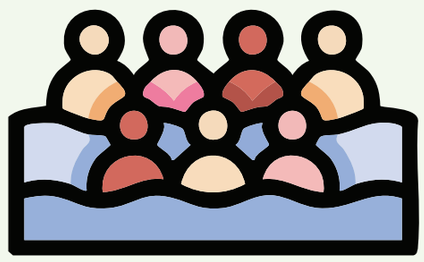
Population at Risk to Methane Emission

Occupational Exposure: Common among workers in oil and gas, refineries, landfills, coal mines, livestock, and wastewater facilities.

Community Exposure: Elevated risks for communities near oil and gas operations, especially onshore fields.

Vulnerable Populations: Children, the elderly, pregnant women, and those with health conditions are more susceptible, especially to pollutants like ozone.



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Benefits of Methane Mitigation

Community health and wellbeing:
Less flaring means fewer harmful emissions, reducing respiratory diseases and improving overall well-being.

Source of revenue:
Associated gas can generate significant revenue when commercialized rather than flared.

Environmental Health:
eliminating gas flaring reduces air pollution.

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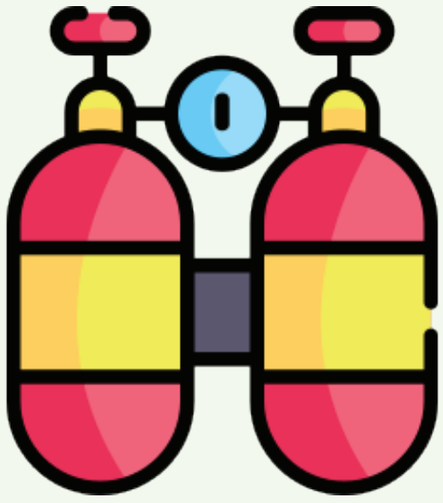
Reducing Methane Emission in the Oil and Gas Sector: Zero Gas Flaring

According to the global methane assessment, cutting methane emissions can decrease global warming by 0.3°C and prevent thousands of premature deaths and asthma-related hospital visits annually by 2040.

0.3°C

reduction in global warming can prevent thousands of premature deaths



Recovery and Utilisation:
Capture and utilise associated gas (mainly methane) instead of venting or flaring.

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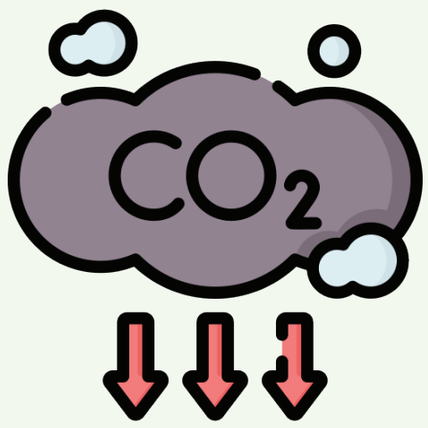
Reducing Methane Emission in the Oil and Gas Sector: Zero Gas Flaring



Accelerate compliance of companies to methane reduction guidelines.

Alternative Uses of Methane:
Promote methane use for energy production and other industrial processes like in manufacturing ammonia for fertilizers.

Improved Equipment and Maintenance:
Control fugitive emissions with better equipment and regular inspections, including leak detection and repair systems.