



TANA AND ATHI RIVERS DEVELOPMENT AUTHORITY (TARDA)

2023 METHANE GAS EMISSIONS IN KENYA REPORT

Report Developed in November 2024

OVERVIEW

This report analyzes methane gas emissions in Kenya using data from the *Sentinel-5P satellite (COPERNICUS/S5P/OFFL/L3_CH4)* on the *Google Earth Engine (GEE)* platform. The map showcases cumulative methane concentrations for 2023 and identifies emission hotspots. Additionally, the report explores livestock vaccination as a mitigation strategy, examining methane's relationship with livestock and its environmental impacts.

UNDERSTANDING METHANE GAS



Methane (CH_4) is a potent greenhouse gas contributing approximately 20% of global warming attributed to long-lived greenhouse gases.

Key Facts:

- *Global Warming Potential (GWP)*: Methane is 25 times more effective than CO_2 at trapping heat over a 100-year period and 80 times more potent over 20 years.

Sources:

- *Natural*: Wetlands, termites, and geological seepage.
- *Human-Induced*: Agriculture (mainly livestock), oil and gas production, and landfills.

What Does "ppb" Mean?

- ppb stands for **parts per billion**, a concentration unit indicating the amount of a substance in air.

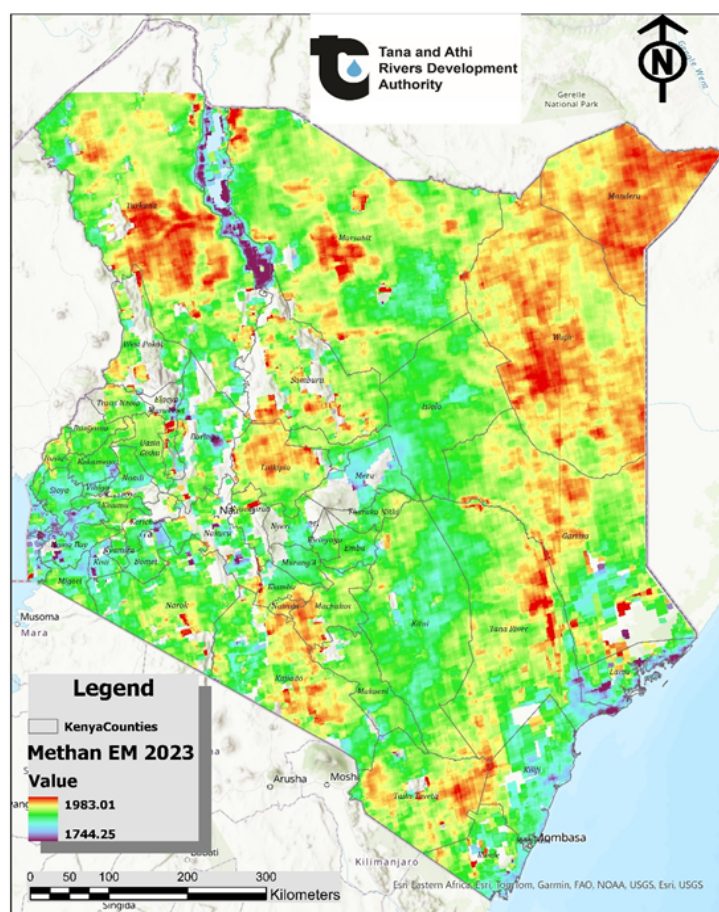
Example: If methane levels measure 1,983 ppb, there are 1,983 molecules of methane in every billion molecules of air.

Methane's atmospheric concentration serves as a key indicator of climate change and is measurable via advanced satellite sensors like Sentinel-5P.



INSIGHTS FROM SENTINEL-5P DATA

2023 CUMULATIVE METHANE GAS EMISSION



The COPERNICUS/S5P/OFFL/L3_CH4 dataset visualized methane emissions across Kenya in 2023. The map created using the GEE platform highlights areas with elevated methane concentrations.

KEY FINDINGS

Hotspot Regions

Counties such as **Mandera, Marsabit, Samburu, and Tana River** recorded the highest emissions, aligning with areas of high livestock density.

EMISSION LEVELS

High Emissions

- Dark red zones with methane levels near 1,983 ppb.

Low Emissions

- Green zones with methane levels around 1,744 ppb.

Geographical Trends

Semi-arid pastoral zones exhibit significant methane release.

METHANE AND LIVESTOCK

Livestock, particularly ruminants (e.g., cattle, sheep, and goats), are major contributors to methane emissions through:

1. Enteric Fermentation

Methane is a byproduct of microbial digestion in the rumen.

2. Manure Decomposition

Methane is released during anaerobic breakdown of livestock waste.



In Kenya, livestock farming is the leading source of agricultural methane emissions. According to the 2019 Kenya Livestock Census, Kenya has an estimated 60 million livestock, predominantly in arid and semi-arid regions.

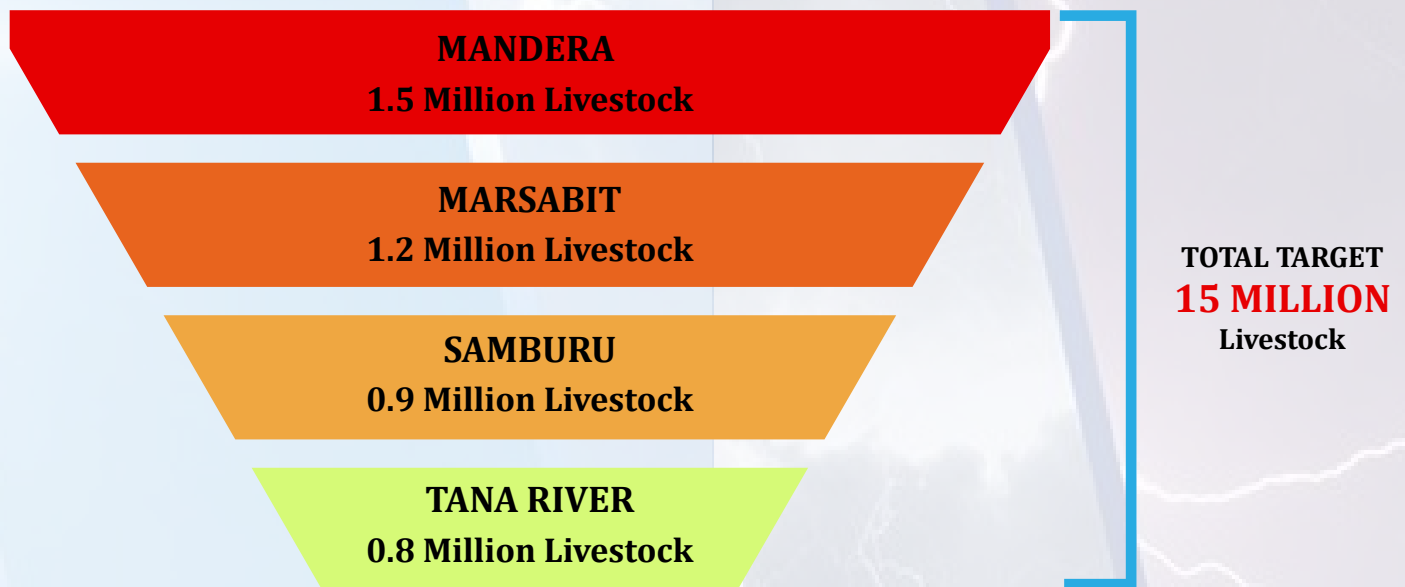


LIVESTOCK VACCINATION MITIGATION STRATEGY

Vaccinating livestock to suppress methane-producing microbes in the digestive system is an innovative approach to reducing emissions. Studies suggest that methane emissions can be reduced by **20-30%**, alongside benefits like improved feed efficiency and productivity.



VACCINATION TARGETS BY COUNTY BASED METHANE HOTSPOTS USING METHANE MAP AND LIVESTOCK DATA



SPATIAL ANALYSIS OF METHANE HOTSPOTS

The methane emission map identifies priority counties for intervention

Mandera County

Large pastoral herds contribute significantly to emissions.

Marsabit County

High methane levels correspond to extensive grazing systems.

Tana River County

Mixed farming and poor manure management amplify emissions.



Large Pastoral Herd

GLOBAL CONTEXT AND RESEARCH

Kenya's efforts align with global methane reduction strategies:

FEED ADDITIVES

Seaweed Supplements

Studies in Australia show that *Asparagopsis Taxiformis* can reduce methane emissions by up to 80% (CSIRO).

Nitrate Additives

Trials in India achieved 30-50% reductions.

ANTI-METHANE VACCINES

Experimental vaccines targeting gut microbes show promising reductions.

Kenya's methane mitigation aligns with its Nationally Determined Contributions (NDCs) under the Paris Agreement, emphasizing agriculture as a critical sector for climate action.

RECOMMENDATIONS

Enhance Satellite Monitoring

Continuously track methane emissions with Sentinel-5P data

Scale Livestock Vaccination

Expand vaccination programs in hotspot regions

Adopt Feed Additives

Incorporate seaweed and nitrate supplements to reduce emissions further

Farmer Training

Educate farmers on methane reduction techniques and sustainable livestock practices

County Level Prioritization

Begin interventions in counties with the highest emissions

CONCLUSION

Kenya's 2023 methane map reveals high-emission zones linked to livestock farming, emphasizing the need for targeted interventions. Combining livestock vaccination with feed additives and sustainable farming practices can reduce methane emissions significantly, aligning with Kenya's climate goals and boosting agricultural productivity.

**WE ARE THE FIRST GENERATION TO FEEL THE IMPACT OF CLIMATE CHANGE AND
THE LAST GENERATION THAT CAN DO SOMETHING ABOUT IT**

— BARACK OBAMA —

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