AGATE Project Overview

Emission, Estimation and Data Requirements

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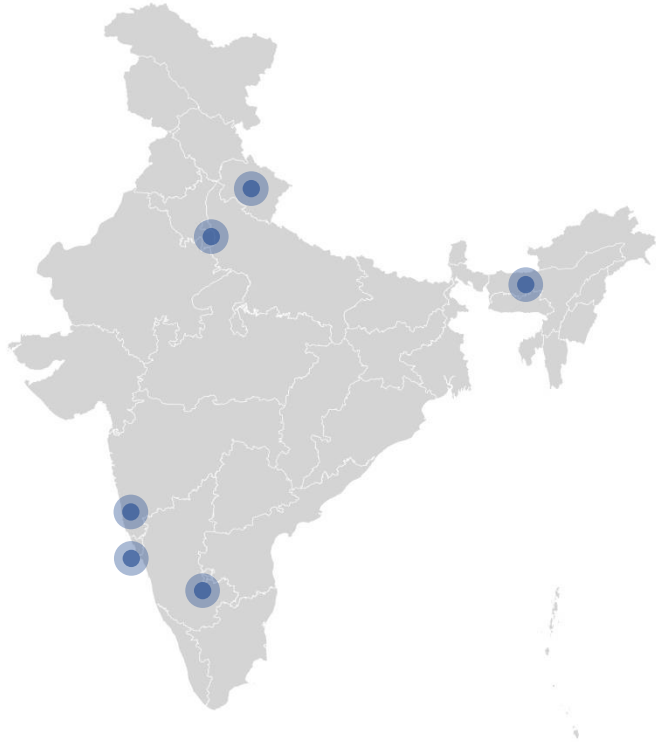
About TERI

We are one of the **world's premier think-tanks** and research institutions in the field of **energy, climate change and sustainability**

- TERI (**The Energy and Resources Institute**) established **six centers** across the country, namely Bengaluru, Gurugram, Goa, Guwahati, Mumbai, and Nainital.
- **1974:** Established as **Tata Energy and Resource Institute (TERI)**, and supported by Mr JRD Tata.
- **600+** team of scientists, sociologists, economists, engineers, and others
- TERI's work is focused on :
  - Promoting efficient use of resources
  - Increasing access and uptake of sustainable inputs and practices
  - Reducing the impact on environment and climate
- TERI's Current Capabilities / Focused Area of expertise



TERI centers in India

Sustainable Agriculture | Climate Change | Energy | Environment | Sustainable Habitat | Health & Nutrition | Resources

Role of Our Institute w.r.t AGATE

1. Validation of Satellite- based emissions using ground observations
2. Identification of emission hotspots, trends, and anomalies
3. Collection of reliable on-ground activity data
4. Designing sustainable agricultural practices based on emission data

Potential Users

- Policy Makers
- Agencies: Vasudha, Renew Power etc
- Civil Society Organisation
- Think Tanks
- Agricultural Expert
- Animal Husbandry department etc.

Current Estimation

NH3 Emissions /Agricultural NOx Emissions/Methane Emissions: Real-time measurement using portable gas sensor/analyzer.

Observation-Based Practices

Other institutes like Vasudha, Bhu Mitra, renew power etc, are working in this field.

Experimentation & Adaptive Techniques

The method they adopt generally is empirical method.

Experimental Data and Assumptions

Challenges in emission estimation: Methane

- **Primary Source:** Rice fields are a major contributor to methane emissions.
- **Impact on Emissions:**

Continuous flooding → **Higher methane emissions** (due to anaerobic conditions).

Intermittent irrigation & aeration → **Lower methane emissions** (by allowing oxygen penetration).

- **Lack of Data:** No available information on:
- **Irrigation Type & Level** – Whether continuous flooding or intermittent irrigation is used.
- **Aeration Frequency** – How often fields are drained or exposed to air.
- **Data Gap Challenge:** Without specific irrigation and aeration data, accurate methane emission estimation is difficult.

Challenges in emission estimation: Methane and Nitrous Oxide

- ***Sources of Emissions:***

- **Methane (CH_4):** Produced during enteric fermentation in the digestive system of ruminants (e.g., cows, buffaloes) and from manure decomposition under anaerobic conditions.

- **Nitrous Oxide (N_2O):** Emitted from livestock manure when it undergoes microbial processes like nitrification and denitrification in soil.

- ***Data Challenge:***

- The **livestock census is infrequent** (every 5 years), leading to outdated population figures.

- **Total cattle numbers are recorded**, but **key factors like gender and age** are missing.

- **Why it matters:**

    - **Methane emissions vary** based on cattle type (dairy vs. non-dairy) and digestive efficiency.

    - **Older cattle produce more methane** than younger ones.

    - **Nitrous oxide emissions depend on manure composition, which varies with age and diet.**

- **Impact:**

- Without gender and age data, **accurate emission calculations become difficult**.

- Policy planning and mitigation strategies may be **less effective due to incomplete data**.

Challenges in emission estimation: Ammonia

•**Agricultural Production Yield (APY):** Refers to the total crop output per unit area in a given district, commonly measured in tons per hectare.

•**Fertilizer Usage & Its Role:**

•Fertilizers (Nitrogen, Phosphorus, Potassium – NPK) play a crucial role in improving crop yields.

•Excessive or imbalanced fertilizer application can lead to soil degradation, water pollution, and greenhouse gas emissions.

•***Data Gap & Challenges:***

•Agricultural activity data at district level is available, but District-level **fertilizer usage data is unavailable**, making it difficult to analyze its impact on yield.

•Without this data, it is challenging to assess:

- •The relationship between **fertilizer application and productivity** at the local level.
- •The **efficiency of fertilizer use**, which is key for sustainable farming practices.
- •The **environmental impact** of fertilizer overuse or underuse in different regions.

•**Impact:**

- Lack of granular data **hinders targeted policy decisions** for sustainable agriculture.
- Makes it difficult to **estimate emissions** from fertilizer use at the district level.

THANK YOU