Near-real Time Emission Inventory Platform for Air Quality Management in the Lower Mekong Sub-region

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A Region Under Fire: The Cost of Biomass Burning

9 Million

Premature deaths worldwide caused by all forms of pollution[1].

4.2 Million

Premature deaths globally linked to ambient air pollution (including fire emissions) [2].

~350 Million

Hectares of land burned by wildfires globally each year[3].

45%

of current global warming driven by Short-Lived Climate Pollutants (SLCPs)[4].

[1] **Landrigan, P. J., et al.** (2018). The Lancet Commission on pollution and health. *The Lancet, 391*(10119), 462-512. https://doi.org/10.1016/S0140-6736(17)32345-0
[2] **World Health Organization (WHO).** (2022). *Ambient (outdoor) air pollution*. WHO Fact Sheets. https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health
[3] **Giglio, L., Randerson, J. T., & van der Werf, G. R.** (2013). Analysis of daily, monthly, and annual burned area using the fourth-generation global fire emissions database (GFED4). *Journal of Geophysical Research: Biogeosciences, 118*(1), 317-328. https://doi.org/10.1002/jgrg.20042
[4] **Climate and Clean Air Coalition (CCAC).** (2023). *Short-lived climate pollutants*. https://www.ccacoalition.org/content/short-lived-climate-pollutants

INTRODUCTION *Platform Scopes*

1 Geographical Coverage

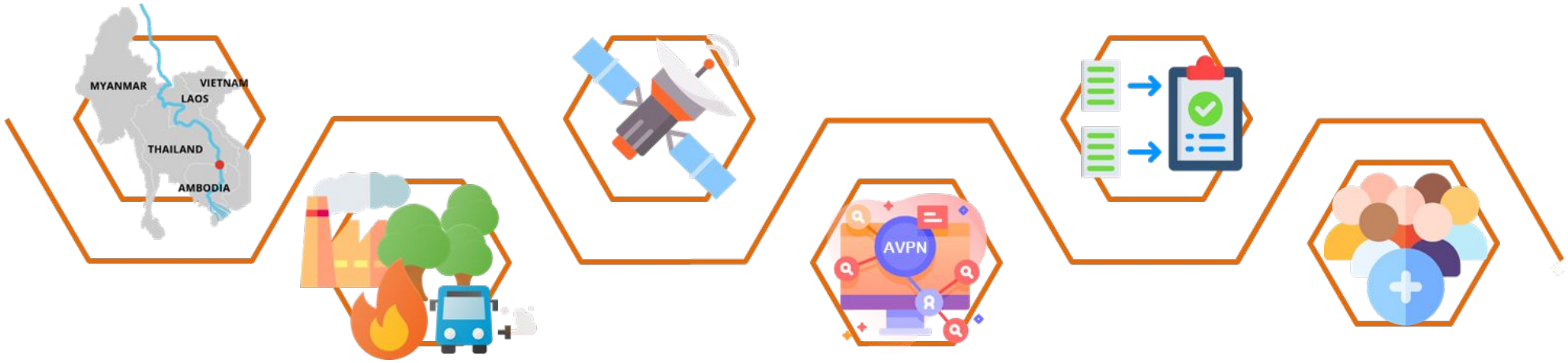
Cambodia, Laos, Myanmar, Thailand, and Vietnam

3 Standardized Data & AI Support

Satellite Data, Land use maps, and AI-driven classification

5 Validate Data

Independent datasets and ground truth where available



2 Emission Categories

Forest Fires, Agricultural burning, Traffic and Industry

Which, Air Pollutants: PM, NMVOCs, SO_2, NH_3

SCLPs: BC, OC, CO, NOx

GHGs: CO_2, N_2O, CH_4

4 Open Access Platform

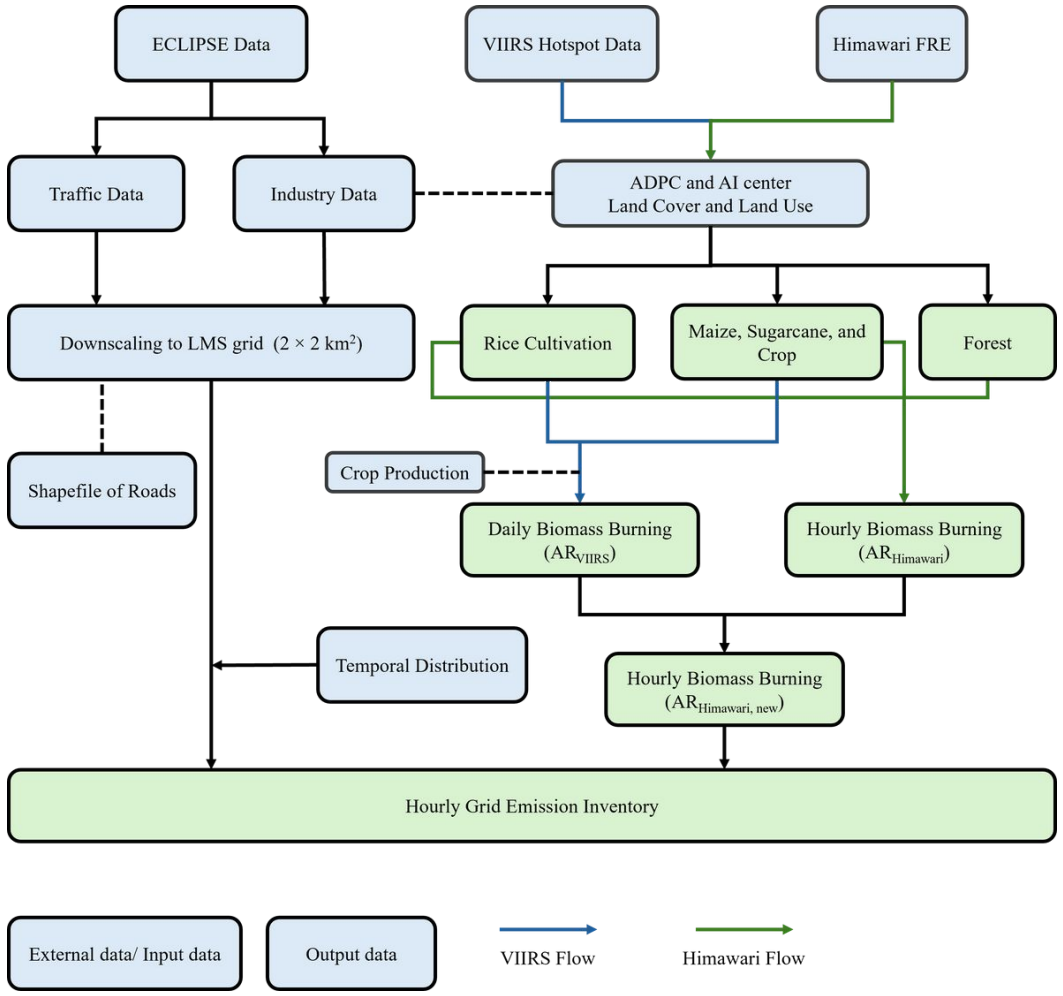
Provides dashboards, interactive maps, time-series trends, and downloadable datasets.

6 Conduct Capacity-building programs

Government organizations, academic institutions and regional stakeholders

METHODOLOGY *Project Objectives*

- Uses hotspot data and Fire Radiative Power (FRP) to identify fire events.
- Applies land use classification to categorize fire types.
- Employs AI models to identify crop types for assigning specific emission factors.
- Traffic emissions are downscaled using road network data.
- Industrial emissions are mapped using land cover data.
- Traffic and industrial emissions are integrated based on the ECLIPSE 2025 inventory.



Ground Truthing: *Validating the Data*

Accuracy is validated by comparing Active Fire detections (Himawari-9) against confirmed Burned Area products (MODIS), allowing for a 2 km spatial buffer and ±7day lag.

Downscaling: *Mapping Traffic & Industry*

TRAFFIC METHOD

Traffic emissions are calculated using OpenStreetMap (OSM) road network data to downscale the ECLIPSE inventory from 0.5° × 0.5° to 2 km × 2 km resolution:

$$EL_{(i,j)} = \text{Total EI}_{(k)} \times \frac{\text{Length of road in Grid } i}{\text{Total Length of road in Grid } k}$$

Where: EL: Traffic Emission level

i: Grid ID in downscaled study area

j: Pollutant type (e.g., PM2.5, NOx, CO)

k: Grid ID of original ECLIPSE dataset

DOWNSCALING METHODOLOGY

Industrial emissions are calculated using the density of populated regions or the existence of industrial facilities inside each sub-grid, in contrast to the road network-based distribution utilized for traffic emissions to downscale the ECLIPSE inventory from 0.5° × 0.5° to 2 km × 2 km resolution:

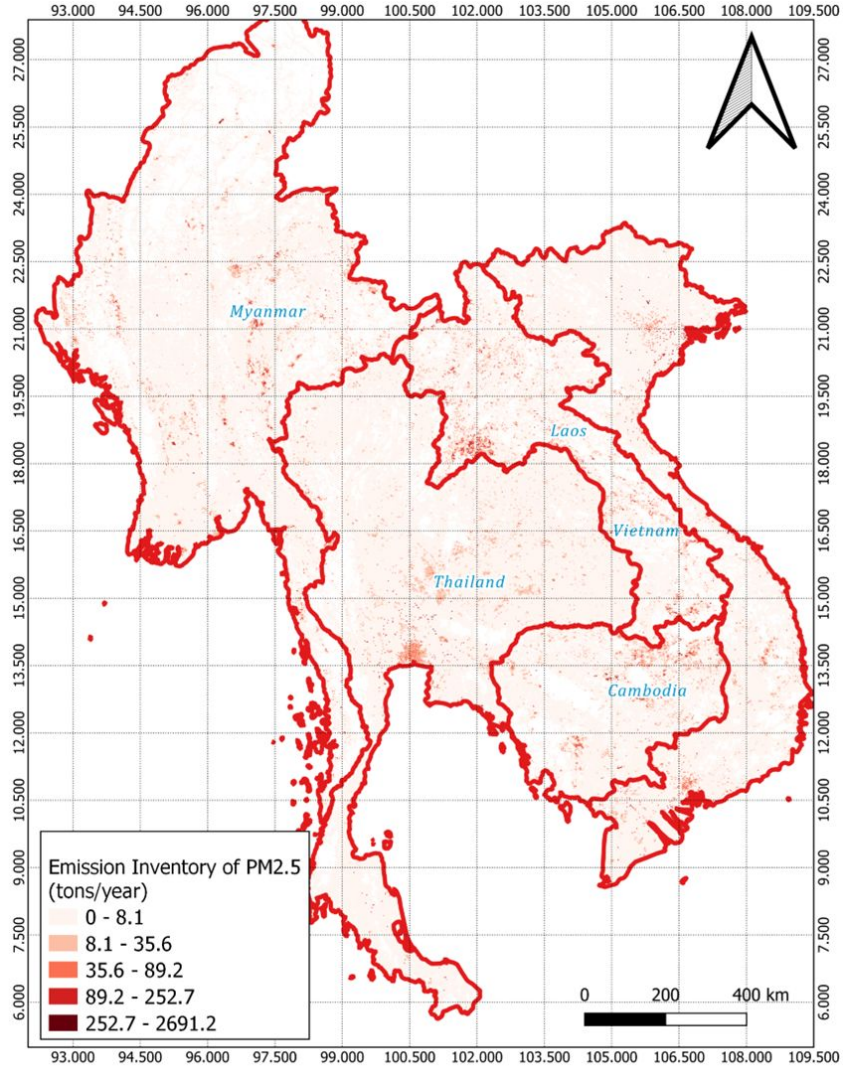
$$EL_{(i,j)} = \frac{\text{Total EI}_{(k)}}{\text{Total number of Grid containing the industries in Grid } k}$$

Where: EL: Industrial Emission level

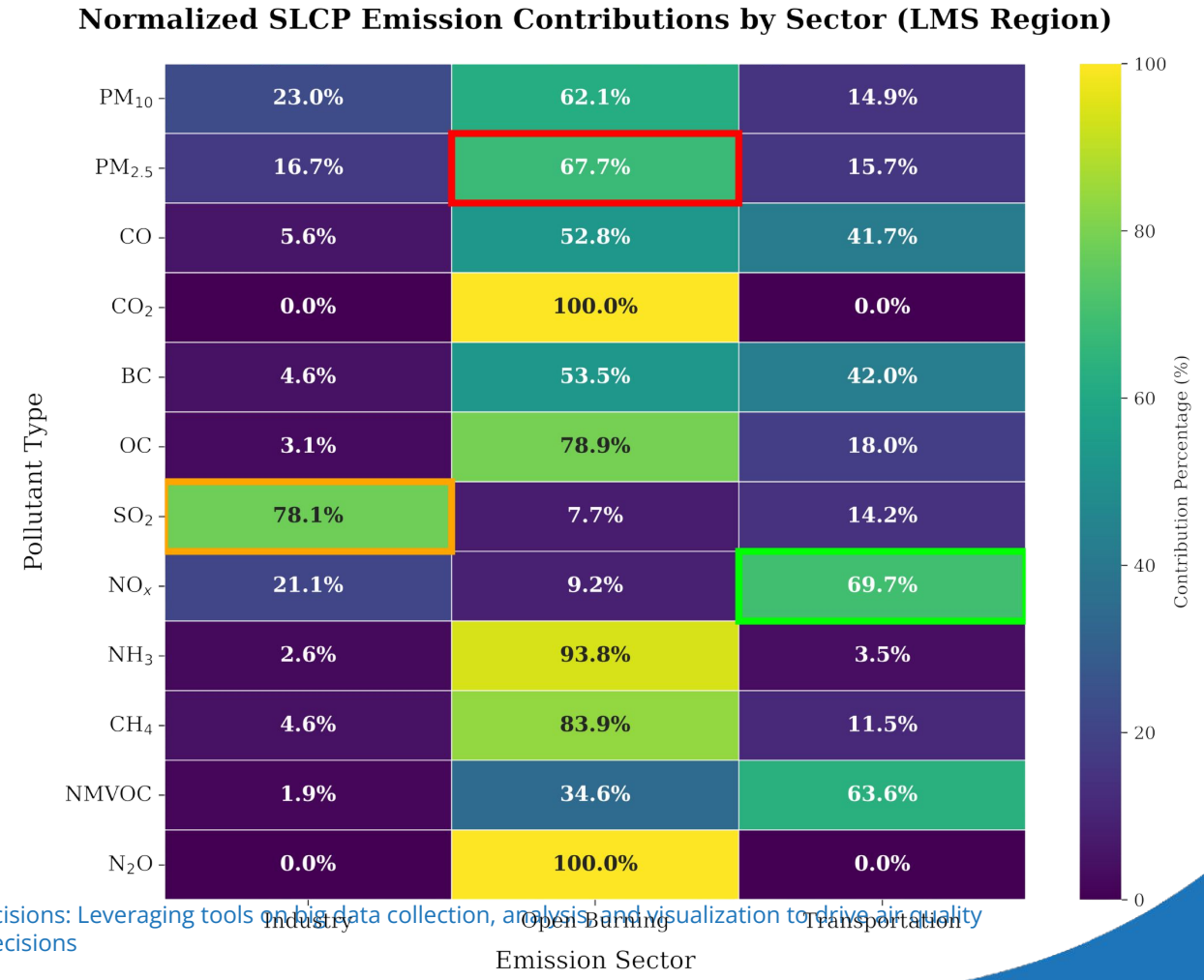
i: Grid ID in downscaled study area

j: Pollutant type (e.g., $PM_{2.5}$, NOx, CO)

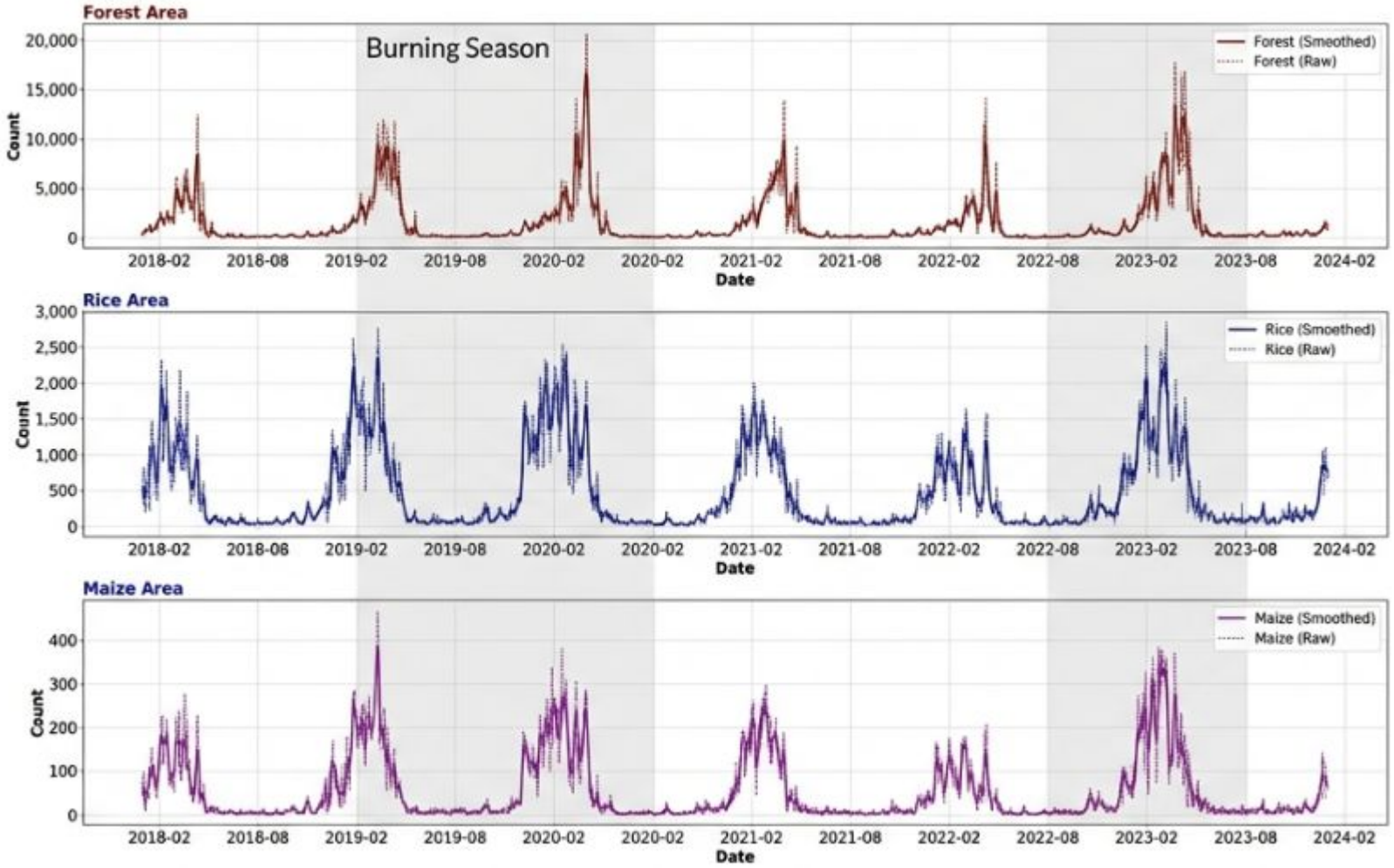
RESULT *Overall Emission Inventory*



Transport and Industrial Emissions use ECLIPSE 2025, **Open Burning** Emissions use 2024 Himawari-based data



Key Insights: *The Seasonal Rhythms*

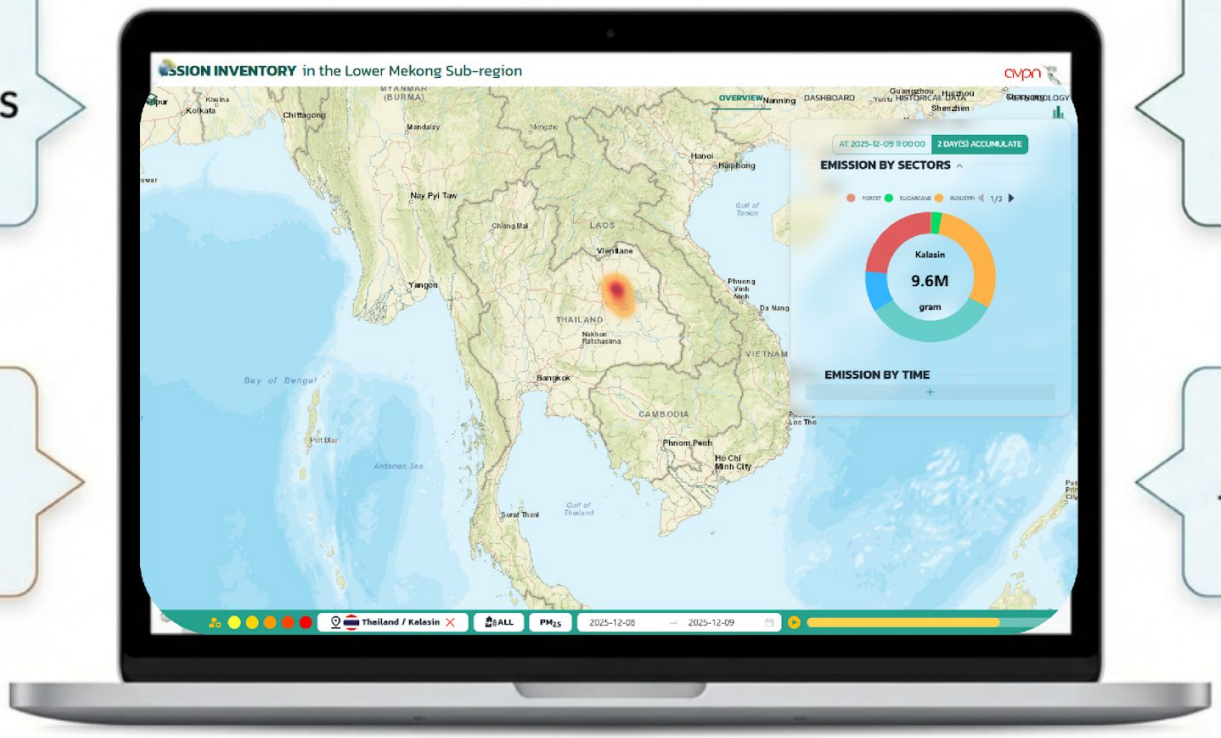


- Forest fires drive the most extreme spikes, while agriculture (Rice/Maize) provides a consistent pollution baseline.
- 2019, 2020, and 2023 show the highest forest fire activity.

Lower Mekong Emission Watch Platform

URL:
lowermekongemissionwatch.com

Historical Data:
2018–Present



Real-time interactive dashboard

Open Access for Policymakers

Scan to access platform

Driving Policy & Decision-Making *Future Opportunities*

Regional Level (Transboundary Haze Cooperation)

Serves as a unified data-sharing tool to support the **ASEAN Agreement on Transboundary Haze Pollution (AATHP)**, helping LMS countries establish joint response protocols.

National Level (Early Warning & Legislation)

Government agencies (e.g., PCD) with near-real-time alert systems to enforce emission thresholds and support **Clean Air Act requirement**.

Provincial Level (Targeted Enforcement)

Enables local governments to monitor compliance with seasonal **zero-burn** mandates, deploying rapid interventions to precise hotspots.

City Level (Proactive Health Protection)

Automated alerts during extreme pollution spikes to initiate emergency protocols like targeted **health advisories or school closures**.

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