Networking and Brokerage Event

Horizon Europe

MSCA Staff Exchanges Call 2026

SLCP (Methane & Black Carbon) Emission over India and its global impact through Climate Modelling

16 February 2026

Dr. Saroj Ku. Sahu
Department of Environmental Science
Berhampur University
India
Mob: +91-9439919236
Email: sks.evs@buodisha.edu.in
Website: http://aeimsksahu.com

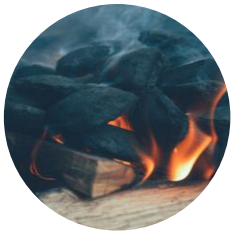
Short-Lived Climate Pollutants (SLCPs)

- Climate forcers with short atmospheric lifetimes (days to ~15 years).
- High radiative forcing efficiency relative to CO_2.
- Major SLCPs include Black Carbon (BC), Methane (CH_4)










BC

- Strong light-absorbing aerosol → positive radiative forcing.
- Reduces snow/ice albedo when deposited → accelerates melting.
- Short lifetime (~days to weeks), but intense regional impacts.

CH_4

- Atmospheric lifetime ~12 yrs
- Potent greenhouse gas (~28–30 times CO_2 over 100 years).
- Precursor to tropospheric ozone formation.

Proposed Project Description

Rationale

Asian countries like India is a rapidly growing hotspot of SLCP emissions like CH_4 & BC due to changing trend of anthropogenic and natural sources with energy demand and changing life-style, leading to near-term warming, air quality, and regional climate issues.

Objective

- To identify all types of SLCP sources and its quantification at finest spatial resolution and hotspot mapping and seasonal variability analysis.
- To optimize global climate modelling for understanding the long/short-term impact.

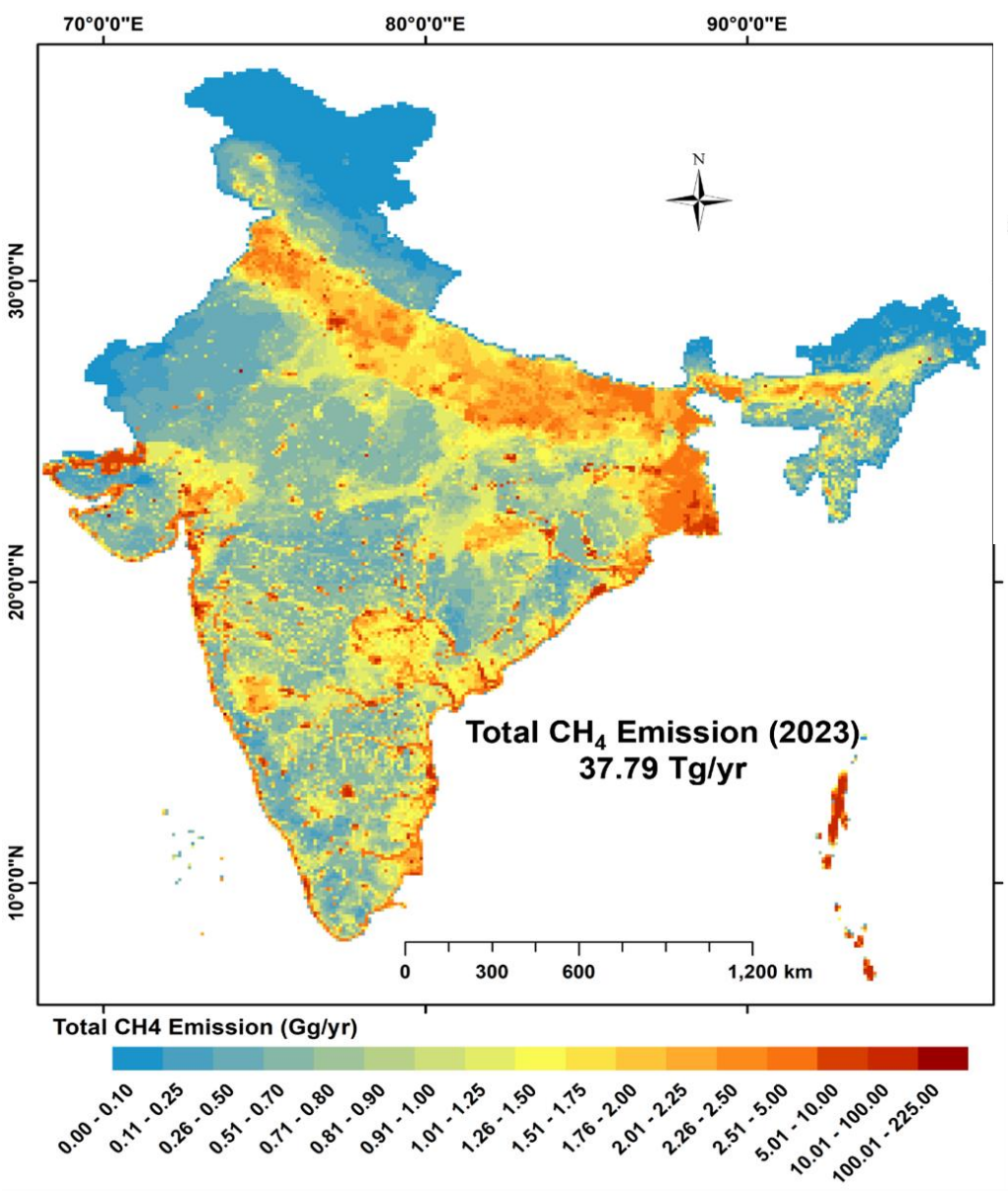
Methodology

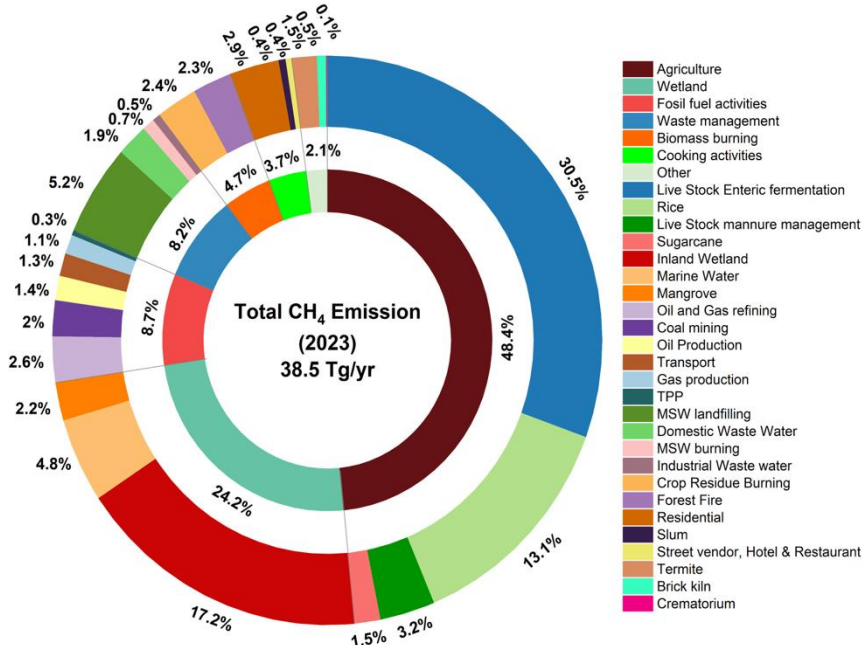
- IPCC defined Tier II and Tier III methodologies, incorporating country-specific emission factors, technology differentiation, and activity data refinement
- Atmospheric modelling and satellite validation to reduce uncertainty and improve spatial-temporal accuracy.

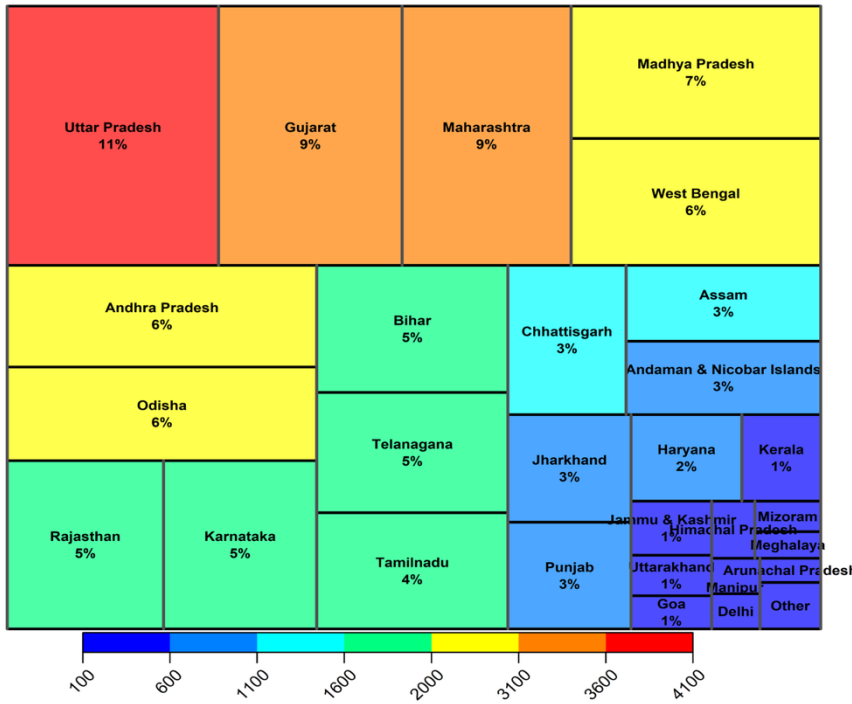
Deliverables

- Develop/update BC and CH_4 emission inventory database over India with its seasonal and sectoral assessment.
- Modelling cum Satellite study will Identification of Spatial hotspot and policy-ready mitigation assessment report.

Methane Emission in India



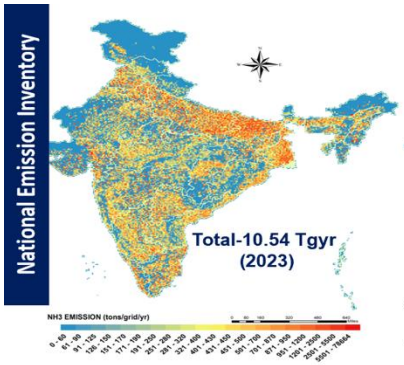




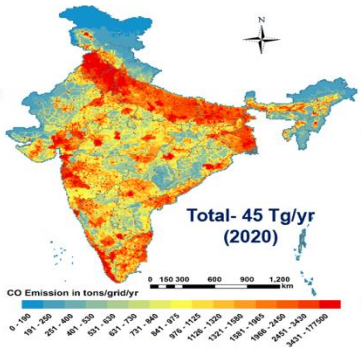
Mishra & Sahu et al, 2026, ESSDD

GHGs & Air Pollutant Emission-Data Availability over India

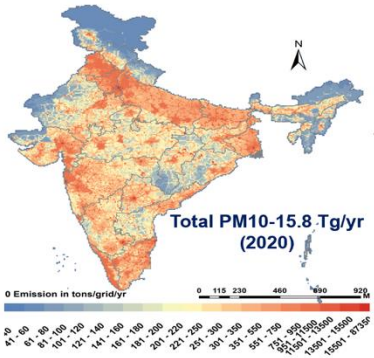
National Emission Inventory



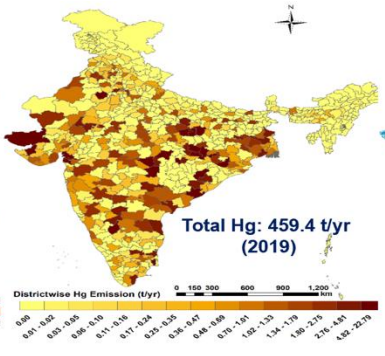
Sahoo et al, 2024, JoHM
Ammonia (NH_3)



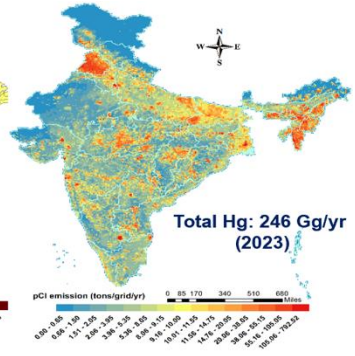
Sahu et al, 2024, Env. Pollu.
Indirect GHGs (CO)



Sahu et al, 2023, ESSD
Particulate Matter(PM)



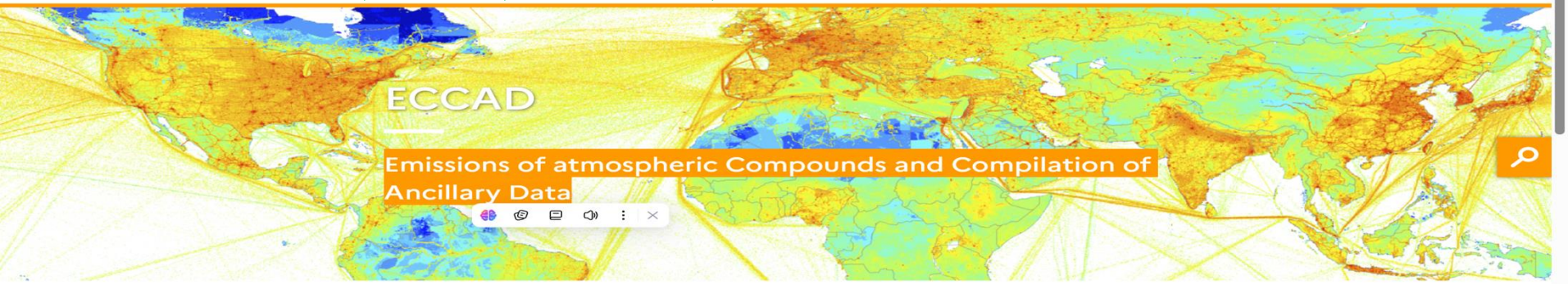
Sahu et al, 2024, JoHM
Mercury (Hg)



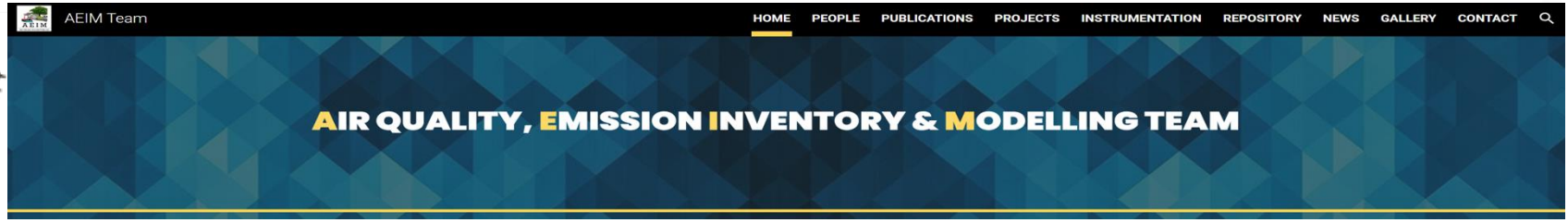
Sahoo et al, 2025 (SoTE)
Particulate Chloride (pCl)

DATA CAN BE DOWNLOADED FROM GLOBAL EMISSION REPOSITORY SITE

Emissions of Atmospheric Compounds and Compilation of Ancillary Data (ECCAD),



ECCAD : Making data accessible and providing tools for data analysis



Gridded Emission Dataset over India (2020) at ECCAD.

https://eccad.sedoo.fr/#/metadata/661?version=v1.0 & https://www.aeimsksahu.com/repository

Research Expertise

Co-PI - Indo-Norway International Project: QUISARC
(Quantifying Impacts of South Asian Aerosols on Regional and Arctic Climate)

Leading the Indian component of the Indo-Norwegian collaborative research initiative on South Asian aerosol-climate interactions.

Updated the Indian anthropogenic emission-inventories & compared with Global emission Community Emission Data System (CEDS) inventory.

Addressed key Emission data gap, Climate Modelling & uncertainties

Investigated long-range transport pathways and tele-connections Using state-of-the-art global offline Climate model

Strengthened Indo-Norway scientific collaboration

Relevant Publications

i. Janardanan, R., Maksyutov, S., Wang, F., Nayagam, L., Sahu, S. K., Mangaraj, P., … Matsunaga, T. (2024). Country-level methane emissions and their sectoral trends during 2009–2020 estimated by high-resolution inversion of GOSAT and surface observations. *Environmental Research Letters*, *19*(3), 034007–034007. https://doi.org/10.1088/1748-9326/ad2436

ii. Mishra, A., Mangaraj, P., Sahoo, P., Beig, G., Janardanan, R., & Sahu, S. K. (2025). Reporting of Gridded (0.1°×0.1°) Methane Emission Data for India to Redefine Global Climate Studies. *Earth System Science Data Discussion*. https://doi.org/10.5194/essd-2025-65

iii. Samal, A., Sahu, S. K., Mishra, A., Mangaraj, P., Pani, S. K., & Beig, G. (2024). Assessment and Quantification of Methane Emission from Indian Livestock and Manure Management. *Aerosol and Air Quality Research*, *24*(6), 230204–230204. https://doi.org/10.4209/aaqr.230204

iv. Sahu, S. K., Beig, G., & Sharma, C. (2008a). Decadal growth of black carbon emissions in India. *Geophysical Research Letters*, *35*(2). https://doi.org/10.1029/2007gl032333

v. Kumar, P., Beig, G., Sahu, S. K., Yadav, R., Maji, S., Singh, V., & Bamniya, B. R. (2023). Development of a high-resolution emissions inventory of carbonaceous particulate matters and their growth during 2011–2018 over India. *Atmospheric Environment*, *303*, 119750–119750. https://doi.org/10.1016/j.atmosenv.2023.119750

vi. Lund, M. T., Sahu, S. K., Chowdhury, S., Myhre, G., Johansen, A. N., Mangaraj, P., … Staniaszek, Z. (2025). Air Pollution and Health Burden in India Quantified Using the AEIM-India Emission Inventory. *ACS ES&T Air*. https://doi.org/10.1021/acsestair.5c00171

vii. Mangaraj, P., Sahu, S. K., & Beig, G. (2024). Development of emission inventory for air quality assessment and mitigation strategies over most populous Indian megacity, Mumbai. *Urban Climate*, *55*, 101928–101928. https://doi.org/10.1016/j.uclim.2024.101928

viii. Sahu, S. K., Mishra, M., Mishra, A., Mangaraj, P., & Beig, G. (2024). Quantification and assessment of hazardous mercury emission from industrial process and other unattended sectors in India: A step towards mitigation. *Journal of Hazardous Materials*, *470*, 134103–134103. https://doi.org/10.1016/j.jhazmat.2024.134103

ix. Sahoo, P., Mishra, A., Mangaraj, P., Ravindra, K., Beig, G., Tyagi, B., & Sahu, S. K. (2025). What drives anthropogenic fine particulate chloride emissions in India? – A quantitative assessment of hotspots. *The Science of the Total Environment*, *991*, 179949–179949. https://doi.org/10.1016/j.scitotenv.2025.179949

x. Sahoo, P., Sahu, S. K., Mangaraj, P., Mishra, A., Beig, G., & Gunthe, S. S. (2024). Reporting of Gridded Ammonia Emission and Assessment of Hotspots across India: A comprehensive study of 24 anthropogenic sources. *Journal of Hazardous Materials*, *479*, 135557–135557. https://doi.org/10.1016/j.jhazmat.2024.135557

xi. Sahu, S. K., Mangaraj, P., & Beig, G. (2023). Decadal growth in emission load of major air pollutants in Delhi. *Earth System Science Data*, *15*(7), 3183–3202. https://doi.org/10.5194/essd-15-3183-2023

xii. Sahu, S. K., Mangaraj, P., Beig, G., Lund, M. T., Samset, B. H., Sahoo, P., & Mishra, A. (2023). Development and comprehensive analysis of spatially resolved technological high resolution (0.1°×0.1°) Emission Inventory of Particulate Matter for India: A step Towards Air Quality Mitigation. *Earth System Science Data Discussion*. https://doi.org/10.5194/essd-2023-310

xiii. Sahu, S. K., Mangaraj, P., Sahoo, P., Mishra, A., & Beig, G. (2024). Quantification and Spatial Analysis of Gridded ($0.1^0 \times 0.1^0$) Emission of Indirect GHGs/Air Pollutants from Anthropogenic Sources in India. *Environmental Pollution*, *363*, 125231–125231. https://doi.org/10.1016/j.envpol.2024.125231

Contact Details

Dr. Saroj Ku Sahu

Department of Environmental Science

Berhampur University, Bhanja Bihar, Odisha, India, 760007

Mob: +91-9439919236

Email: sks.evs@buodisha.edu.in

Website: http://aeimsksahu.com (More details about group activity and data repository)

The nature of your organisation: **Academic Institution**

The country from which it operates: **India**