Dr. Neeldip Barman

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Research interests: Air Pollution Modelling, Air Quality Management, Chemical Transport Modelling Aerosol-Climate interactions, Regional Climate Modelling

Education

- **Postdoctoral Researcher,** IIT Bombay, Mumbai (September 2023 – Present)

  Advisors: Prof. Chandra Venkataraman, Prof. Srinidhi Balasubramanian
- **Visiting Scholar,** University of California, Berkeley (September – October 2024)
- **Ph.D. in Environmental Engineering**, IIT Guwahati, Guwahati (July 2018 – March 2024)

  Thesis title: "Transported emissions from the Indo-Gangetic Plain dominate Air pollution and Climatic impacts over North East India during Pre-monsoon season"

  Advisors: Prof. Sharad Gokhale
- **M.Tech in Environmental Engineering**, IIT Guwahati, Guwahati (July 2016 – July 2018)

  Thesis title: "Black Carbon in Urban Areas of Guwahati, its Source Apportionment and Micro and Global Scale Transportation". CPI: 9.31
- **B.E. in Civil Engineering**, Gauhati University, Guwahati (August 2011 – August 2015)

  Percentage: 88.60

Peer-reviewed publications

1. **Barman, N.**, Gokhale, S., Tiwari, D., 2024. Impact of boundary layer parameterizations on simulated seasonal meteorology over North-East India, *Dynamics of Atmospheres and Oceans.* 108, 101505 Link
2. Venkataraman, C., Anand, A., Maji, S., **Barman, N.**, et al. 2024. Drivers of $PM_{2.5}$ episodes and exceedance in India: A synthesis from the COALESCE network, *JGR: Atmospheres*. 29 (14) Link
3. **Barman, N.**, Gokhale, S., 2023. Transported aerosols regulate the pre-monsoon rainfall over north-east India: a WRF-Chem modelling study. *Atmospheric Chemistry and Physics*. 23, 6197–6215. Link
4. **Barman, N.**, Gokhale, S., 2022. Aerosol influence on the pre-monsoon rainfall mechanisms over North-East India: A WRF-Chem study. *Atmospheric Research*. 268, 106002 Link
5. **Barman, N.**, Gokhale, S., 2019. Urban black carbon - source apportionment, emissions and long-range transport over the Brahmaputra River Valley. *Science of the Total Environment*. 693, 1–14. Link

Working Papers

6. **Barman, N.**, Gokhale, S., An alternate mechanism of enhancement in particulate pollution due to aerosol direct radiative effect.
7. **Barman, N.**, Balasubramanian, S., Venkataraman, C., et al. Delineation of multi-scale $PM_{2.5}$ airsheds in India using PAVITRA.
8. **Barman, N.**, Venkataraman, C., Balasubramanian, S., Arub, Z., Saxena, S., et al. An airshed approach to mitigating extreme $PM_{2.5}$ levels in India's Indo-Gangetic Plains.
9. Arub, Z., Saxena, S., Mendoza, L.R., **Barman, N.**, Marshall, J., Apte, J., Balasubramanian, S., Venkataraman, C. Strategizing India's National Clean Air Program (NCAP) to transition between city scales.
10. Balasubramanian, S., Mendoza, L.R., **Barman, N., et al.** Making a case for a multi-scale, multi-sector mitigation approach for Clean Air Goals in India.

Research experience

My core area of research has been modeling air pollution and its climatic impacts. During my master's, I worked on city-scale dispersion modeling of black carbon with AERMOD and its regional transport and deposition in the Himalayas through HYSPLIT. In my doctoral studies, I estimated the air pollution and climatic impacts of transported aerosols of the Indo-Gangetic Plains on North-East India through a chemical transport model (WRF-Chem). The study examined the processes and mechanisms of impact and established that the emissions from the Indo-Gangetic Plains are primarily responsible for air pollution and atmospheric anomalies over North-East India. Additionally, I have worked with the WRF model to understand the sensitivity of boundary layer parameterizations on predicted meteorology through model evaluation. Currently, I am working on an international multi-institutional project (PAVITRA) to formulate airshed-based air quality management in India using a reduced complexity model, InMAP-PAVITRA. Altogether, I have had the opportunity to work with a diverse set of air quality and climate models to develop science informed policies. In addition to modeling, I also had field experience with several air pollution measurement tools.

Conference/Invited talks/Workshops

1. Yadav, G. P., **Barman, N**., Mendoza, L. R., Arub, Z., Bharadwaj, P., Marshall, J., Apte, J., Balasubramanian, S., Venkataraman, C., (2025, October 13-17) Establishing contributions from agricultural emissions to India's ambient PM2.5 exposures. 43nd AAAR Conference, Buffalo, New York, United States.

2. **Barman, N.**, Venkataraman, C., Balasubramaniam, S., Mendoza, L. R., Wang, Y., Apte, J., Marshall, J. D. (2025, April 1-2). An Airshed Approach to Mitigating Extreme $PM_{2.5}$ Levels in India's Indo-Gangetic Plains. Fundamentals of Air Quality Modelling and Its Role in Air Quality Management 2025, New Delhi, India.

3. Mendoza, L. R., Balasubramaniam, S., **Barman, N**., Wang, Y., Arub, Z., Marshall, J. D., Venkataraman, C., Apte, J., (2024, December) Evaluating Multi-scale Heterogeneity in PM2.5 Exposures for India using an Annualized Reduced Complexity Model. AGU24, Washington, D.C., United States. https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1758940

4. Arub, Z., Mendoza, L. R, Saxena, S., **Barman, N**., Apte, J., Marshall, J. D., Balasubramaniam, S., Venkataraman, C., (2024, December) Modeling the Impact of Urban and Non-Urban Interventions in India's National Clean Air Program. AGU24, Washington, D.C., United States. https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1615000

5. **Barman, N**., Mendoza, L. R., Wang, Y., Balasubramaniam, S., Apte, J., Marshall, J. D., Venkataraman, C (2024, October 21-25). An Airshed Approach to Mitigating Extreme $PM_{2.5}$ Levels in India. 42nd AAAR Conference, Albuquerque, New Mexico, United States. https://aaarabstracts.com/2024/view_abstract.php?pid=132

6. Mendoza, L. R., Balasubramaniam, S., **Barman, N**., Wang, Y., Marshall, J. D., Apte, J., Venkataraman, C. Air Pollution mAnagement and interVentIon Tool foR IndiA (PAVITRA): Making a Case for Multi-Scale Multi-Sector Air Quality Management. 42nd AAAR Conference, Albuquerque, New Mexico, United States. https://aaarabstracts.com/2024/view_abstract.php?pid=503

7. **Barman, N**., Gokhale, S., 2022. Transported black carbon dominates radiative effects over North East India during pre-monsoon season. National Conference on Climate Change: Science and Technology Innovation, Tezpur University, December 15-16. 2022.

8. Workshop on "Applications of Remote Sensing & GIS in Natural Disasters", jointly organized by Assam Survey & Settlement Training Centre and IIT Guwahati

9. Paper presentation "Energy content in the organic fraction of dry municipal solid waste: A case study" in RECYCLE 2018, IIT Guwahati

Work experience

- Working as a Project Research Scientist in PAVITRA project at IIT Bombay since April 2024
- Worked as a Project Research Associate in PAVITRA project at IIT Bombay from September 2023 - March 2024.

Teaching experience

- Taught as Teaching Assistant in various subjects during Masters and Ph.D. in following subjects:

    1. Air Quality Modelling
    2. Air and Noise Pollution Laboratory
    3. Environmental Engineering Laboratory
    4. Engineering Drawing
- Instructor in TEQIP Air Quality Modelling Workshop with AERMOD, April 2019 at IIT Guwahati

Mentoring experience

- Mentored graduate students Dewashish Tiwari (2022 – present) and Girivendra Pratap Yadav (2023 -present) at IIT Bombay

Skills

- Setup and application of aerosol pollution and climate models: WRF-Chem, InMAP, AERMOD, HYSPLIT, WRF
- Optimization of WRF, WRF-Chem and InMAP models
- Experience in working with high performance computing (HPC) environment
- Automating and parallelising work in HPC environment
- Handling of NetCDF and HDF raster datasets with Python, CDO and NCO
- Handling of vector datasets (shapefiles) through QGIS and geopandas
- Geospatial analysis with QGIS and geopandas, numpy and matplotlib
- Coding: Python, Bash and Fortran
- Instruments: Particulate and gaseous air pollution measurement including Aethalometer
- Experience with Github usage, **Github**: https://github.com/Neeldip/Analysis-codes

Research highlights in media

- https://india.mongabay.com/2022/06/scientists-unpack-the-influence-of-black-carbon-aerosols-on-rainfall-in-northeast-india/
- https://scroll.in/article/1026857/how-black-carbon-emissions-are-affecting-rainfall-in-the-north-east

Journal Reviewer

- Geohealth
- Earth and Space Science

Awards

- Obtained 2nd rank in Gauhati University B.E. Civil Engineering examination 2015
- Best Student award in B.E. Civil Engineering