

Dr. Bhanu Pandey

Scientist E

Environment Management & Sustainability

Environmental Management, Ecological Restoration, Air Pollution, and Mine Sustainability

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Professional Profile

Scientist working at the interface of environmental management, mine-land reclamation, biodiversity, air pollution, plant-soil interactions, and occupational and public health in mining landscapes. Research spans ecological restoration of post-mining areas, phytostabilization of industrial residues, ecosystem monitoring, environmental impact assessment, and field-to-policy translation for sustainable mining and environmental health.

Research Interests

- Mine-land reclamation, ecological restoration, and post-mining ecosystem development
- Soil quality, biodiversity, and plant-soil-microbe interactions in disturbed landscapes
- Air pollution, particulate deposition, and plant physiological responses
- Phytostabilization/phytoremediation of fly ash, mine overburden, red mud, and other industrial wastes
- Environmental impact assessment (EIA/EMP), ecological compliance, and applied sustainability studies
- Environmental and occupational health in mining regions

Career Highlights

- UGC- Research Fellowship in Sciences for Meritorious Students (RFSMS) -JRF (May 28, 2012 - May. 27, 2014)
- Led the ANRF/DST core research grant project on phytostabilization of fly ash using organic and biotechnological approaches with medicinal plants.
- Project Leader for major sponsored studies for ECL, BCCL, Adani Enterprises Ltd., and allied industry partners, including ecological assessment, air-quality monitoring, occupational health, and plantation success evaluation.
- Design registration granted in India (2024) for "Technical design of soil sampler to collect soil sample in layers."

Appointments and Education

Professional Appointments

Scientist E | 19 Sep 2025 – Till date

Senior Scientist | 19 Sep 2021 – 18 Sep 2025
CSIR-Central Institute of Mining and Fuel Research,
Dhanbad

Scientist | 19 Sep 2017 - 18 Sep 2021
CSIR-Central Institute of Mining and Fuel Research,
Dhanbad

Education

Ph.D. in Botany | 2015

Banaras Hindu University, Varanasi

Thesis: Air pollution around coal mine areas and its impact on soil and vegetation

M.Sc. in Botany | 2009

Banaras Hindu University, Varanasi

B.Sc. (Hons.) in Botany | 2007

Banaras Hindu University, Varanasi

Selected Sponsored / Grant Projects

Assessment of the efficacy of an organic and biotechnological approach to fly ash amendment and its subsequent phytostabilization using two medicinally important plants (GAP/SERB/DST/131/2023-24) - Principal Investigator

Modern innovative solutions for environmental/occupational lung health challenges using clinical and pre-clinical strategies (MLP-137/21-22) - Project Leader, CIMFR

Phenome India: CSIR Health Cohort Knowledgebase (HCP-0047) - Project Leader, CIMFR

Assessment of the success of Tree Plantation in ECL created over 1003.87 ha in the last 10 years (SSP/843/2024-25) - Project Leader

EC compliance study in Cluster VII group of mines of BCCL (SSP/851/2024-25) - Project Leader

Monitoring of air quality in Kenda Area, ECL, for Cluster No. 11 (SSP/904/2024-25) - Project Leader

Occupational health and safety study at AEL Suliyari coal mine site (SSP/927/2024-25) - Project Leader

DSTPS bioaccumulation and bio-magnification study around Asansol-Raniganj-Andal area (CNP/5112/2021-22) - Project Leader

Research Output Snapshot

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| Journal papers (2018-2025) 27 | Conference papers / abstracts 11 |
| Book chapters 11 | Patent / design registration 1 granted in 2024 |
| Reported citations / indices Total citations 1345; h-index 15; i10-index 18 | |

Selected Publications

- Pandey, B., Agrawal, M., & Singh, S. (2014). Assessment of air pollution around coal mining area: emphasizing on spatial distributions, seasonal variations and heavy metals, using cluster and principal component analysis. *Atmospheric pollution research*, 5(1), 79-86. <https://doi.org/10.5094/APR.2014.010>
- Pandey, B., Agrawal, M., & Singh, S. (2014). Coal mining activities change plant community structure due to air pollution and soil degradation. *Ecotoxicology*, 23(8), 1474-1483. <https://doi.org/10.1007/s10646-014-1289-4>
- Pandey, B., Agrawal, M., & Singh, S. (2016). Ecological risk assessment of soil contamination by trace elements around coal mining area. *Journal of Soils and Sediments*, 16(1), 159-168. <https://doi.org/10.1007/s11368-015-1173-8>
- Gautam, M., Pandey, B., & Agrawal, M. (2018). Identification of indicator species at abandoned red mud dumps in comparison to residential and forest sites, accredited to soil properties. *Ecological indicators*, 88, 88-102. <https://doi.org/10.1016/j.ecolind.2017.12.062>
- Pandey B., Mukherjee A., Agrawal M., Singh S. (2019). Assessment of seasonal and site-specific variations in soil physical, chemical and biological properties around opencast coal mines. *Pedosphere*, 29(5), 642-655. [https://doi.org/10.1016/S1002-0160\(17\)60431-4](https://doi.org/10.1016/S1002-0160(17)60431-4)
- Pandey B., Singh S., Roy L.B., Shekhar S., Singh R.K., Prasad B., Singh K.K.K. (2021). Phytostabilization of coal mine overburden waste, exploiting the phytoremedial efficacy of lemongrass under varying level of cow dung manure. *Ecotoxicology and Environmental Safety*, 208, 111757. <https://doi.org/10.1016/j.ecoenv.2020.111757>
- Singh S., Pandey B., Roy L.B., Shekhar S., Singh R.K. (2021). Tree responses to foliar dust deposition and gradient of air pollution around opencast coal mines of Jharia coalfield, India: gas exchange, antioxidative potential and tolerance level. *Environmental Science and Pollution Research*, 28, 8637-8651. <https://doi.org/10.1007/s11356-020-11088-1>
- Gautam M., Pandey B., Agrawal S.B., Agrawal M. (2022). Stabilization of metals in sludge-amended soil using red mud and its effects on yield and oil quality of Brassica juncea cultivar Kranti. *Environmental Geochemistry and Health*, 44, 1431-1450. <https://doi.org/10.1007/s10653-021-01150-3>
- Pandey B., Ghosh A. (2023). Urban ecosystem services and climate change: a dynamic interplay. *Frontiers in Sustainable Cities*, 5, 1281430. <https://doi.org/10.3389/frsc.2023.1281430>
- Ghosh A., Pandey B., Agrawal M., Agrawal S.B. (2024). Assessing the effects of early and timely sowing on wheat cultivar HD 2967 under current and future tropospheric ozone scenarios. *Environmental and Experimental Botany*, 228, 106018. <https://doi.org/10.1016/j.envexpbot.2024.106018>
- Abhishek, S., Ghosh, A., & Pandey, B. (2025). A comprehensive review on phytoremediation of fly ash and red mud: exploring environmental impacts and biotechnological innovations. *Environmental Science and Pollution Research*, 32(54), 29967-29994 <https://doi.org/10.1007/s11356-024-35217-2>
- Abhishek, S., Ghosh, A., Singh, A. A., & Pandey, B. (2025). Identification of metal-tolerant herbaceous species for phytostabilization and ecological restoration of fly ash dumpsites. *Physiology and Molecular Biology of Plants*, 1-20. <https://doi.org/10.1007/s12298-025-01612-3>

Books, Patent, Teaching, and Professional Service

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| Selected Book Chapters <ul style="list-style-type: none"> Responses of Tropical and Subtropical Plants to Air Pollution. In <i>Tropical Ecosystems: Structure, Functions</i> | Mentoring and Academic Contributions <ul style="list-style-type: none"> Mentoring 2 Ph.D. and postgraduate students from AcSIR, BHU, CUJ, and BBMKU. |
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and Challenges in the Face of Global Change (Springer, 2019).

- Air Pollution: Role in Climate Change and Its Impact on Crop Plants. In Climate Change and Agricultural Ecosystems (Woodhead/Elsevier, 2019).
- Implications of Ozone on Ecosystem Services. In Tropospheric Ozone: A Hazard for Vegetation and Human Health (Cambridge Scholars Publishing, 2021).
- Sustainable Production and Consumption. In Green Circular Economy: A New Paradigm for Sustainable Development (Springer, 2023).
- Restoring Biodiversity and Ecosystem Services on Post-Industrial Land. In Biodiversity and Ecosystem Services on Post-Industrial Land (Wiley, 2024).

Patent / Design Registration

- Design Registration (India; granted 26 April 2024): "Technical design of soil sampler to collect soil sample in layers," with co-inventors Sudarshan Singh Rathore, Siddharth Singh, Ranjeet Kumar Singh, Shailendra Kumar Singh, Sameer Shekhar, Reddi Ganesh, and Prasenjeet Chakraborty.

- Supervised student training on reclamation and remediation of mined land.
- Invited lecture: "Effects of air pollution and dust deposition on trees around Jharia coalfield" at the national conference on Sustainable Development for Environment, Banaras Hindu University, 20-21 January 2023.

Professional Service and Institutional Roles

- Safety Officer, CSIR-CIMFR.
- Member, Clean Air Task Force under the 15th Finance Commission (as reported in the assessment document).
- Contributor to the Draft Task Force Report / National Report on Greening of Mining Operations and Mineral Processing.
- Member, International Society of Tropical Ecology.
- Contributor to disaster management planning, research council agenda preparation, annual reports, technical brochures, recruitment-related duties, and institutional events at CSIR-CIMFR.

Technical Expertise and Field / Facility Experience

Multimodular ambient air quality monitoring system | Microwave digestion system | Aethalometer and aerosol spectrometer | Portable photosynthesis meter and soil respiration chamber | Leaf area meter | US EPA PM10/PM2.5 samplers | Kjeldahl digester, distillation unit, and fume scrubber