Dr. Srinivasan Balachandran
Associate Professor
Department of Environmental Studies Institute of Science, Visva-Bharati,
Santiniketan 731236, West Bengal, India, Tel: +91-95315-35710; +91-9002189061
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Academic Qualification

- B.Sc. (Botany): St. Joseph's College, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India, 1991
- M.Sc. (Environmental Sciences): Jawaharlal Nehru University, New Delhi, India, 1993
- M.Phil. (Environmental Sciences): Jawaharlal Nehru University, New Delhi, India, 1996. Title: "Influence of atmospheric pollutants on wet deposition in Delhi". Supervisor: Prof. P.S. Khillare
- Ph.D. (Environmental Sciences): Jawaharlal Nehru University, New Delhi, India, 2002. Title: "Profiles of Respirable and Non-Respirable particulate Polycyclic Aromatic Hydrocarbons in the vehicular exhaust and urban atmosphere of Delhi". Supervisor: Prof. P.S. Khillare

Professional Career

Associate Professor (2015 – to till date)
Department for Environmental Studies, Siksha-Bhavana, Visva-Bharati, Santiniketan, West Bengal, India. Teaching Environmental Chemistry, Environmental Analytical techniques, Water pollution, Soil Science, Soil pollution and solid waste management, Environmental Toxicology, Biodiversity and conservation for M.Sc. I and II year

Assistant Professor: (2004 – 2015)
Department for Environmental Studies, Siksha-Bhavana, Visva-Bharati, Santiniketan, West Bengal, India. Taught Environmental Chemistry, Environmental Analytical techniques, Water pollution, Soil Science, Soil pollution and solid waste management, Environmental Toxicology, Biodiversity and conservation for M.Sc. I and II year

Research Associate:2003-2004.
School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, 110067, INDIA. Worked as a Post-Doctoral Fellow awarded by Council of Scientific and Industrial Research (CSIR), Govt. of India (**Research Associate**). Title: Profile of Polycyclic Aromatic Hydrocarbons in soils and atmospheric dust of Delhi. Project Investigator: Prof. PS Khillare

Extended-Senior research Fellow: 2002-2003.
School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, 110067, INDIA. Worked as an Extended-Senior research Fellow awarded by Council of Scientific and Industrial Research (CSIR), Govt. of India (Extended-Senior research Fellow). Title: Profile of Polycyclic Aromatic Hydrocarbons in Urban street dust and their source materials in Delhi. Project Investigator: Prof. PS Khillare

Area of Interest:

- Persistent Organic Pollutants; Polycyclic aromatic hydrocarbons and its degradation;
- Soil pollution; bioremediation by vermicomposting;
- Chemical speciation and bioavailability of potentially toxic elements;
- Physical, chemical, biological pre-treatment for enhancing Biogas;

- Renewable energy and rural upliftment

List of recent publications (Selected Publications):

1. Mathew, A. K., Bhui, I., Banerjee, S. N., Goswami, R., Chakraborty, A. K., Shome, A., Chakraborty. A.K., **Balachandran, S**., Chaudhury, S. (2015). Biogas production from locally available aquatic weeds of Santiniketan through anaerobic digestion. *Clean Technologies and Environmental Policy*, *17*(6), 1681-1688. (IF 4.3, 2023)
2. Hussain K, **Balachandran S**., Hoque RR (2015) Sources of polycyclic aromatic hydrocarbons in sediments of the Bharalu River, a tributary of the River Brahmaputra in Guwahati, India, *Ecotoxicology and Environmental Safety* 122 (2015) 61–67 (IF 6.8, 2023)
3. Manash Gope, Raza Rafiqul Hoque, and **S. Balachandran** (2015) Chemical Speciation Of Zn In Roadside Deposited Dust Of Asansol, West Bengal, India , International Journal Of Bio-Resource, Environment And Agricultural Sciences (IJBEAS) , Vol. 1(4) :192-198, 2015
4. Basu, M., Mayana, K., Xavier, S., **Balachandran, S**., & Mishra, N. (2016). Effect of scopoletin on monoamine oxidases and brain amines. *Neurochemistry International*, *93*, 113-117. (IF 4.2, 2023)
5. Laha, T., Gope, M., Masto, R. E., Datta, S., & **Balachandran, S.** (2016). Assessment of some PTEs (Co, Fe, and Mn) and their bioavailability in playground soils Khagra, West Bengal, India. *International Journal Of Bio-Resource, Environment And Agricultural Sciences* (IJBEAS) Vol. 2(3) :345-358, 2016
6. Laha, T., Gope, M., Masto, R. E., Datta, S., & **Balachandran, S.** (2016). Influence of bell-metal industry on the concentration and speciation of lead (Pb) in the playground soil of Khagra, West Bengal. *Int. J. Bio-res. Env. Agril. Sci*., Vol. 2(3) :333-344, 2016
7. Goswami R, Mukherjee S, Chakraborty AK, **Balachandran** S, Sinha Babu SP, Chaudhury S, Optimization of growth determinants of a potent cellulolytic bacterium isolated from lignocellulosic biomass for enhancing biogas production, Clean Techn Environ Policy (2016) 18: 1565-83. https://doi.org/10.1007/s10098-016-1141-z (IF 4.3, 2023)
8. Manash Gope, Reginald Ebhin Masto, Joshy George, Raza Rafiqul Hoque, **Srinivasan Balachandran** (2017) Bioavailability and health risk of some potentially toxic elements (Cd, Cu, Pb and Zn) in street dust of Asansol, India, *Ecotoxicology and Environmental Safety* 138, 231–241. (IF 6.8, 2023)
9. Bhui, I., Mathew, A. K., Chaudhury, S., & **Balachandran, S.** (2018). Influence of volatile fatty acids in different inoculum to substrate ratio and enhancement of biogas production using water hyacinth and salvinia. *Bioresource technology*, *270*, 409-415. (IF 11.4, 2023)
10. Pranamika Bhuyan, Pratibha Deka, Amit Prakash, **S. Balacha**ndran, Raza Rafiqul Hoque (2018) Chemical characterization and source apportionment of aerosol over mid Brahmaputra Valley, India, *Environmental Pollution* 234 (2018) 997-1010 (IF 8.9, 2023)
11. Manash Gope, Reginald Masto, Joshy George, **S. Balachandran**(2018) Exposure and cancer risk assessment of polycyclic aromatic hydrocarbons (PAHs) in the street dust of Asansol city, India, *Sustainable Cities and Society,* 38, 616-626 (IF11.7, 2023)
12. Gope, M., Masto, R. E., George, J., & **Balachandran, S**. (2018). Tracing source, distribution and health risk of potentially harmful elements (PHEs) in street dust of Durgapur, India. *Ecotoxicology and Environmental Safety*, *154*, 280-293. (IF 6.8, 2023)
13. Kumar P, Ranjan M.R, Tripathi A, Balachandran S. Srivastava P (2018) Heavy metal pollution assessment around Kota Super Thermal power plant, Poll Res. 37 (3) : 145-153

14. Gope, M., Masto, R.E., Basu, A., Bhattacharyya, D., Saha, R., Hoque, R.R., Khillare, P.S., **Balachandran, S**. (2020), Elucidating the distribution and sources of street dust bound PAHs in Durgapur, India: a probabilistic health risk assessment study by Monte-Carlo simulation, Environmental Pollution, https://doi.org/10.1016/j.envpol.2020.115669 (IF 8.9, 2023)
15. Laha, T., Gope, M., Datta, S., Masto, R.E., **Balachandran, S**. (2020) Oral bioaccessibility of potentially toxic elements (PTEs) and related health risk in urban playground soil from a medieval bell metal industrial town Khagra, India, *Environ Geochem Health* (2020). https://doi.org/10.1007/s10653-020-00715-y (IF 4.2, 2023)
16. Pal, M., Gope M., Basu A., Laha T., Masto R. E., Labar R., Kundu T. K., Hoque R. R., Khillare P. S., and **Balachandran S**..(2021) "Indoor Quality of Residential Homes and Schools of an Industrial Area in Asansol: Characterization, Bioaccessibility and Health Risk Assessment of Potentially Toxic Elements." *Nature Environment and Pollution Technology* 20, no. 1 (2021): 13-28. (**https://doi.org/10.46488/NEPT.2021.v20i01.002**)
17. Basu, A., Hazra, A. K., Chaudhury, S., Ross, A. B., & **Balachandran, S.** (2021, June). State of the Art Research on Sustainable Use of Water Hyacinth: A Bibliometric and Text Mining Analysis. In *Informatics* (Vol. 8, No. 2, p. 38). Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/informatics8020038 (IF 3.1, 2023)
18. Sinha, D., Banerjee, S., Mandal, S., Basu A., Banerjee, A., **Balachandran, S.,** Mandal, N.C., and Chaudhury S (2021). "Enhanced biogas production from Lantana camara via bioaugmentation of cellulolytic bacteria." *Bioresource Technology* (2021): 125652. https://doi.org/10.1016/j.biortech.2021.125652, (IF 11.4, 2023)
19. Pal, S., S. Maity, **S. Balachandran**, and S. Chaudhury (2021). "In-vitro Effects of Chlorpyrifos and Monocrotophos on the Activity of Acetylcholinesterase (AChE) in Different Tissues of Apple Snail Pila globosa (Swainson, 1822)." *Nature Environment & Pollution Technology* 20, no. 3 , 1263-1268
20. Gogoi, D., Sazid, A., Bora, J., Deka, P., **Balachandran, S**., & Hoque, R. R. (2021). Particulate matter exposure in biomass-burning homes of different communities of Brahmaputra Valley. *Environmental monitoring and assessment*, *193*(12), 1-17. (IF 3, 2023)
21. Show, B. K., Banerjee, S., Banerjee, A., GhoshThakur, R., Hazra, A. K., Mandal, N. C., Ross, A.B., **Balachandran, S**. & Chaudhury, S. (2022). Insect gut bacteria: a promising tool for enhanced biogas production. *Reviews in Environmental Science and Bio/Technology*, 21, 1 -25. (IF 14.4, 2023)
22. Pal, S., Basu, A., Thakur, R. G., **Balachandran, S**., & Chaudhury, S. (2022). Consumption of Pila globosa (Swainson) collected from organophosphate applied paddy fields: human health risks. *Environmental Science and Pollution Research*, 29, 1-14. (IF 5.8, 2023)
23. Deka, P., Medhi, C., Bhuyan, P., Gope, M., **Balachandran, S**., & Hoque, R. R. (2022). Understanding exposure risks of women and children to PAHs in biomass using households of Brahmaputra valley. *Journal of Air Pollution and Health*, *7*(1), 33-50.
24. GhoshThakur, R., Basu, A., Haque, Z., Bhattacharya, B., GonChaudhuri, S., & **Balachandran, S**. (2022). Performance prediction of the Micro Solar Dome in different climatic regions of India from pilot-scale by Random Forest algorithm. *Sustainable Energy Technologies and Assessments*, *52*, 102163. (IF 8, 2023)
25. Bagdi T, Ghosh S, Sarkar A, Hazra AK, **Balachandran S,** Chaudhury S, (2022) Whose Development Counts? Adoption of Biogas in the Rural Communities of India- A Review , *International Journal of Renewable Energy* Research, 12, (4), 2023-2042

26. Laha T., **Balachandran S**. and Masto R.E. (2023). Spatial and temporal variation of in-vitro Bioaccessibility of chromium in playground soils of ancient bell metal industrial town, Khagra, West Bengal. *International Journal of Biological Innovations*. 5(1): 132-142. https://doi.org/10.46505/ IJBI.2023.5111
27. Bagdi T, Ghosh S, Sarkar A, Hazra, A.K., Balachandran S., Chaudhury S. (2023) Evaluation of research progress and trends on gender and renewable energy: A bibliometric analysis, Journal of Cleaner Production, Volume 423, 15 October 2023, 138654 (IF 11.1, 2023)
28. Show B.K., Panja S, GhoshThakur R , Basu A, Koley A., Ghosh A., Pramanik K., Chaudhury S., Hazra A.K., Dey N., Ross A.B. and Balachandran S (2023) Optimisation of Anaerobic Digestate and Chemical Fertiliser Application to Enhance Rice Yield—A Machine-Learning Approach, Sustainability 2023, 15, 13706.
29. GhoshThakur R, Balachandran S, and GonChaudhuri S (2023) Analysis of multimodal performance of a hybrid solar pumped storage system for enhanced energy security in rural areas, International Journal of Green Energy. DOI: 10.1080/15435075.2023.2264414 (Date of acceptance 22nd September 2023) (IF 3.3, 2022)
30. Koley, A, Mukhopadhyay, P., Gupta, N., Singh, A., Ghosh, A., Show, B.K., GhoshThakur, R., Chaudhury, S., Hazra, A.K., Balachandran S. (2023), Biogas production potential of aquatic weeds as the next-generation feedstock for bioenergy production: a review, *Environ Sci Pollut Res* (2023). https://doi.org/10.1007/s11356-023-30191-7, Published16 October 2023
31. Show B.K., Shivakumaran G., Koley A., Ghosh A., Chaudhury S.,· Hazra A.K., Balachandran S. (2023) Effect of thermal and NaOH pretreatment on water hyacinth to enhance the biogas production, *Environ Sci Pollut Res* (2023). https://doi.org/10.1007/s11356-023-30810-3, Published10 November 2023

Books and Chapters (Recent publications):

1. Koley A., Bray D., Banerjee S., Sarkar S., GhoshThakur R., Hazra A.K., Mandal N.C., Chaudhury S., Ross A.B., Camargo-Valero M.A., Balachandran S. (2023) Water Hyacinth (Eichhornia crassipes) A Sustainable Strategy for Heavy Metals Removal from Contaminated Waterbodies, In Bioremediation of Toxic Metal (loid) s edited by Anju Mallick, Mohd. Kashif Kidwai Vinod Kumar Garg, CRC Press.
2. Gupta N., Banerjee S., Koley A., Basu A., Gogoi N., Hoque R.R., Mandal N.C., Balachandran S. (2024) Fungal Strategies for the Remediation of Polycyclic Aromatic Hydrocarbons**,** in the Book, Bioremediation for Sustainable Environmental Cleanup**,** Edited By Anju Malik, Vinod Kumar Garg, Edition1st Edition, Boca Raton, CRC Press, ISBN9781003277941
3. Koley A., Ghosh A., Banerjee S., Gupta N., GhoshThakur R., Show B.K., Chaudhury S., Hazra A.K., Ross A.B., Nahar G., Balachandran S. (2024) "Phytoremediation of Wastewater Discharged from Paper and Pulp, Textile and Dairy Industries using Water Hyacinth (Eichhornia crassipes)" in the Book, Bioremediation for Sustainable Environmental Cleanup, Edited By Anju Malik, Vinod Kumar Garg, Edition1st Edition, Boca Raton, CRC Press, ISBN9781003277941
4. GhoshThakur R., Ghosh A., GonChaudhuri S., Balachandran S. (2023) Effectiveness of Solar Pumped Storage powerplants in stabilizing rural grid during high renewable penetration, In, Non-Conventional Renewable Energy Impact On Environment, H. S. R. A PUBLICATIONS, Bangalore, ISBN:

5. Balachandran S., Chaudhury S, Hazra A.K., Banerjee S.N. (2023) ***Illuminating Rural India with a Sustainable Symphony of Solar and Biogas Energy: A case study of a rural village at Bolpur, Santiniketan, India.*** In "Solar Visions", International Solar Innovation Council (InSIC), "Into Kustannus", Finland.
6. Anudeb Ghosh, Apurba Koley, Saradashree Pal, Nitu Gupta, Binoy Kumar Show, Gaurav Nahar, Srinivasan Balachandran (2024) Technological Advancement for Biohydrogen Production from Agricultural Waste, Chapter 10 in Emerging Trends and Techniques in Biofuel Production from Agricultural Waste, Edited by Pardeep Singh, Springer Nature, DOI: 10.1007/978-981-99-8244-8_10; ISBN 978-981-99-8243-1

List of PhD scholars

1. Influence of abiotic stress on callus culture of *Heliotropium indicum* L for assessment of flavonoids and phenolic contents – M. Senthil Kumar – awarded (2013)
2. Risk assessment of potentially toxic elements and Polycyclic aromatic hydrocarbons in the street dust (<53µM) of Asansol and Durgapur, West Bengal, India- Manash Gope- Awarded. (2017)
3. Mobility and bioavailability of potentially toxic elements (PTEs) in playground soils of Khagra, Murshidabad district, West Bengal – Tanmay Laha- awarded (2018)
4. Modulating neurotoxic effects of Chlorpyrifos by a naturally occurring Coumarin Scopoletin- Mahua Basu- awarded (2018)
5. Enhancing biogas production by co-digestion – Indranil Bhui – awarded (2018)
6. Potential Toxic Elements in Indoor Dust of Durgapur and Asansol Industrial Area and Associated Health Risk Assessment – Mousumi Pal - awarded (2020)

List of completed Projects

a) UGC Major Projecty

Name of the project: "A Comparative ethnobotanical investigation: The Santal tribes of major populated districts in West Bengal, India", (Jan 2010 to Jan 2013)
Sponsoring agency: UGC. (extended for six months and submitted in July 2013)

Role: PI of the Project

b) DST BURD Project

Name of the Project: **Development and Integration of Biomass and Concentrating Photovoltaic System for the Rural and the urban Energy Bridge :BioCPV.**
A research project under the Indo-UK Collaborative Research Initiative on *Bridging the Urban and the Rural Divide (BURD).*

Sponsoring agency: DST, New Delhi (2012-2015) extended upto 2017 [DST/SEED/INDO- UK/002/2011/VBU dated 20th June 2012]

Total cost of the project is **INR 5, 57, 17, 125/-** of which amount sanction to Visva-Bharati is **INR 2, 26, 70, 325/-**

Collaboration with Prof. Tapas Mallik (University of Exeter, UK), Prof. Gavin Walker (University of Nottingham, UK), Prof. Md. Pourkashanian (Univ of Sheffield, UK), Prof. K.S. Reddy (IIT Madras) Prof. Prakash Ghosh (IIT Mumbai)

Role: Co- PI of the Project

c) Project title: **BEFWAM- Bioenergy, Fertilizer and clean water from invasive aquatic macrophytes (Extended upto March 2022) [**(BB/S011439/1 dated 3.12.2018)]
A research project under the Indo-UK –Uganda Collaborative Research Initiative on *providing bioenergy, fertilizer and clean water from invasive aquatic macrophytes.*

Sponsoring agency: BBSRC-RCUK, (2019-2022)

Amount Sanctioned:**UK£.19,58,977** /- of which amount for Visva-Bharati is **UK£.2,62,595.28**/- . Prof. Shibani Chaudhury (Co-PI), Prof. A. Hazra (Co-PI) and Dr. S. Balachandran (Co-PI).

Collaboration with Dr. Andrew B. Ross (PI), Dr. Valerie Dupont , Prof. Jon Lovett, Dr. Miller Alonso Camargo-Valero, Univ. of Leeds; Prof. A.B. Pandit, ICT, Mumbai; Mary Suzan Abbo, CREEC, Uganda; Gaurav Nahar, Defiant Renewables, Pune.

Role: Co- PI of the Project

d) Name of the Project; **"Development, Research and Pilot scale installation of solar-hydro pumped storage scheme in a remote village of Manipur to ensure 24x7 electricity**" [DST/TMD/MI/OGMI/2018/14 (G) dated 28.8.2018]
Sponsoring agency; DST, Period 2018-2020, Extended upto March 2021
Amount Sanctioned; **Rs. 2,60,67,500** of which amount for Visva-Bharati is Rs. 88,57,000. Prof. Shibani Chaudhury, Dept. of Environmental Studies is the Principal Investigator and Prof. Amit Kumar Hazra, Department of Lifelong Learning & Extension, PSV and Dr. S. Balachandran, Dept. of Environmental Studies are the Co-Investigators of the project.
Collaboration with Dr. SP Gonchaudhury, NBIRT Kolkata
Role: Co- PI of the Project

e) Name of the Project: *"***Earthworm Gut Microbes Mediated Carcinogenic Polycyclic Aromatic Hydrocarbons (CPAHs) Remediation in Contaminated Soil*"***
Sponsoring Agency: DBT under Twinning Program [BT/PR25738/NER/95/1329/2017]
Sponsoring Agency; DBT Twinning project, Period; December 2018-December 2021
Amount Sanctioned: Rs. ***56,39,200*** /- of which amount for Visva-Bharati is Rs. 22,54,600 /-.
Dr. S. Balachandran (PI), Prof. N.C. Mandal, Dept. of Botany, Visva-Bharati (Co-PI)
Collaboration with Department of Environmental Sciences, Tezpur University

Ongoing projects:

a) Name of the Project: "**Community water supply scheme based on Integrated Rainwater harvesting and Solar PV water pumping system**"
Sponsoring Agency: DST, Period- September 2021 to September 2023 [TMD(EWO)/ITISE/2020/08(G)] dated 24.09.2020
Prof. Amit Kumar Hazra, Department of Lifelong Learning & Extension, PSV (PI of the Project) and Dr. S. Balachandran, Dept. of Environmental Studies (Co-Investigator)
Collaboration with Mr. Richik GhoshThakur, NB Institute of Rural Technology-Kolkata

Amount Sanctioned- INR 1,39,22,880/-

b) Name of the Project: "**Ensuring Energy security and green livelihood of rural communities of Tripura using affordable Solar Energy and local resources**"
Sponsoring Agency: DST, Period- October 2023 to October 2026 [SEED/TIASN-2/2023/251] dated 27.10.2023
Mr. Richik GhoshThakur, NB Institute of Rural Technology- Kolkata, PI
Dr. S. Balachandran, Dept. of Environmental Studies (Co-PI)
Amount Sanctioned- INR 1,36,30,759/-

c) Name of the Project: **"Improving Sustainability of Present-day Manure based Biogas Digesters through Biochar Addition"**
Sponsoring Agency: Royal Academy of Engineering, United Kingdom, under the Technology Programme [Transforming Systems through Partnership Program] February 2024 to January 2025 [TSP-2325-5-163] dated 08.02.2024
Prof. Manosh Paul and Prof. Arjun Subramanian, University of Glasgow, UK (Academic Partner), Dr. Sam Kerr, Suiso Pvt. Ltd, UK (Industrial partner)
Dr. Balachandran , PI of the Project and Prof. Amit Kumar Hazra, Department of Lifelong Learning & Extension, PSV (CO-PI of the Project)
Dr. Gaurav Nahar, Defiant Renewables, Pune (Industrial partner)
Amount Sanctioned- £ 64,450/-

S. Balachandran