**Session Proposal**

# Session Title

Deciphering the Soil-Pollutant Nexus: Biogeochemical Frontiers for Soil Health and Sustainable Ecosystems

# Session Organizers

Conveners:

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# Session Description

Soil contamination by toxic xenobiotics has emerged as a pressing global challenge, exacerbated by intensifying agricultural, industrial, and commercial activities. This session will explore the intricate biogeochemical processes that govern the fate, transport, and transformation of pollutants in soil ecosystems. It aligns with the focus on soil health and sustainability by addressing urgent contamination threats through a biogeochemical lens. By unraveling these mechanisms, we can develop effective strategies to mitigate environmental contamination, restore soil health, and safeguard food security. The session will highlight interdisciplinary research on pollutant-soil interactions, emphasizing innovative remediation technologies and sustainable management practices.

Objectives of this session aims to: 1) foster cross-disciplinary dialogue to bridge fundamental science and practical applications; 2) showcase cutting-edge research on traditional and emerging contaminants (e.g., antibiotic resistance genes, environmental hormones, pathogens); 3) catalyze collaborations to address knowledge gaps and scale up solutions for global soil sustainability.

Key Themes and Topics:

(1) Molecular Mechanisms and Ecological Impacts:

Include but not limited to,

Interactions between soil components (e.g., organic matter, minerals, microbiota) and pollutants (e.g., heavy metals, pesticides, antibiotics, microplastics, and other emerging pollutants); Ecological consequences of pollutant accumulation, including effects on biodiversity and ecosystem services.

(2) Coupled Biogeochemical Processes:

This include but not limited to,

Multi-process dynamics of pollutants in soils, particularly the interplay between biogeochemical transformations (e.g., redox reactions, speciation changes) and elemental cycling (e.g. C, N, S, Fe); Role of microbial communities and abiotic factors in driving pollutant fate.

(3) Soil-Plant Continuum and Health Implications:

Include but not limited to:

Pollutant uptake, translocation, and trophic transfer in the soil-plant system; Impacts on soil health indicators (e.g., enzyme activities, microbial diversity) and agricultural productivity.

(4) Innovative Remediation and Sustainable Solutions:

Include but not limited to:

Emerging technologies for ecological control (e.g., phytoremediation, biochar, nanotechnology); Bioremediation strategies leveraging microbial consortia or plant-microbe synergies; Policy-relevant frameworks for sustainable soil management and restoration.

# Format

Researchers in soil science, environmental chemistry, microbiology, ecotoxicology, and agroecology; policymakers; and practitioners in remediation and land management are target audience.

This session invites abstracts addressing experimental, modeling, or field studies on the above themes, with a focus on mechanistic insights or scalable innovations. Case studies on regional pollution challenges and transboundary implications are encouraged.

Session format includes: 1) keynote presentations by leading experts; 2) oral and poster sessions for submitted abstracts.

# Proposed Speakers

**Only list the potential foreign speakers intend to invite:**

1. **Ashley Edwin Franks**, La Trobe University (Australia), a.franks@latrobe.edu.au. Professor Franks is ProVice-Chancellor (Research Capability) and Co-Director of the Mallee Region Innovation Center of La Trobe University. He is a Fellow of the Australian Society of Microbiology, MCR representative to the Australian Academy of Science, and an NHMRC Investigator Panel Member, contributing significantly to microbial ecology research. He specializes in applied and environmental microbiology, studying microbial community structure and interactions with plants, soils, microbiomes, electrodes, and sewer systems. He was a key researcher in the Pseudomics project and Geobacter Project.
2. **Brajesh Singh**, Western Sydney University (Australia), B.Singh@westernsydney.edu.au. Professor Brajesh Singh, a Fellow of the Australian Academy of Science, is a leading expert in functional ecology and soil biology. His research explains soil biodiversity patterns and microbial respiration-climate warming feedbacks, redefining soil carbon stability theories. He pioneered an agricultural innovation framework integrating soil microbiome modulation, health assessments, and pathogen detection technologies to enhance soil fertility and global food security. He has received numerous awards, including the Dorothy Jones Prize, Arrell Global Food Innovation Award, and Alexander von Humboldt Research Award. Professor Singh also serves as Editor-in-Chief of Journal of Sustainable Agriculture and Environment and on several editorial boards.
3. **David Graham**, Durham University (U.K.), david.w.graham@durham.ac.uk. Professor Graham has long engaged in antimicrobial resistance monitoring and related projects around the world. He is co-lead author of the UNEP report on the environmental dimensions of antibiotic resistance and author of the World Health Organization, FAO, OIE WASH and antibiotic resistance reports on developing and emerging countries.
4. **Erik Björn**, Umeå University (Sweden), erik.bjorn@umu.se. Professor Erik Björn is the Assistant Head of the Department and a senior professor in the field of metal transformation in soil and sediment. His research focuses on how the chemical structure of metal compounds control mechanisms and kinetics for reactions which are central for the cycling of metals in the environment.
5. **Hui Li**, Professor of Environmental Soil Chemistry at Department of Plant, Soil and Microbial Sciences, Michigan State University, lihui@msu.edu. His research program focuses on analysis, sorption, transformation, bioavailability, and plant uptake of pharmaceuticals and personal care products, per- and polyfluoroalkyl substances, and legacy organic contaminants in the environment, understanding of fundamental environmental processes in water and soil at molecular scale, plant uptake of organic contaminants from soil and water, and development of environmental remediation technology and mitigation management strategies. He received Jackson Soil Chemistry and Mineralogy Award from Soil Science Society of America (SSSA) in 2017, and Environmental Quality Research Award from American Society of Agronomy (ASA) in 2023. Dr. Li was elected as a Fellow of SSSA in 2018, and a Fellow of ASA in 2021. He also received the inaugural Research Fellow (Career) Award from College of Agriculture and Natural Resources, Michigan State University in 2023.
6. **Jianzhong He**, National University of Singapore (Singapore), jianzhong.he@nus.edu.sg. Professor He is the director of Centre for Environment Resilience. She conducts interdisciplinary research aiming to develop environmental microbiological technologies to clean up environmental pollutants, promote sustainable developments, and protect human health. She is a leading scientist in studying the bioremediation of toxic organic pollutants (e.g., PBDEs, PCBs, and TPPBA). Recognized for her contributions, she is an elected Fellow of the Royal Society of Biology. She also chairs IChemE Water Singapore and serves on the editorial boards of ISME Journal, Applied and Environmental Microbiology, and Environmental Science & Technology.
7. **Kang Xia**, Virginia Tech (USA), kxia@vt.edu. Kang Xia is a Professor at Virginia Tech and serves as the Director of the Center for Advanced Innovation in Agriculture. Her research focuses on understanding human-induced impacts on water and soil quality and developing strategies for their remediation. Her work encompasses the occurrence, fate, and effects of emerging contaminants and pesticides in soil and water systems, the development of novel analytical methods for detecting organic contaminants in complex environmental samples, the biogeochemistry of organic carbon, nitrogen, and phosphorus, and remediation technologies for organic contaminants in soil.
8. **Marion Schrumpf**, Max-Planck-Institute for Biogeochemistry (Germany), mschrumpf@bgc-jena.mpg.de. Marion Schrumpf’s research focuses on the persistence of organic carbon in soils and its sensitivity to land use and environmental changes. She investigates soil processes driving organic matter accumulation and mobilization, with a special interest in how plants, microorganisms, and soil minerals drive biogeochemical processes in soils, and the interacting carbon - water - and nutrient cycles.
9. **Shaobin Wang**, School of Chemical Engineering，Faculty of Sciences, Engineering and Technology, University of Adelaideshaobin. wang@adelaide.edu.au. Prof. Wang obtained his PhD in Chemical Engineering from University of Queensland, Australia. He is now a Professor and ARC Laureate Fellow at the School of Chemical Engineering, The University of Adelaide, Australia. His research interests focus on nanomaterial synthesis and application for adsorption and catalysis, fuel and energy conversion and environmental remediation. He has published more than 800 refereed journal papers with citation over 90,000 and H-index of 169. He was awarded 2012 Thomson Reuters Citation & Innovation Awards in Australia and 2023 Research Excellence Award of UoA. He is also the Clarivate Analytics Highly Cited Researcher In Engineering, Chemistry and Environment/Ecology for 2016-2022. Prof Wang currently serves as the Editor of Applied Catalysis B: Environment and Energy, co-Editor of Journal of Colloid Interface Science, and Associate Editor of Chemical Engineering Journal Advances, Carbon Research, etc.
10. **Wei Zhang**, Michigan State University (USA), weizhang@msu.edu. Professor Zhang has served as the Interim Chairperson of the Department of Plant, Soil, and Microbial Sciences since 2024. He is an expert in studying the fate and transport of emerging contaminants, including veterinary antibiotics, engineered nanoparticles, and emerging microbial pathogens. The overarching goal of his research program is to enhance the protection of soil and water resources and promote sustainable agricultural production by advancing the understanding of fundamental processes and developing scientifically sound management practices. He also serves as an Associate Editor for the Journal of Environmental Quality and the Canadian Journal of Soil Science.
11. Yi-Tang Chang, Soochow University Department of Microbiology (Taiwan), ytchang@scu.edu.tw. Professor Chang currently works at the Department of Microbiology, Soochow University, Taipei, Taiwan. His research focuses on Environmental Microbiology, Environmental Biotechnology, and Environmental Engineering. The research topics include bioremediation, biological treatment processes, and indoor bioaerosol control. The most recent publication is "Selective biodegradation of octylphenol polyethoxylates with different ethoxylate length chains by aerobic bacterial culture". He has served as the dean of School of Science at Soochow University Department of Microbiology, Taipei, Taiwan from 2021-2023.
12. Ya-Hui Chuang, National Chung Hsing University, Department of Soil and Environmental Sciences, Taiwan. yhchuang.68@dragon.nchu.edu.tw. Associate Professor Chuang currently works at the department of Soil and Environmental Sciences, National Chung Hsing University, Taichung, Taiwan. Her research focuses on the study of the fate and transport of emerging organic contaminants in the agroecosystem, and developing analytical methods for emerging organic contaminants in environmental samples, using liquid chromatography–tandem mass spectrometry (LC-MS/MS). The overarching goal of her lab’s research is to provide the needed knowledge to better assess the potential risks to food safety and human health. She also serves as the Director of Pesticide Residue Analysis Center at National Chung Hsing University since 2022.