**Session Proposal**

# Session Title

Soil Biogeochemistry in Wetlands: Foundations for Restoration and Climate Resilience

# Session Organizers

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# Session Description

Wetland ecosystems deliver vital ecological functions—including long-term carbon storage, nutrient retention, hydrological regulation, and greenhouse gas mitigation—many of which are governed by the unique biogeochemical characteristics of wetland soils. In the context of accelerating climate change, biodiversity loss, and diffuse pollution, wetland restoration has emerged as a key strategy in global environmental policy. However, the effectiveness of restoration initiatives remains constrained by limited understanding of the soil processes underpinning these functions.

This session aims to advance scientific understanding of the biogeochemical processes in wetland soils that regulate ecosystem function and resilience. Emphasis will be placed on the role of soil redox dynamics, organic matter stability, nutrient cycling (particularly of nitrogen, phosphorus, and sulfur), and microbial community functioning under varying hydrological regimes. Key topics include the impacts of drainage, restoration, eutrophication, sulfate and nitrate loading, as well as climatic stressors such as drought and freeze-thaw cycles. By integrating empirical and theoretical approaches across disciplines—including soil science, biogeochemistry, hydrology, and restoration ecology—this session seeks to build a mechanistic basis for effective wetland restoration and adaptive management in the face of ongoing global change.

# Format

Oral presentations

# Proposed Speakers

1. Prof. Dr. Xiaojuan Feng

Affiliation: Institute of Botany, Chinese Academy of Sciences, China

Contribution: Prof. Dr. Feng is a leading soil biogeochemist specializing in the transformation and transport of terrestrial organic matter under global change. She uses molecular techniques—including biomarkers and compound-specific isotope analysis—combined with landscape-scale experiments to study environmental controls on organic carbon distribution in soils and aquatic systems. Her work enhances our understanding of soil organic matter formation, stabilization, and long-term carbon storage, offering critical insights for predicting ecosystem responses and sustainable carbon management.

1. Prof. Dr. Klaus-Holger Knorr

Affiliation: University of Münster, Germany

Contribution: Prof. Dr. Knorr is a globally recognized expert in wetland and peatland biogeochemistry. His research focuses on the interplay between hydrological dynamics, redox processes, and microbial activity that regulate carbon and nutrient fluxes in these ecosystems. His pioneering work has significantly advanced our understanding of carbon and nitrogen cycling in peatlands and wetlands, providing valuable insights for restoration strategies and climate mitigation.

1. Prof. L.P.M. Lamers (Leon)

Affiliation: Radboud University

Contribution: Prof. Lamers specializes in aquatic ecology and environmental biology, focusing on how hydrological dynamics shape biogeochemical processes and carbon cycling in aquatic and wetland ecosystems. His research integrates field studies and laboratory experiments to unravel microbial processes and ecosystem interactions that drive carbon stabilization. As Chair of Aquatische ecologie en milieubiologie at Radboud University, his work provides critical insights for predicting and mitigating climate change impacts on aquatic environments.

1. Dr. Haitao Wang

Affiliation: University of Greifswald

Contribution: Dr. Haitao Wang is a distinguished soil microbial ecologist whose work focuses on the microbial processes governing carbon and nitrogen cycling in peat soils. His research revealed changes in microbial community structure and methane emissions under wet and drought conditions, offering insights into the complex feedbacks between microbial dynamics and climate change. His findings advance our understanding of soil microbial processes and their critical roles in ecosystem functioning and climate change mitigation.

1. Dr. Haojie Liu

Affiliation: University of Rostock, Germany

Contribution: Dr. Haojie Liu is a leading expert in ecohydrology and peatland biogeochemistry. His interdisciplinary research integrates field studies, laboratory experiments, and modeling to examine water dynamics, soil processes, and plant interactions in peatland ecosystems under climate change. His work has enhanced our understanding of the water–carbon relationship and its impact on greenhouse gas emissions, offering vital insights for sustainable management and restoration of degraded peatlands and coastal wetlands.

1. Prof. Dr. Robert Mikutta

Affiliation: Martin-Luther-Universität Halle-Wittenberg

Contribution: Prof. Dr. Robert Mikutta is renowned for his contributions to soil science, particularly in understanding the interactions between organic matter, minerals, and microbes in soil environments. His research has significantly advanced knowledge on soil carbon sequestration, nutrient cycling, and the formation of soil organic matter. By integrating molecular and chemical analyses, Mikutta's work sheds light on the fundamental processes that govern soil fertility and sustainability, influencing both agriculture and environmental science. His interdisciplinary approach has enhanced our understanding of soil's role in mitigating climate change.

1. Prof. Dr. Hans Chr. Bruun Hansen

Affiliation: Department of Plant and Environmental Sciences, University of Copenhagen

Contribution: Hans Christian’s primary research focuses on solid-solution biogeochemical processes in soils and sediments that influence pollutant fate, with particular emphasis on applications in soil and water remediation. His work in environmental chemistry covers three main areas: i) chemistry of mixed valence iron oxides and related compounds, ii) phosphate binding in anoxic soils, and iii) biochar’s as redox catalysts for environmental remediation