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Planetary Boundaries and Climate Resilience: Scientific Solutions for a Sustainable Future

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The accelerating impacts of climate change, biodiversity loss, freshwater scarcity, and environmental degradation highlight the urgent need for integrated sustainability strategies. This presentation examines the planetary boundaries framework as a scientific foundation for understanding Earth's environmental limits and guiding sustainable development. Advances in Earth system science, remote sensing, climate modeling, and ecosystem monitoring provide valuable insights into the interactions between climate, ecosystems, water resources, and human activities.

The session discusses renewable energy expansion, carbon sequestration, ecosystem restoration, regenerative agriculture, and nature-based climate solutions that strengthen resilience while reducing greenhouse gas emissions. Emerging technologies including satellite observation, artificial intelligence, environmental big data, and predictive climate analytics are improving environmental monitoring and supporting evidence-based policy decisions. Future perspectives focus on resilient infrastructure, sustainable resource management, international climate cooperation, and science-driven governance that enables societies to adapt successfully while remaining within planetary boundaries.

Biography

Johan Rockström is Professor of Earth System Science at the University of Potsdam, Germany. His research focuses on climate change, planetary boundaries, sustainability science, water resources, and global environmental governance. He is internationally recognized for advancing sustainable development and climate resilience research.