United Nations University
Institute for Integrated Management of Material Fluxes and of Resources

The role of the UN University in advancing cross-border research and education in the Euroregion Nisa

Dr. Alexey Alekseenko

UNU FLORES

United Nations University

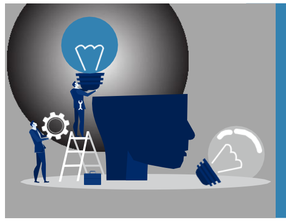
A global think tank

UNU
FLORES

UNU System

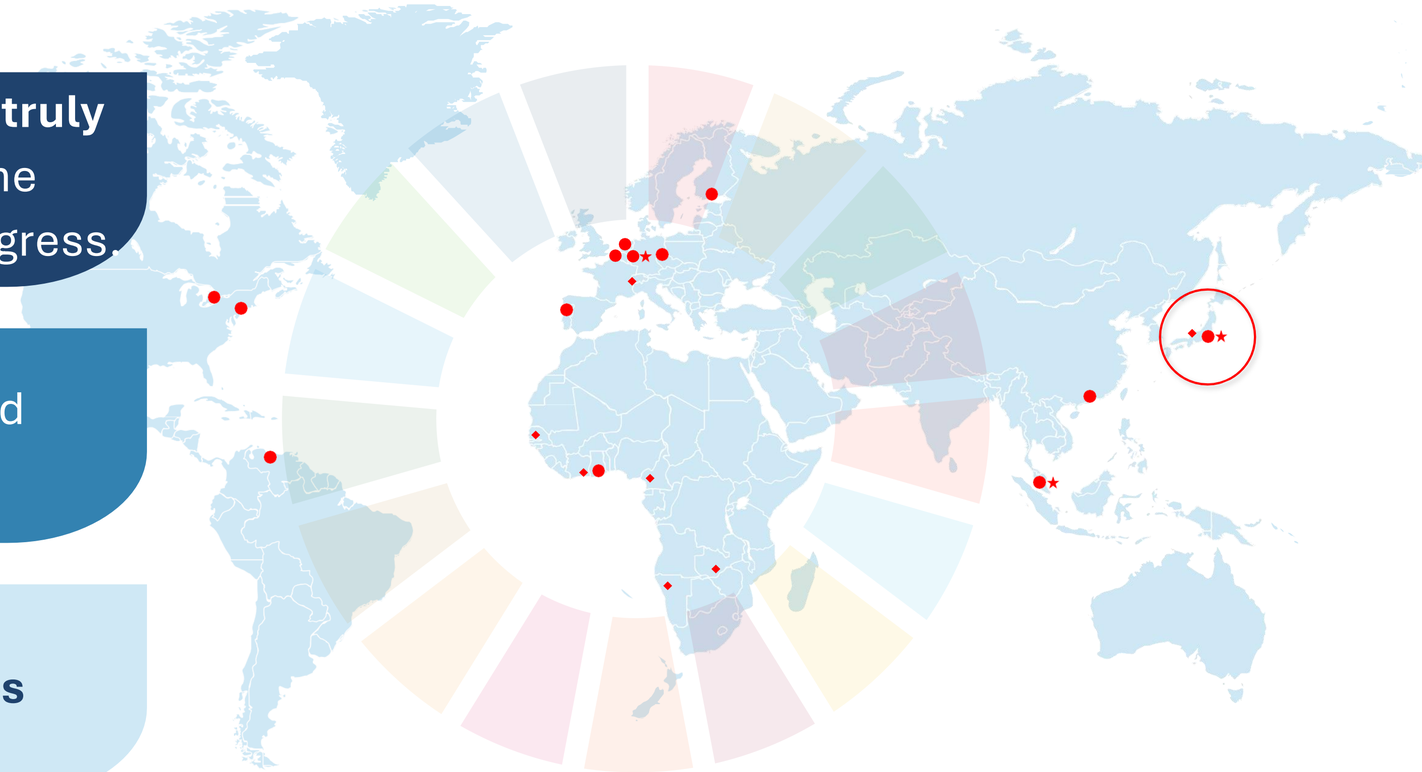
A global system of research and training institutes coordinated by UNU Centre in Tokyo

A university dedicated to being **“truly international”** and focused on the Charter’s goals of peace and progress.



A think tank for the UN System and Member States

13 **Institutes located in 12 countries**



- INSTITUTES
- OPERATING UNITS
- ADMINISTRATIVE & ACADEMIC SERVICE UNITS

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UNU Strategy 2025-2029

Knowledge: Enhancing knowledge and capacity through research and education

Partnerships: Strengthening partnerships, particularly in the Global South, and enhanced collaboration within the UN system

Impact: Greater visibility and impact through expansion and outreach, particularly in the Global South

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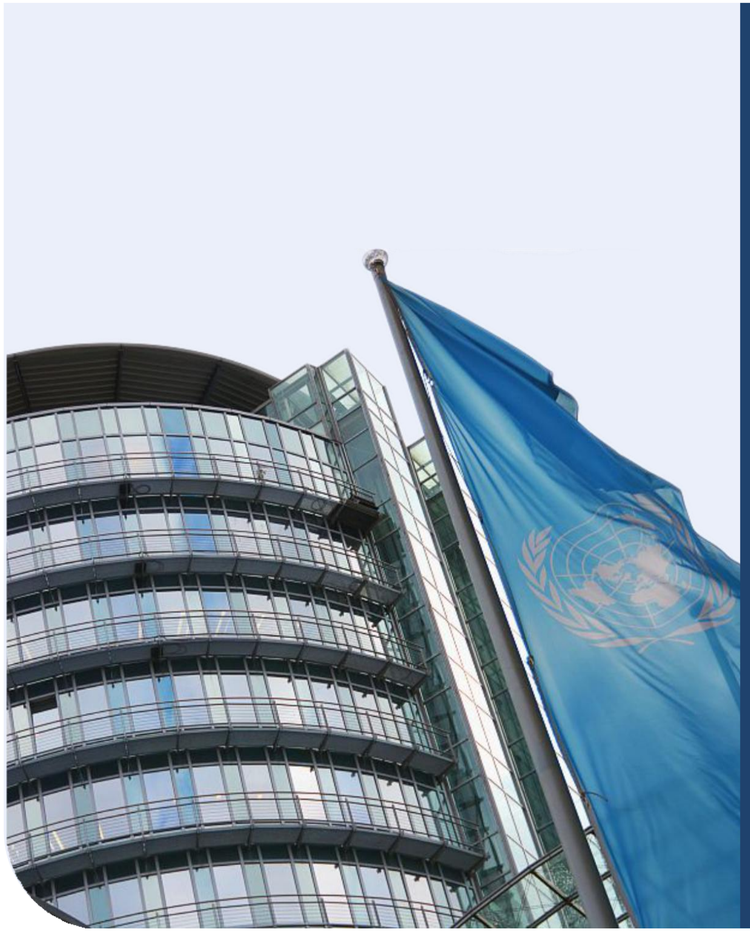
Advancing the Resource Nexus from Dresden



Mandate

The mandate of UNU-FLORES is to advance knowledge on the sustainable management of environmental resources through the Resource Nexus approach.

Strategic Approach

1. Research and Innovation Development
2. Education and Capacity Development
3. Outreach, Advocacy and Impact

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UNU-FLORES Hubs

FLY – Future of Learning with Youth, Learning Planet Institute, Paris

CREST – Climate Resilience and Sustainable Technologies, Dresden University of Technology

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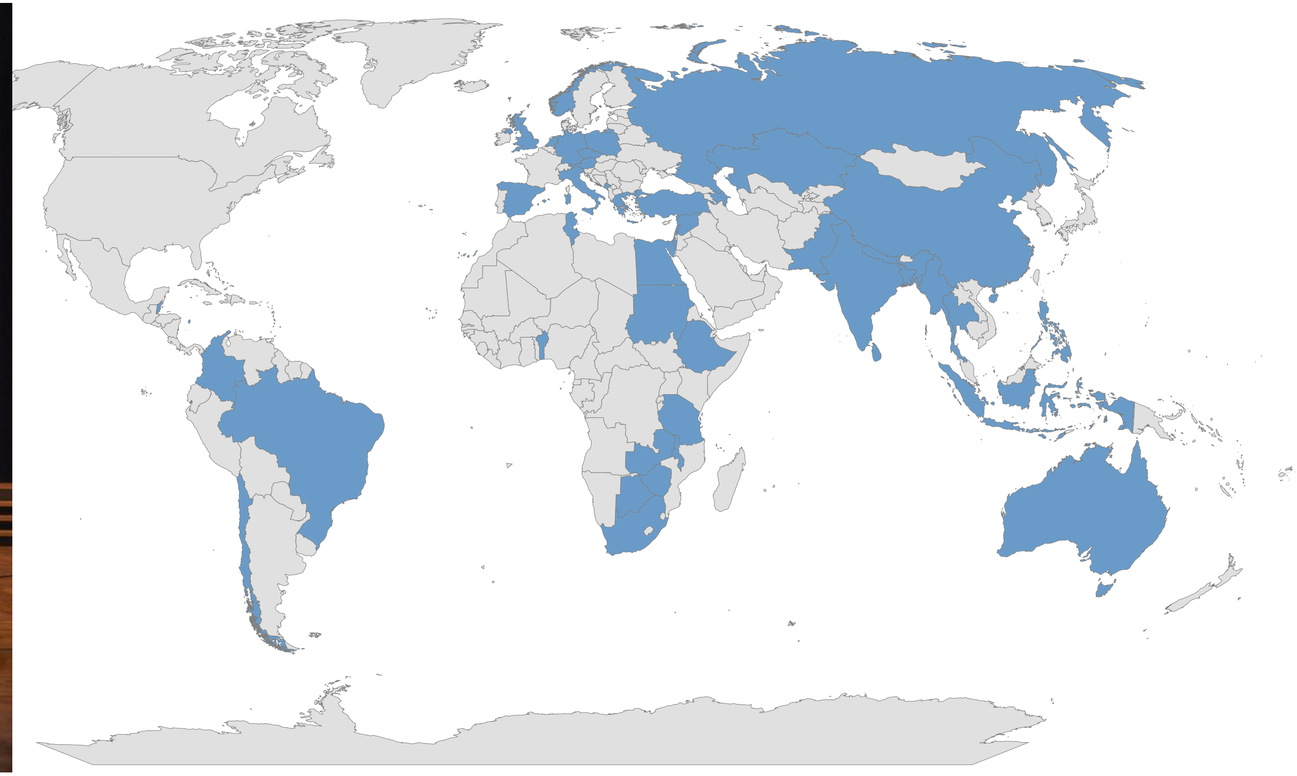
UNU-FLORES Team

111
Team Members

57
Female Colleagues

59
Colleagues from the Global South



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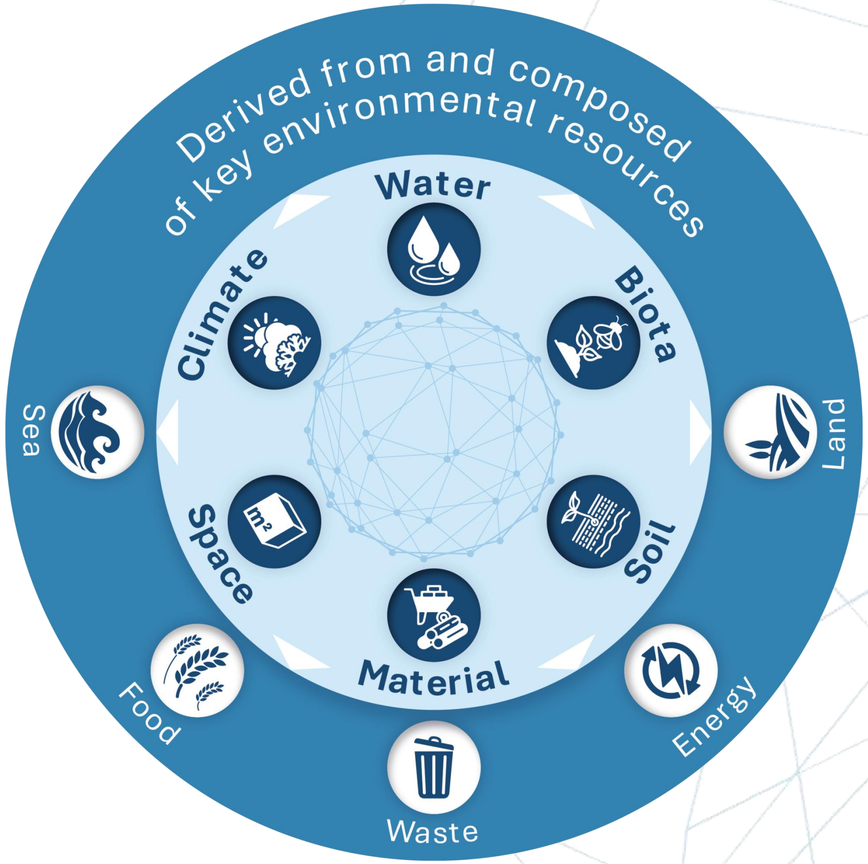
Resource Nexus Approach



An approach to consider the interplay and interlinkages between Resources, i.e., synergies as well as trade-offs

Rather than optimizing for a single resource, find the best overall solution

Include considerations around governance and financing

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Theory of Change Logic

Input

- ✓ Environmental resources
- ✓ Interdisciplinary team
- ✓ Experts from over 50 countries
- ✓ UN system
- ✓ Focus: Global South

Activities

- Systems Thinking
- Data Science
- Citizen Science
- Governance Lens
- Sustainability, Resilience, Risk Assessment
- Barriers Analysis
- Finance Lens

Output

Research and Innovation Development

- Scientific publications
- Tools (e.g., AID)
- Resource Nexus Assessment

Education and Capacity Development

- Certificates
- Accredited courses
- Master and Doctoral Graduates

Outreach, Advocacy and Impact

- Policy briefs
- Events
- Media

Governance and Administration

Outcome

Advancing the Resource Nexus for

- Resilient agri-food and forest systems
- Transformed landscapes
- Sustainable construction
- Responsible electronics
- Circular textiles

…to address the triple planetary crisis of climate change, biodiversity loss and pollution and

… to enable and empower people to sustainably transform policies, businesses and societies by respecting political, economic, societal, technological, environmental and legal contexts.

Impact

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Focus Areas

Advancing the Resource Nexus ...

Transformed Landscapes

Sustainable Buildings and Construction

Resilient Food, Forest and Ecosystems

Responsible Electronics

Circular Textiles

... to address the **triple planetary crisis** of climate change, biodiversity loss and pollution and to enable and empower people to sustainable **transform policies, businesses and societies** by respecting political, economic, societal, technological, environmental and legal contexts.

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Sustainability Nexus Analytics, Informatics, and Data (AID)

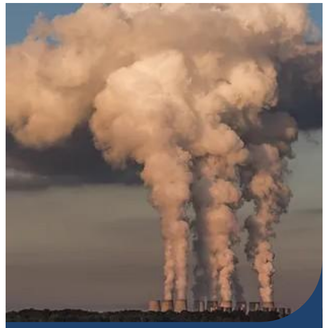
Air Pollution

Biological Invasions

Drought

Flood

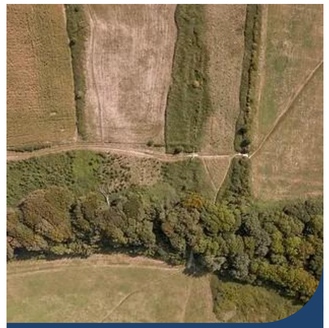
Food Security



Greenhouse Gas Emissions

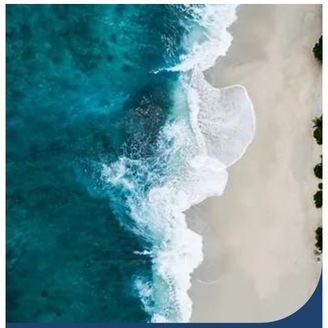
Groundwater

Infrastructure Resilience



Land Use Land Cover Change

Landslides and Land Subsidence



Sea Level Rise

Soil Health

Storms

Wetlands

Visit https://www.sustainabilityaid.net/

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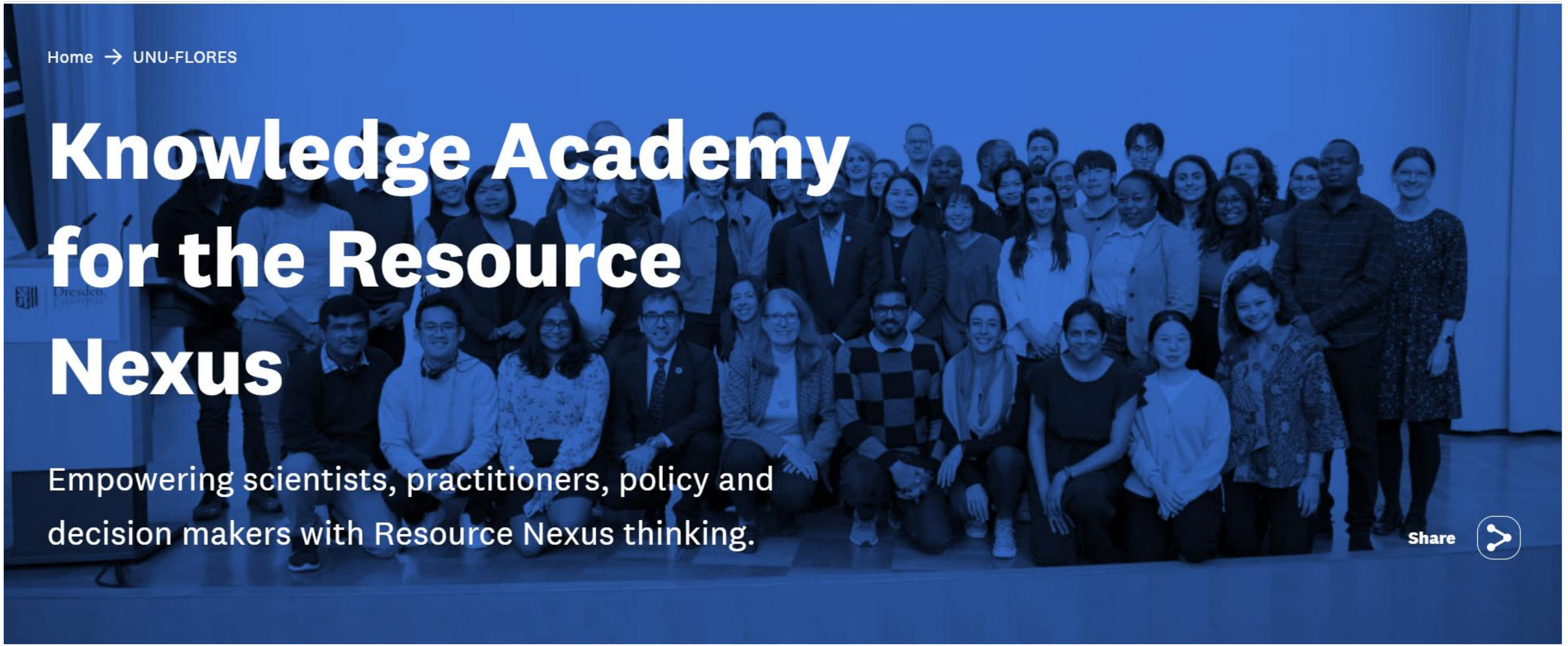

https://unu.edu/flores/knowledge-academy-resource-nexus-kare

UNU-FLORES Doctoral Programme

TECHNISCHE UNIVERSITÄT DRESDEN

Leibniz Institute of Ecological Urban and Regional Development

36
Doctoral researchers

32
Doctoral researchers are from the Global South

50%
Doctoral researchers are women

DAAD Deutscher Akademischer Austauschdienst
German Academic Exchange Service

BASF We create chemistry

IsDB Islamic Development Bank

KAAD Katholischer Akademischer Ausländer-Dienst

UNIDO

SMEKUL Sächsisches Staatsministerium für Energie, Klimaschutz, Umwelt und Landwirtschaft

DFG Deutsche Forschungsgemeinschaft

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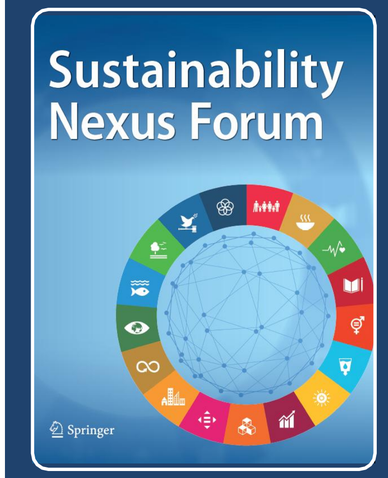
Sustainability Nexus Forum



A transdisciplinary journal which prioritises Nexus perspectives in the realm of Sustainability Transformation

Current Topical Collections

1. Nexus Perspectives for Sustainability Transformation
2. Nexus Perspectives for Sustainability, Just and Timely Transitions in the Era of Climate Change, Geopolitical Tension and Energy Insecurity
3. The Resource Nexus for New Modes of Science Policy Interaction
4. Sustainability Nexus Perspectives on Water Security and Climate Resilience
5. Data for Good: Promoting Data-Driven Nexus Approaches to Sustainability

Visit https://link.springer.com/journal/550

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2

REPOINT: Resource Nexus for Post-Mining Inclusive Transition

A living laboratory in Lusatia

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REPOINT - Resource Nexus for Post-Mining Inclusive Transition

1. Positioning the Lusatian lignite mining district as a model for coal transition regions worldwide

2. Sustainable and resource-effective transformation of industrial areas

3. Revitalization of post-coal landscapes

Office Strasse der Glasmacher 18, 02943 Weisswasser

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The only
UN staff member
with “Lusatia”
in the title

Alexey Alekseenko

Head of the Resource Nexus Laboratory in Lusatia

Education Dr.-Ing., Mining Engineering, TU Bergakademie Freiberg, Germany, 2018

Ph.D., Geoecology, Saint Petersburg Mining University, Russia, 2018

M.Sc., Environmental and Natural Resource Management, Lomonosov Moscow State University, Russia , 2014

Institute UNU-FLORES

Nationality Russian, Israeli

Contacts alekseenko@unu.edu

https://unu.edu/flores/about/expert/alexey-alekseenko

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Resource Nexus approach

The checklist to analyze
mining and processing legacies

Climate:	greenhouse gas emissions
Water:	drainage, contamination
Biota:	biodiversity loss
Soil:	soil degradation
Material:	wasterock piles
Space:	extensive land use
Land:	landscape destruction
Waste:	slurry, tailings
Energy:	energy intensive extraction
Food:	deterioration of fertile landscapes

Image source:
Brouwer et al., 2024

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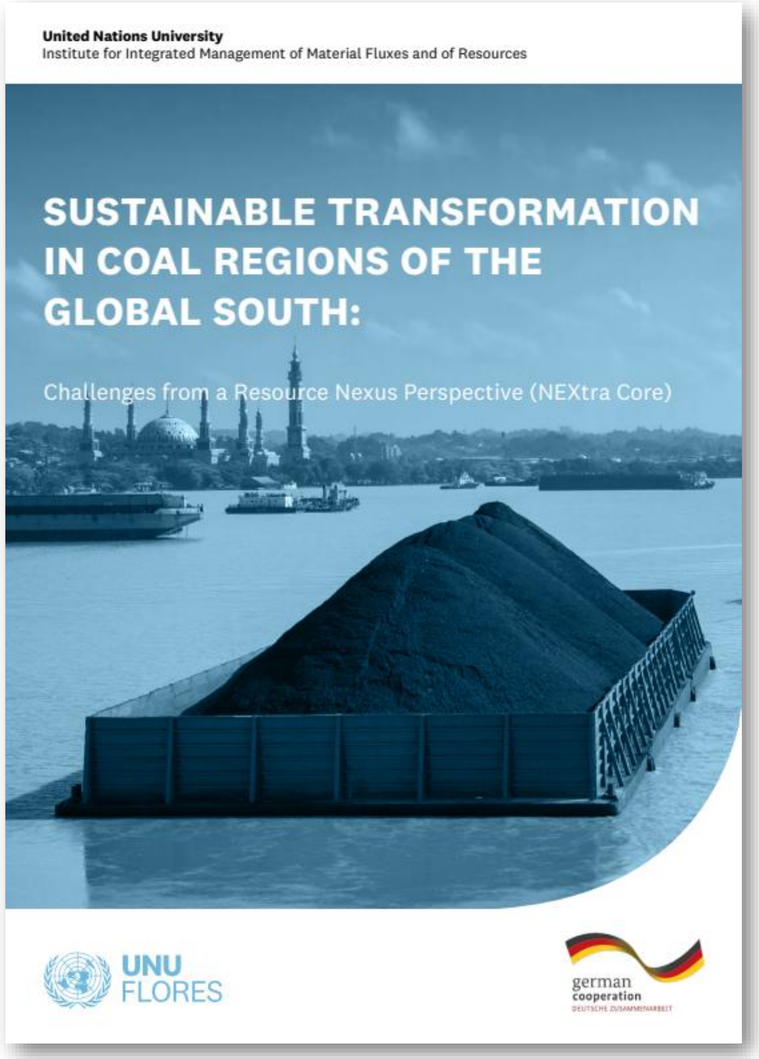
Resource Nexus approach



Post-coal challenges in **Colombia, Mozambique, South Africa, and Indonesia**:

- Environmental legacies
- Energy transition
- Economic restructuring
- Social implications

Download the report:

https://rue.bmz.de/resource/blob/157250/2023-06-20-nextra-core-final-report-finalversion.pdf

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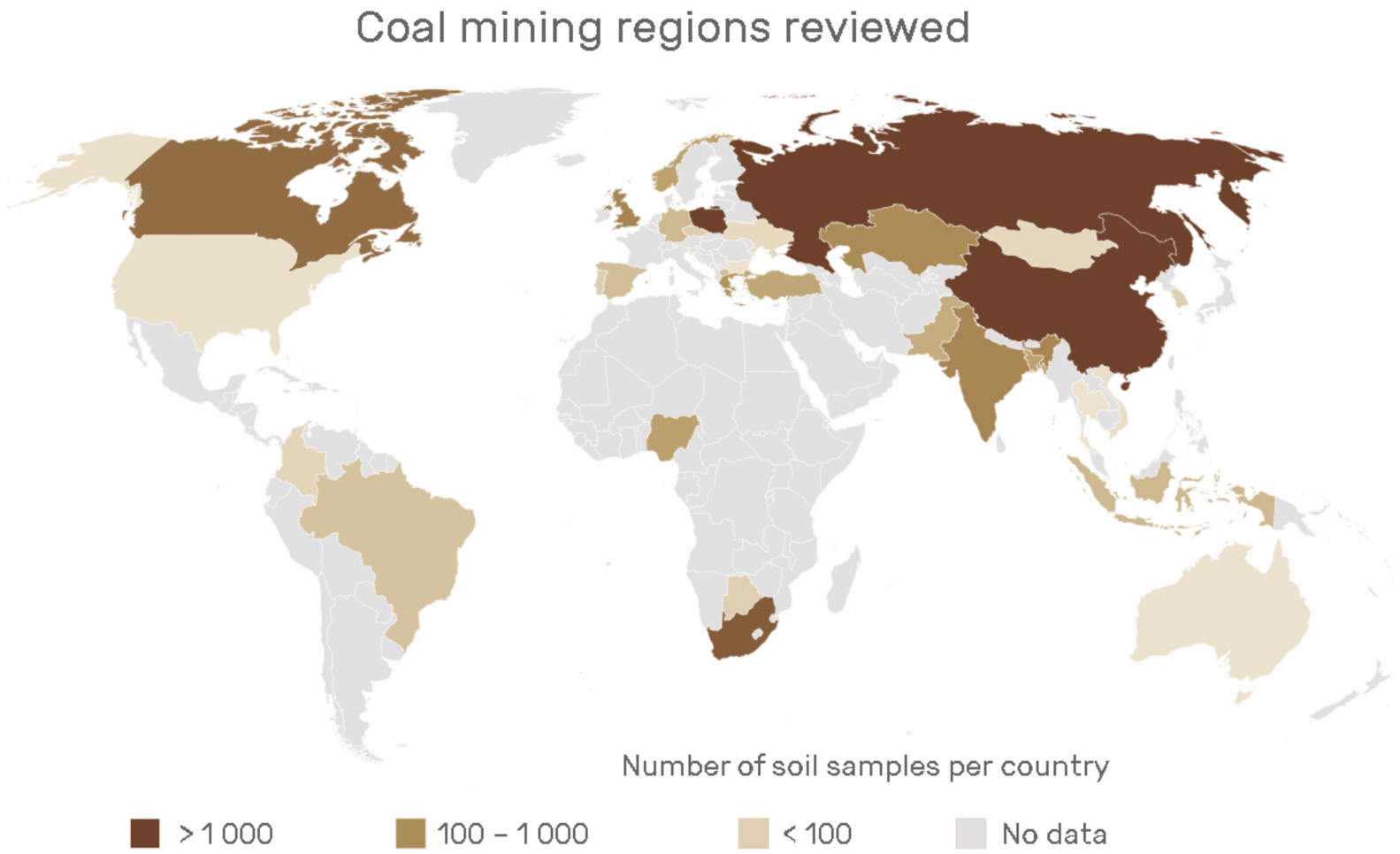
Worldwide data analysis: Mining site soils

Meta-study:

“Global reference concentrations of chemical elements in coal mine soils”

https://doi.org/10.1007/s12665-025-12160-0



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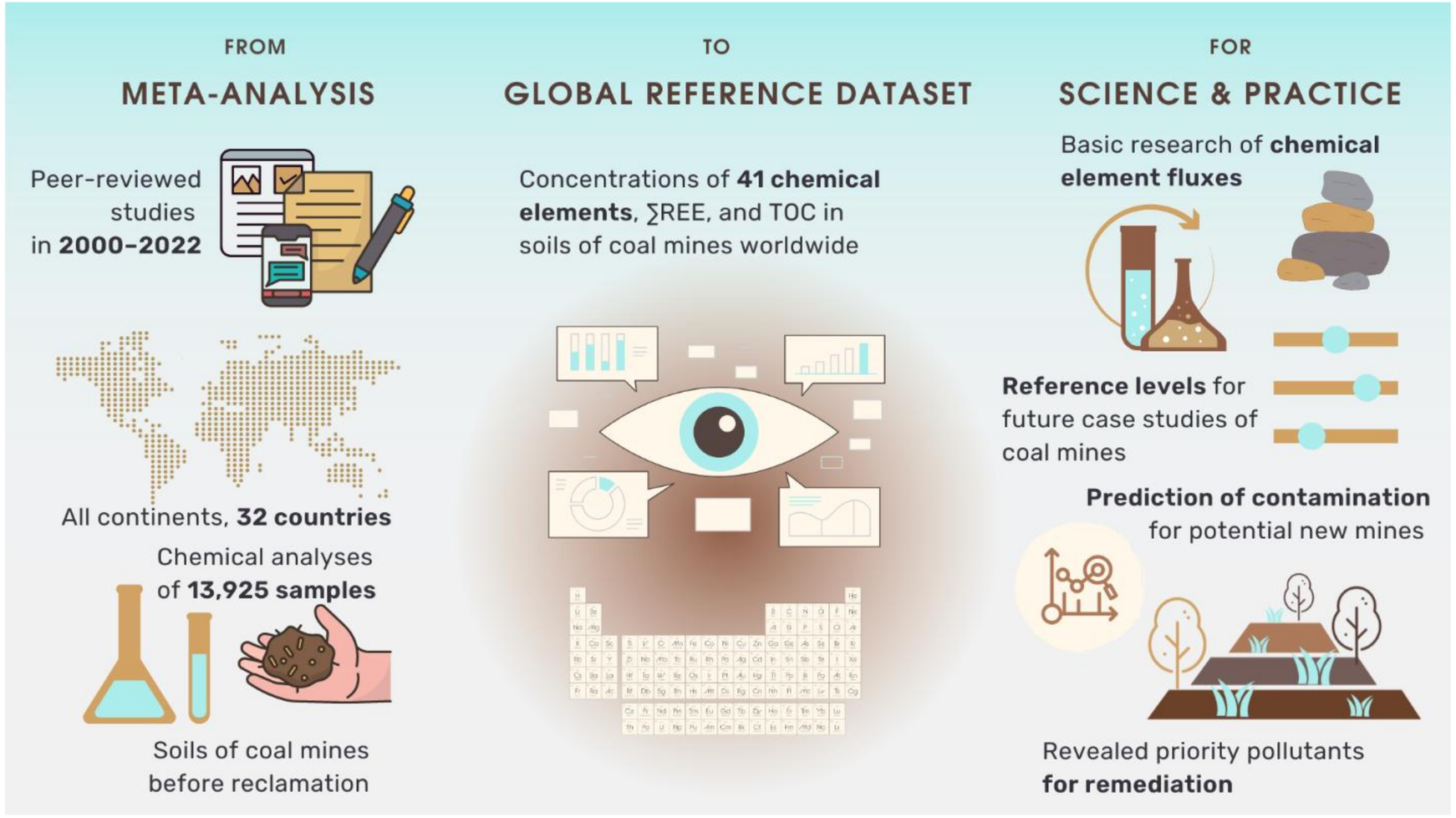

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2024-2026: Resource Nexus Inventory of Post-Mining Legacies in Lusatia

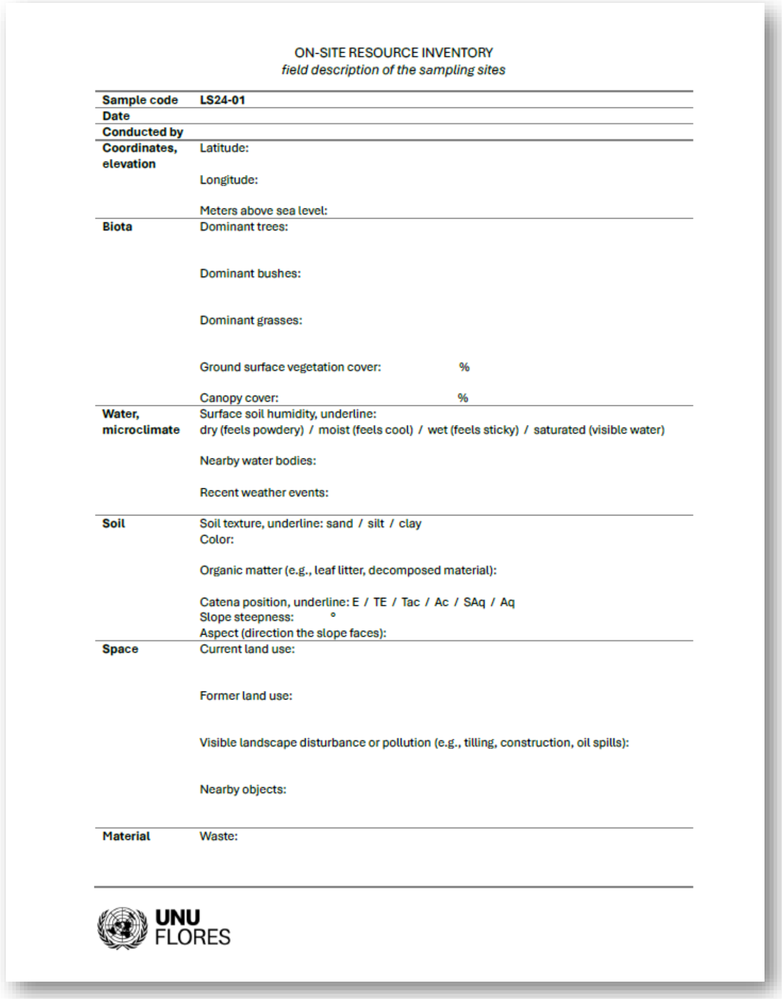
Field and lab studies of the mining-affected areas

Soils and bottom sediments of rivers and lakes

- Concentrations of trace elements
- Particle size distribution in soils
- Active soil acidity and organic carbon content

Air

- Dust fractions PM1, PM2.5, PM4, and PM10 on a regular grid



ON-SITE RESOURCE INVENTORY
field description of the sampling sites

Sample code	**LS24-01**
Date	
Conducted by	
Coordinates, elevation	Latitude: Longitude: Meters above sea level:
Biota	Dominant trees: Dominant bushes: Dominant grasses: Ground surface vegetation cover: % Canopy cover: %
Water, microclimate	Surface soil humidity, underline: dry (feels powdery) / moist (feels cool) / wet (feels sticky) / saturated (visible water) Nearby water bodies: Recent weather events:
Soil	Soil texture, underline: sand / silt / clay Color: Organic matter (e.g., leaf litter, decomposed material): Catena position, underline: E / TE / Tac / Ac / SAq / Aq Slope steepness: ° Aspect (direction the slope faces):
Space	Current land use: Former land use: Visible landscape disturbance or pollution (e.g., tilling, construction, oil spills): Nearby objects:
Material	Waste:

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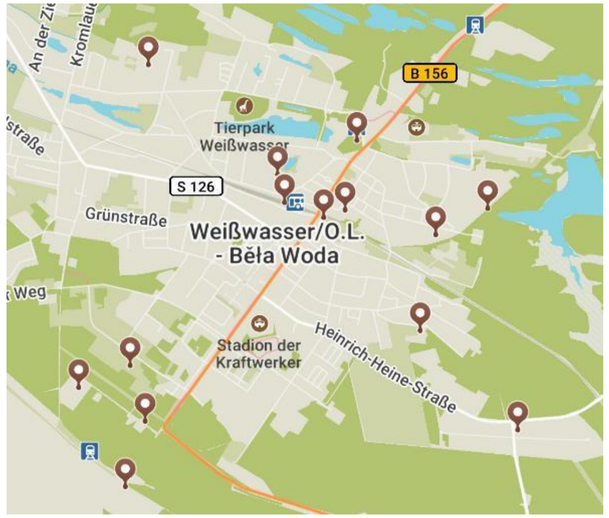
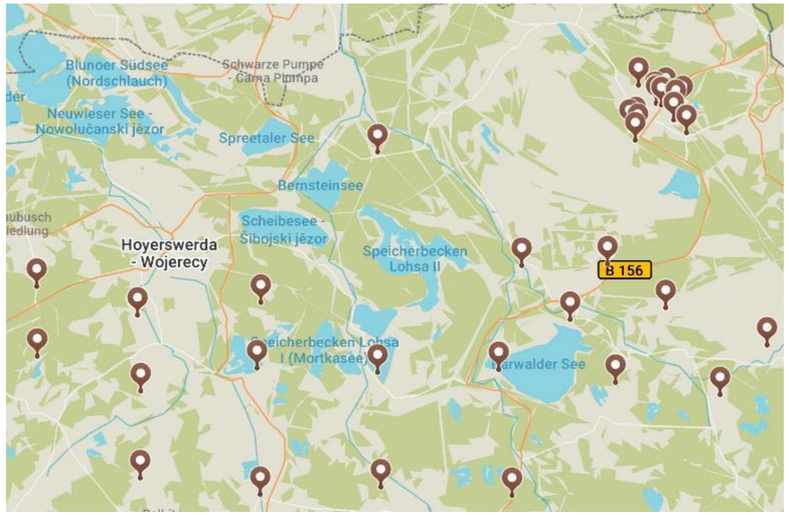
Soil pollution in Lusatia

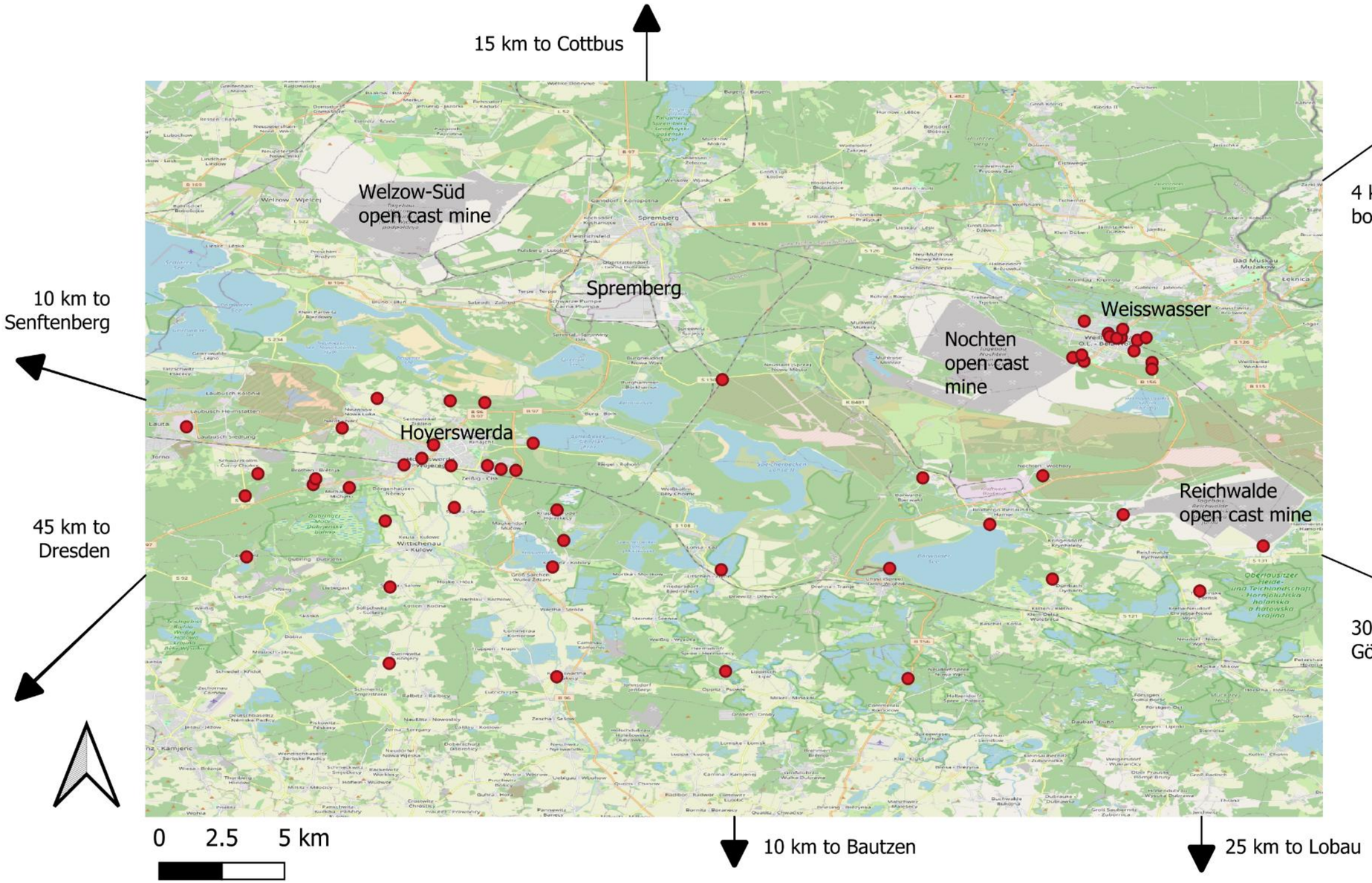
Soil pollution was reported as a critical issue in the Black Triangle: such observed pollutants as Zn, Pb, Cu, Cr, Cd, Co, and Ni pose risks to human health and the environment.

Contamination hotspots were found between the Schwarze Pumpe and Boxberg power plants, where **petrochemical plants, refineries, textile manufactures, and glasswork industry were active** (Som et al., 2002; Spiteri et al., 2005).

Rachwał et al. (2017) revisited old soil samples and revealed different levels of pollution, up to moderately contaminated. These sites are located near emission sources, notably power plants near Hoyerswerda and Weisswasser.







Map of soil and sediment sampling sites in Lusatia

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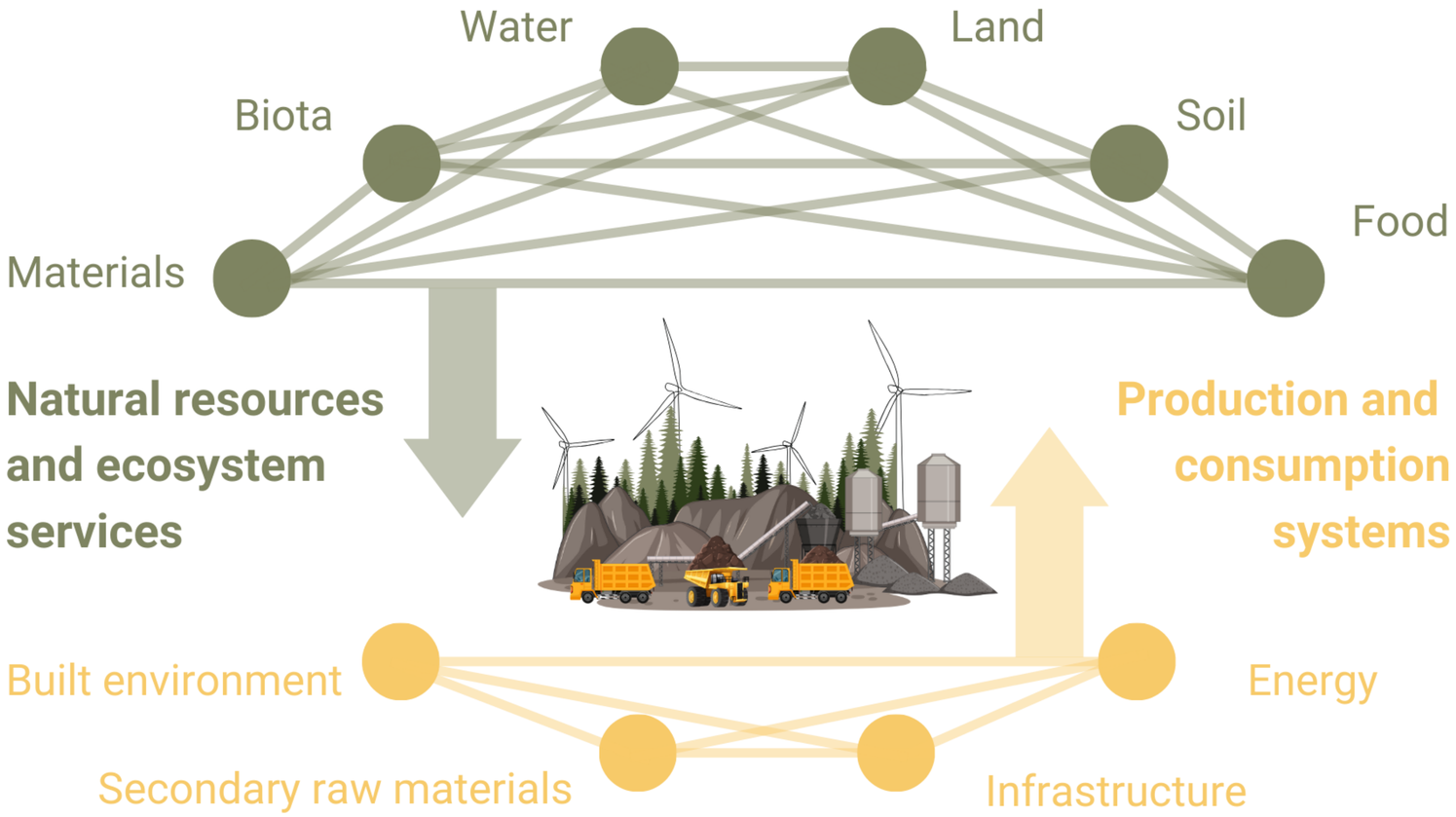
Post-Mining Land Use:
Balancing between ecological restoration and socioeconomic development

Green – nature-oriented.

Yellow – human-focused.

Central image – wind turbines and forests around the lignite mining area in Saxony.



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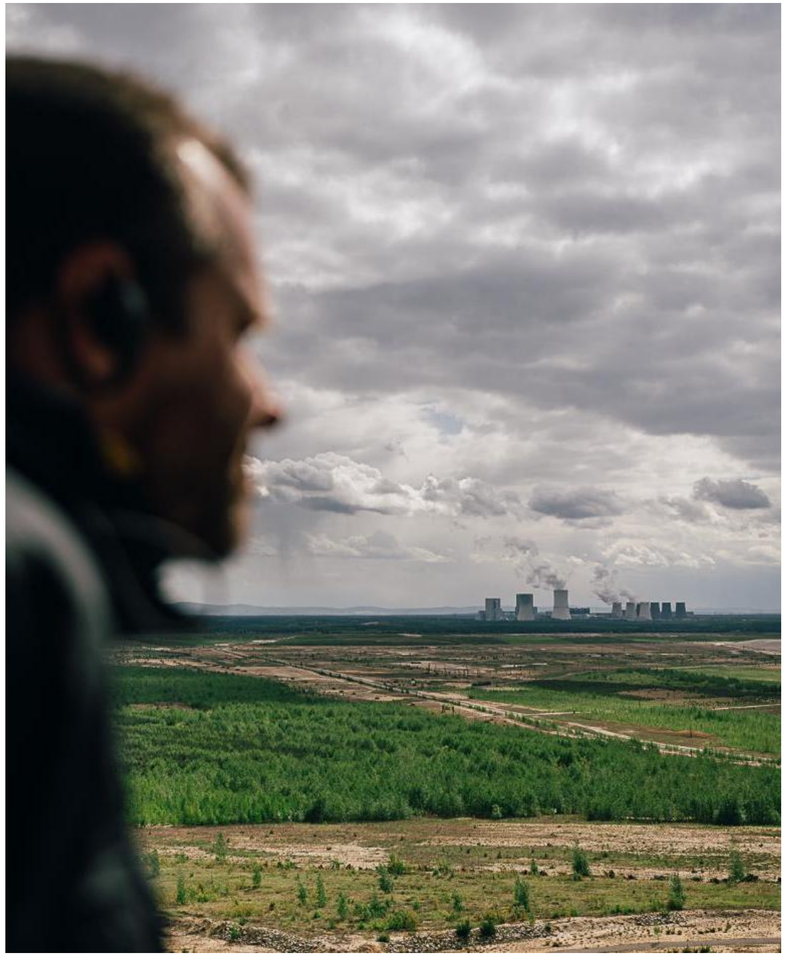
Post-mining landscape restoration: Hands-on workshops



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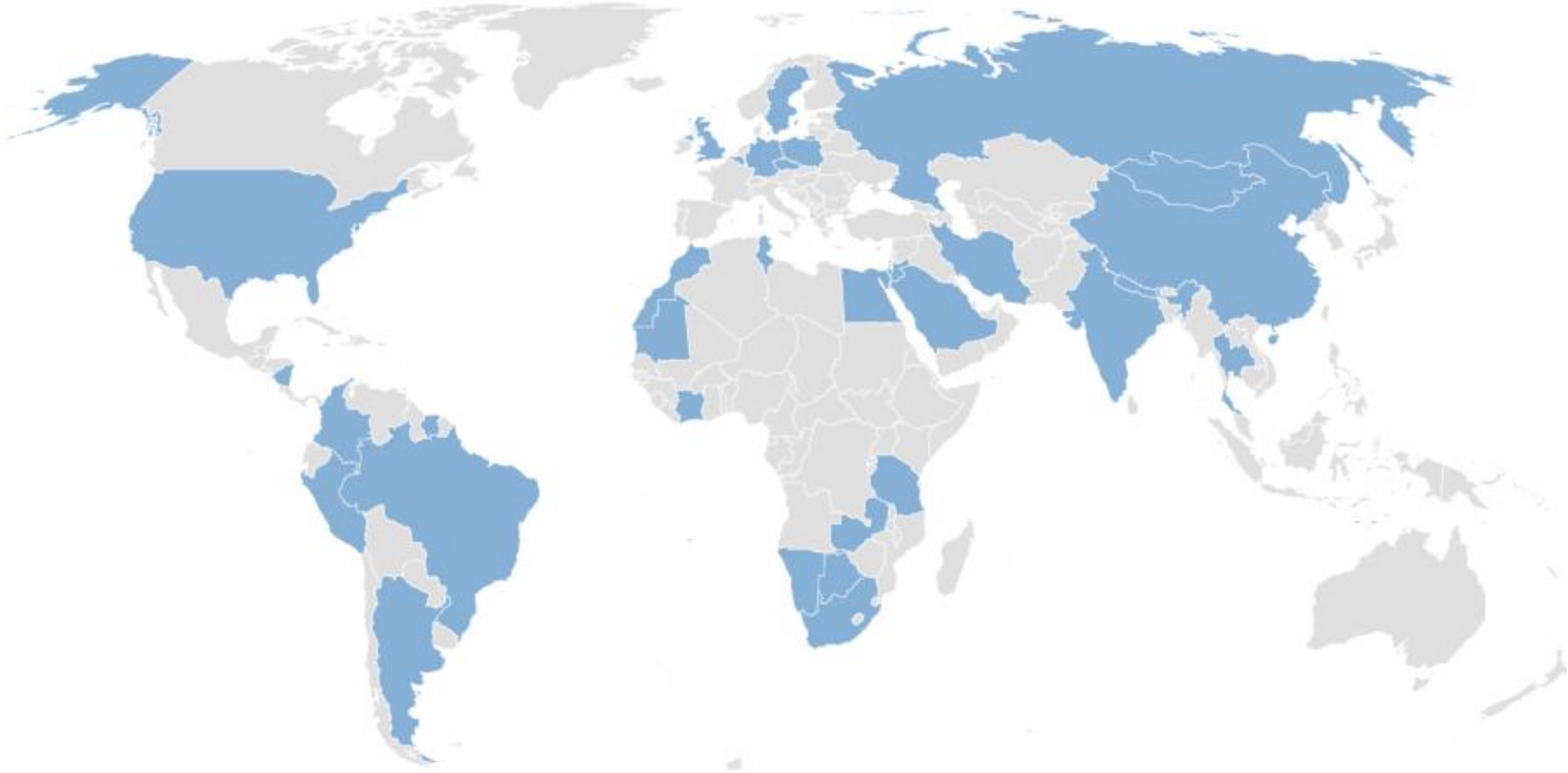
United Nations Convention to Combat Desertification

G20 GLOBAL LAND INITIATIVE

Workshop participants and speakers: Countries represented



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United Nations Convention to Combat Desertification

G20 GLOBAL LAND INITIATIVE

Hands-on training

Post-Mining Landscape Restoration Workshop

Saxony, Germany

April 2024

Key facts:

- 50 participants, more than a half from the Global South
- 2 days of classwork
- 2 days of field trips

Donor: G20 Global Land Initiative, UNCCD

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United Nations Convention to Combat Desertification

G20 GLOBAL LAND INITIATIVE

Field trips

Restored and active lignite mining areas

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United Nations Convention to Combat Desertification

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Post-mining landscape restoration: Hands-on workshops

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Post-mining landscape restoration: Webinars

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United Nations Convention to Combat Desertification

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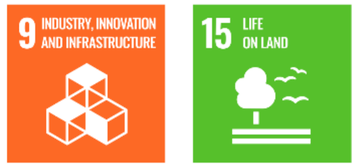
Resource Nexus approach
to former mining areas

1. Resource cataloguing

2. Understanding societal demands

3. Land-use guiding



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Empowering
scientists, practitioners, policy and decision makers
with Resource Nexus thinking

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Thank you!

alekseenko@unu.edu

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