



## **The Leibniz Institute of Ecological Urban and Regional Development e.V. (IOER) in Dresden is offering Master Theses at the research area Landscape, Ecosystems and Biodiversity**

### **Title: Tracing the biodiversity impacts of resource consumption across global supply networks: the case of forestry, mining, and agricultural landscapes**

#### **Topic:**

While various metrics account for the environmental impacts of resource consumption, little is known about the landscape-scale biodiversity loss and habitat degradation produced as a direct consequence of extraction. This gap limits our ability to compute environmental costs externalized through global supply chains. To address this, we are developing methodologies to trace the impacts of global supply chains within productive landscapes, such as mining, agricultural, or forestry territories. As part of this endeavour, a method for supply chain network analysis developed by the supervisor is currently in a testing phase using Python and trade data from UN Comtrade. The proposed thesis topics will complement and be supported by this analysis. We offer two distinct themes for Master thesis development:

#### **Theme A. Landscape-level impacts of biodiversity footprints**

The focus of this master thesis is to explore one or more of the following methods assessing the biodiversity footprint of German resource consumption. While iron mining is the case originally chosen to carry out this topic, other different landscape types (i.e. forestry) can be potentially discussed. Methods suitable for analysis are **one or some** of the following:

The focus of this thesis is to explore methods for assessing the biodiversity footprint of German resource consumption. While iron mining is the primary case study, other landscape types (e.g., forestry) may be discussed. Suitable methods for analysis (only one or two should be chosen) include:

- **Vegetation Indices (NDVI/EVI):** Using time-series data (such as Sentinel-2) to quantify the "greenness" of preselected mining areas. Students will measure how seasonal cycles decay in proximity to the mine (within a 2.0 km radius of the physical pit) due to dust and hydrological changes. Google Earth Engine may be used for this purpose.
- **Habitat Fragmentation:** Using Open Street Map (OSM) or equivalent software to analyze the historical development of roads, infrastructure, or tailings dams. This analysis will



demonstrate the fragmentation of continuous forests into isolated "islands," a primary driver of local extinction.

- Water consumption: Analysis of water use in mining areas based on existing Life Cycle Assessments (LCA).

### **Theme B. Supply chain network analysis of products into Germany**

This theme builds on ongoing research regarding the supply chain of construction steel in Germany, aiming to identify the geographic origins of the iron used. A model for supply chain network analysis has been developed by the supervisor for this purpose. While the original focus is on agricultural or iron mining landscapes, other sectors may be proposed. The thesis will involve **one or more** of the following tasks:

- Literature Review: Identifying valid data sources for global and German statistics to map supply chain phases, products, and economic sectors.
- Data Assignment: Determining product fabrication yields and the allocation of products across different economic sectors based on the literature.
- Trade Data Analysis: Analyzing trade data within the EU (Eurostat) or globally (UN Comtrade). Students may use existing code developed by the supervisor to fetch and process data.
- Expert Validation: Engaging in the validation of analysis results with subject matter experts.
- Visualization: Creating Sankey or Globe diagrams to represent the findings.

### **Background**

Basic knowledge of ecosystem services and quantitative data analysis (e.g., environmental footprinting or geospatial analysis, particularly using Python or R) is desirable.

### **Contact**

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