Flows and Stock of Raw Materials

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1. Introduction

Problem

The Sustainable Development Goals (SDGs), the transition to a low-carbon and circular economy, and ensuring resource supply - all require transformations in the use of natural resources, and the resulting emissions and waste. As a result, there is a need for a robust **information base regarding the current and future demands the economy has for natural resources**.

Solution

The PANORAMA project links physical and economic information on industry sectors, product flows and stocks, and (critical) material flows and stocks, all in a coherent classification on a global scale. This will allow for forecasting resource demand, implications of resource supply problems, and provide a deep understanding of the societal metabolism of products and materials, including the structure of urban mines.

2. Objectives

Map the full (critical) materials chain

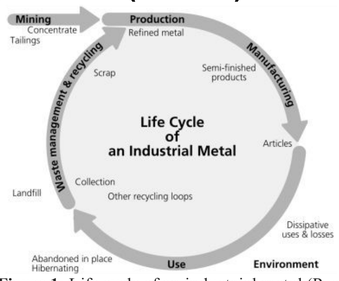


Figure 1: Life cycle of an industrial metal (R-cubed Research Group)

Highly detailed product, material, and element levels

Allowance for **trend analysis**

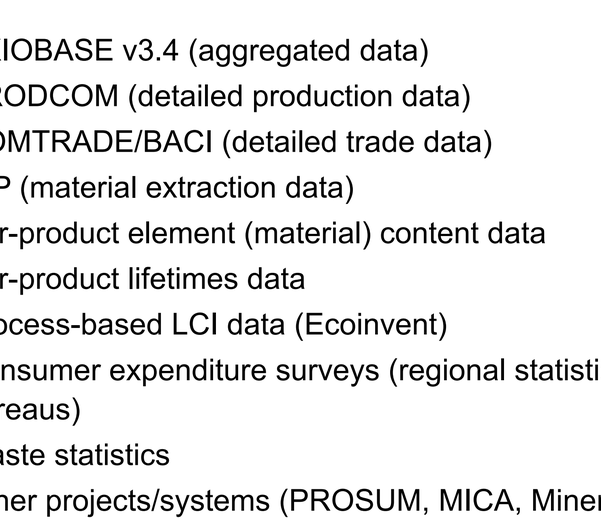


Figure 2: Critical metal demand for the energy transition (Exter et al., 2018)

Geographically specified: 48 countries and world regions connected through trade

Inform consumers if the supply chains are transparent

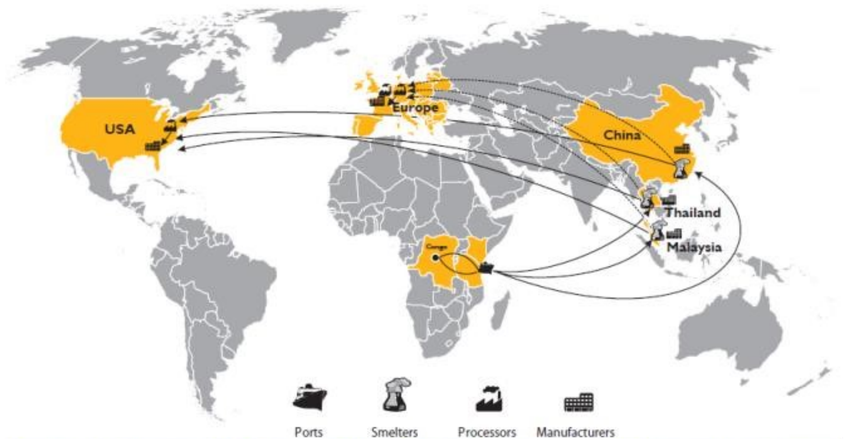


Figure 3: Conflict minerals supply chain (PHILIPS, 2015)

3. Methodology

Defining PANORAMA:

Based on EXIOBASE v3.4, we design a highly detailed physical multi-regional environmentally extended supply and use table (EE-MRSUT) for each product and element (material).

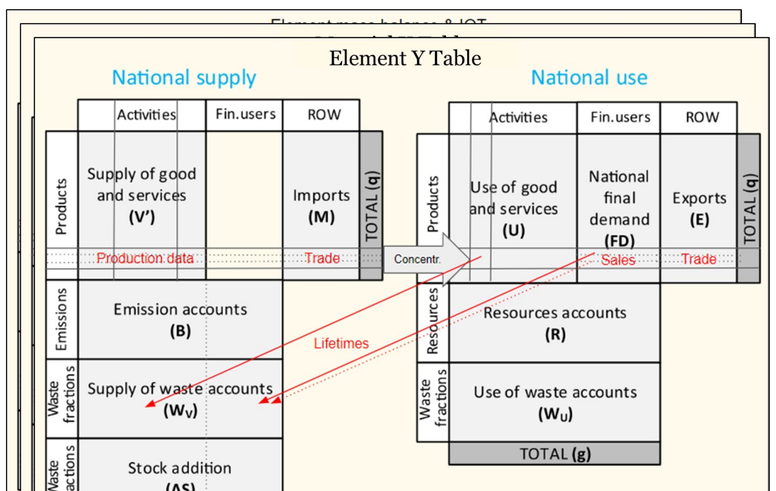


Figure 4: Panorama: disaggregated supply and use tables

Building blocks:

PANORAMA requires the harvesting and harmonization of the following data sources:

- EXIOBASE v3.4 (aggregated data)
- PRODCOM (detailed production data)
- COMTRADE/BACI (detailed trade data)
- IRP (material extraction data)
- Per-product element (material) content data
- Per-product lifetimes data
- Process-based LCI data (Ecoinvent)
- Consumer expenditure surveys (regional statistical bureaus)
- Waste statistics
- Other projects/systems (PROSUM, MICA, Minerals4EU)

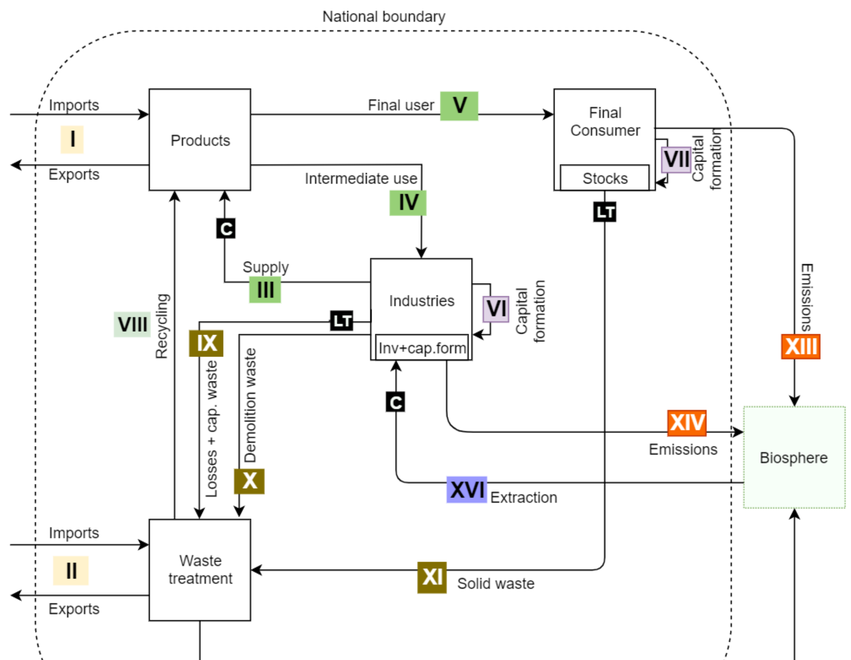
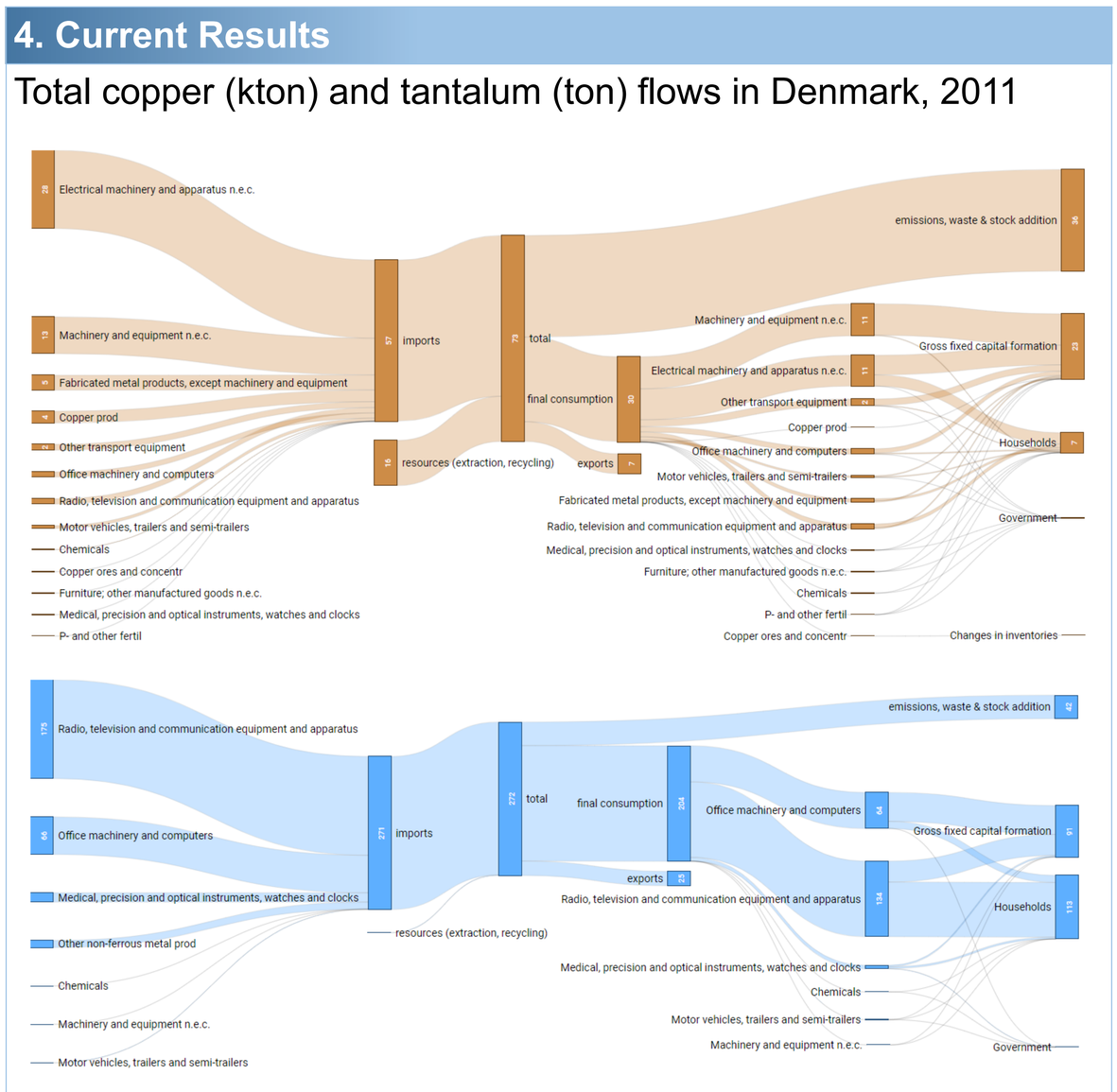


Figure 5: Panorama: Data inventory along anthropogenic cycle. Some flows include original composition data (C) or the related lifetimes (LT) data

4. Current Results

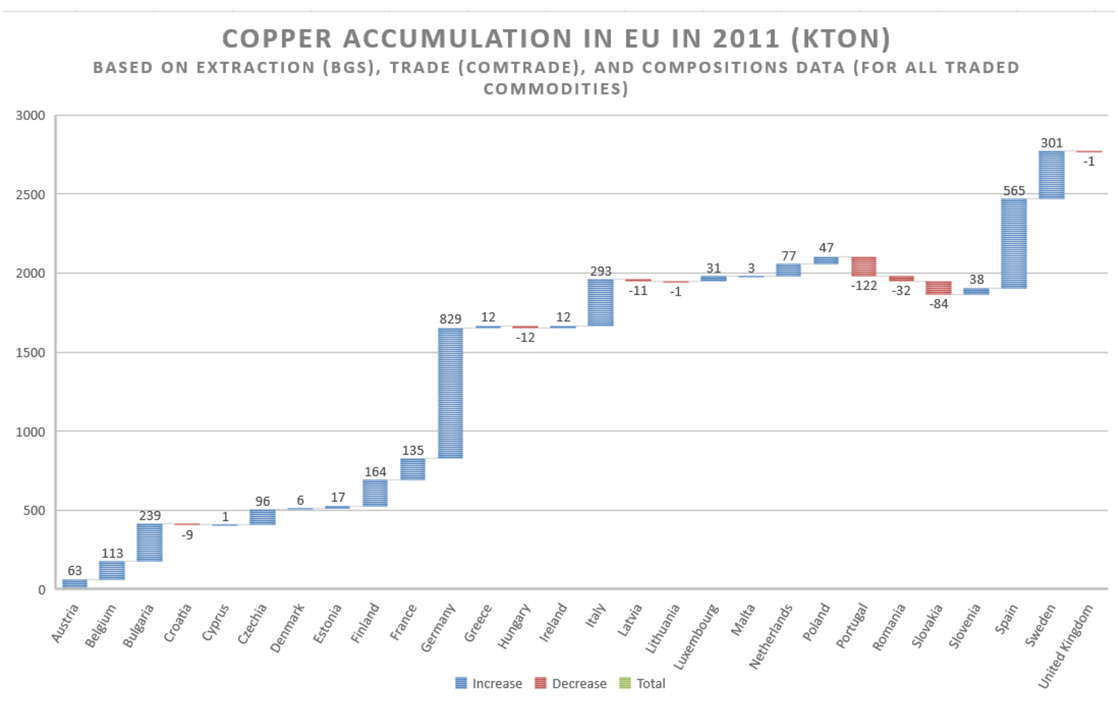
Total copper (kton) and tantalum (ton) flows in Denmark, 2011



Here, the resulting physical SUTs are generalized into aggregated Sankey diagrams

5. Challenges

- Scarce data on product composition
- Data discrepancy between sources (volumes, classifications)
- Data uncertainty and gaps



6. References and Partners

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