

## **Land, energy, and carbon embodied in international trade: Evidences from CREEA model**

Topic: The EXIOBASE Global MRIO database – new insights developed in the projects CREEA and DESIRE (Compiling and Refining Environmental Accounts / Development of a System of Indicators for a Resource Efficient Europe)

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In times when manufacture stages are increasingly spreading among different regions, tracing environmental impacts of consumed products demands supply chain analyses beyond national boundaries. Cleaner production, renewable energy sources, and increasing energy and material efficiency can be reduced or even offset by the increasing outsourcing of energy-intensive stages of manufacture to countries without greenhouse gas (GHG) emissions mitigation targets. These impacts can be even further magnified if production shifts to countries with carbon-intensive energy mix or less energy-efficient technologies – in this case, emissions would not only be reallocated, but could even increase. Discussions on carbon leakage have been gaining strength for the last years. This problem lies in the growth of emissions somewhere else due to climate change mitigation regulations in Annex 1 countries. Triggered by discussions on emissions responsibility and the role of international trade of goods and services in climate change mitigation, extended multi-regional input-output (MRIO) models have been increasingly used for consumption-based analysis. We use a fully integrated MRIO model to calculate national production- and consumption-based footprints of international trade, in order to identify carbon embodied in traded goods and services. We compare both energy and non-energy GHG emissions per capita in production and consumption, and identify main flows of land, energy and carbon embodied in trade. We identify the flows in disaggregated products and in categories related to ultimate services consumption: shelter, construction, food, clothing, mobility, manufactured products, services, and trade.

This paper is part of a case study for CREEA (Compiling and Refining Environmental and Economic Accounts), a FP7 project which will deliver an MRIO comprising 43 countries (27 European Union (EU) countries and 16 non-EU) plus the rest of the world disaggregated in five major regions (Africa, Asia and Pacific, Middle East, Latin America and the Caribbean, and rest of Europe). Trade flows comprise 163 industries and 200 products, plus seven final demand categories. Environmental extensions include 15 land use categories, energy and non-energy related emissions, and high level of detail for energy supply and use in 69 energy carriers.