

# Environmental Impacts Caused by the Material Flows of the Finnish Economy

**Jyri Seppälä<sup>a</sup>, Ilmo Mäenpää<sup>b</sup>, Sirkka Koskela<sup>a</sup>, Matti Melanen<sup>a</sup>, Juha-Matti Katajajuuri<sup>c</sup>, Ari Nissinen<sup>a</sup>, Yrjö Virtanen<sup>c</sup>, Kirsi Usva<sup>c</sup>, Tuuli Myllymaa<sup>a</sup>, Marja-Riitta Hiltunen<sup>a</sup>, Tiina Härmä<sup>b</sup>**

*<sup>a</sup> Finnish Environment Institute, P.O.Box 140, 00251 Helsinki, Finland*

*<sup>b</sup> Thule Institute, P.O. Box 7300, 90014 University of Oulu, Finland*

*<sup>c</sup> MTT Agrifood Research Finland, 31600 Jokioinen, Finland*

*Market opportunities in Life Cycle Thinking*

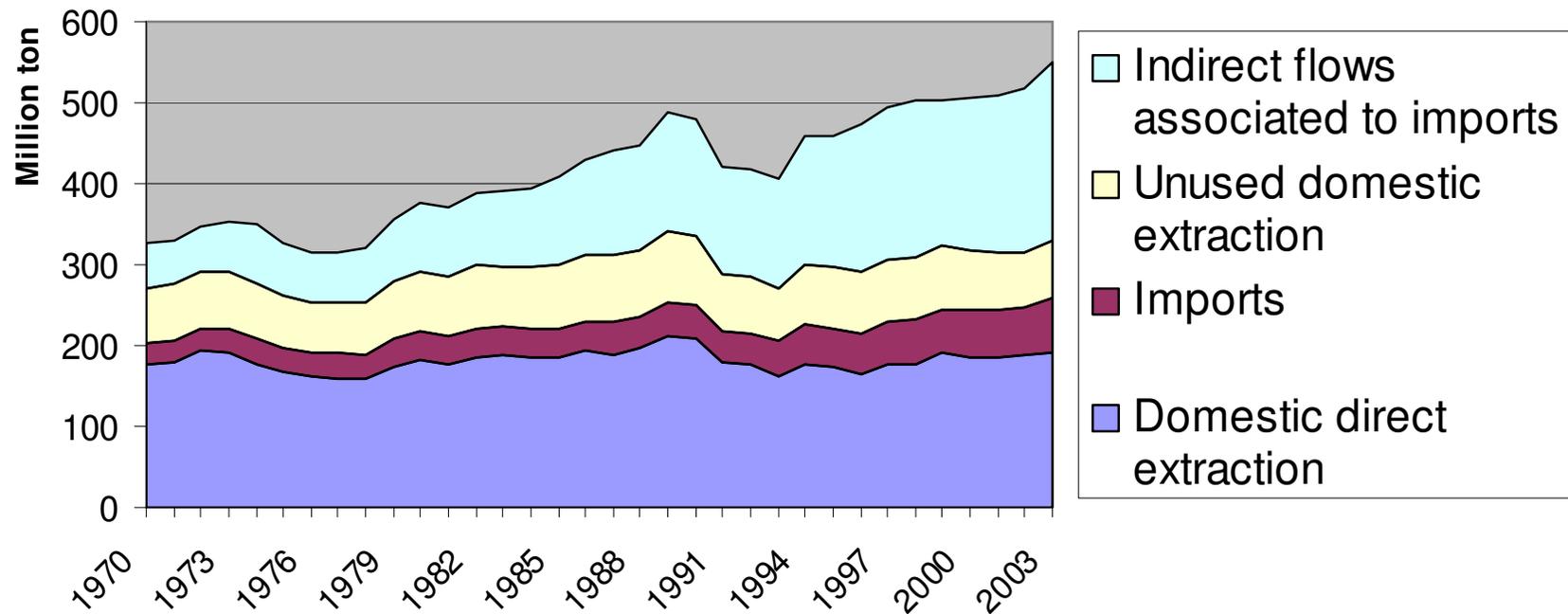
*Nordic Symposium*

*October 9-10, 2006 in Lund Sweden*



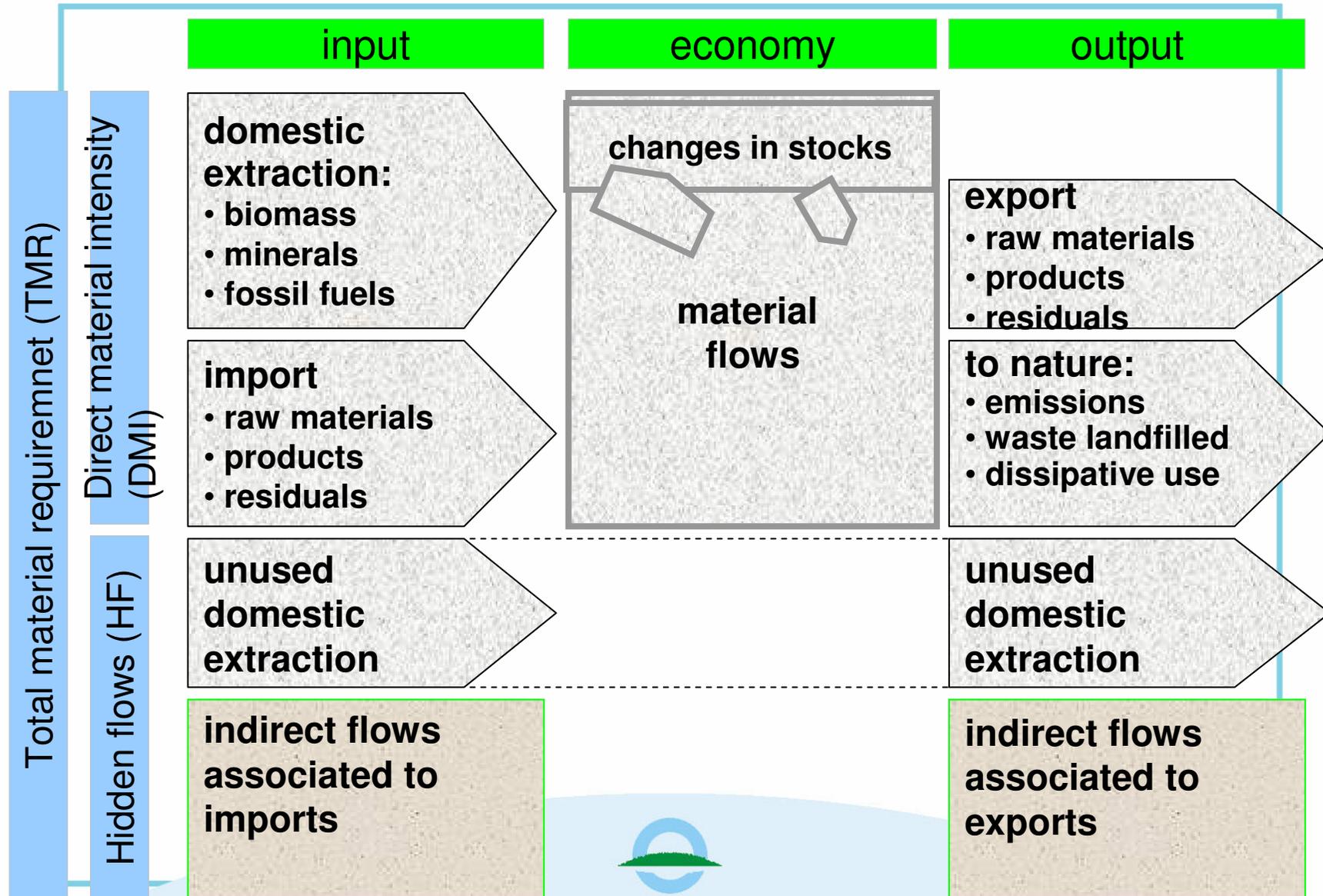
S Y K E

## Total material requirement (TMR) of the Finnish economy in 1970-2003 (Mäenpää 2004)



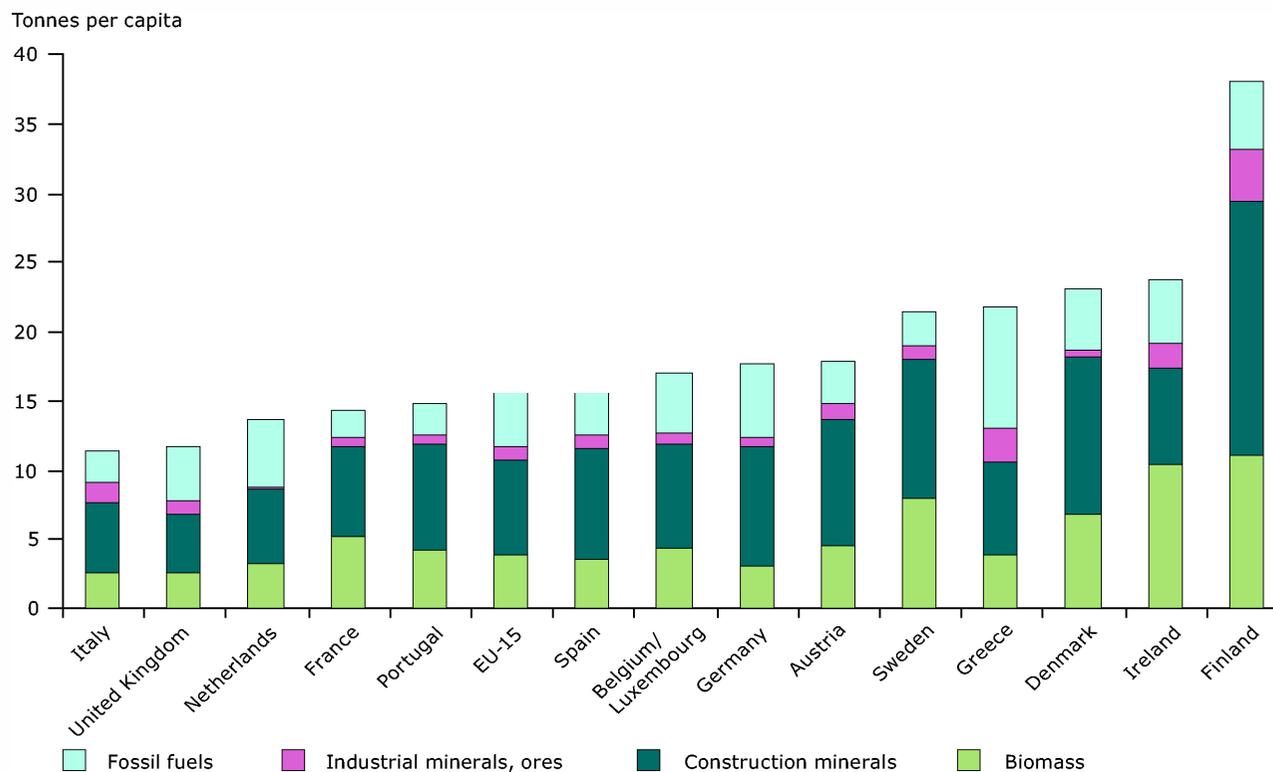
S Y K E

**Material flow balance of an economy** (Mäenpää 2004 and EEA 2003)



## Composition of direct material consumption (DMC) in 2001

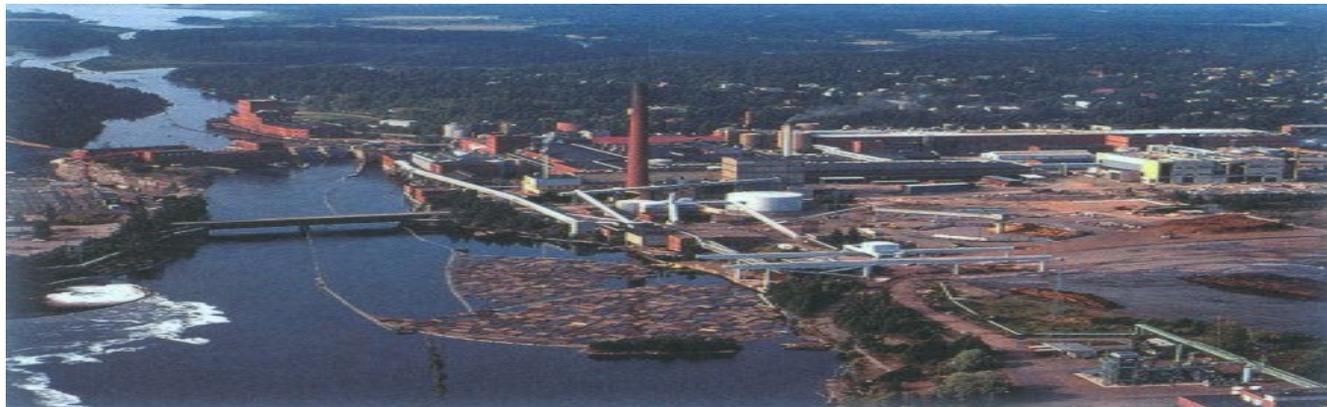
*DMC=domestic extraction+import-export*



Source: EEA 2003. Europe's environment: the third assessment. European Environment Agency, Copenhagen.

# Raised questions within Finland

- \* What can natural resource consumption really tell us about environmental impacts? (e.g. hidden flows and construction minerals)
- \* What are the environmental impacts of the Finnish economy abroad?



S Y K E

## ***Environmental Impacts Caused by the Material Flows of the Finnish Economy (ENVIMAT)***

### ***Project consortium***

- *the Finnish Environment Institute (SYKE)*
  - *the Thule Institute (University of Oulu)*
  - *the MTT Agrifood Research Finland*
  - *the VTT Technical Research Centre of Finland*
- *timetable: spring 2006 - the end of October 2008*
- *founded by the Finnish Environmental Cluster Research Programme 2006-2009*

### ***The aim of the study is to***

- *assess life cycle environmental impacts caused by production and consumption within the Finnish economy (economic sectors and main product groups)*
- *identify the most harmful material flows*
- *develop data basis and the methodologies of IO approaches and environmental impact assessments*



S Y K E

# Materials and Methods

- Material Flow Analysis/Accounts (MFA)
  - physical and monetary input-output tables (PIOT, MIOT)
- Data and assessment systems of environmental loads
  - a national emission register, international emission inventories, assessment guidebooks, LCI databases
- Impact assessment methods
  - LCIA
    - a hybrid model
- The EIPRO study and other international experiences on IO methods
- A Finnish PIOT model developed by Mäenpää (2005)



S Y K E

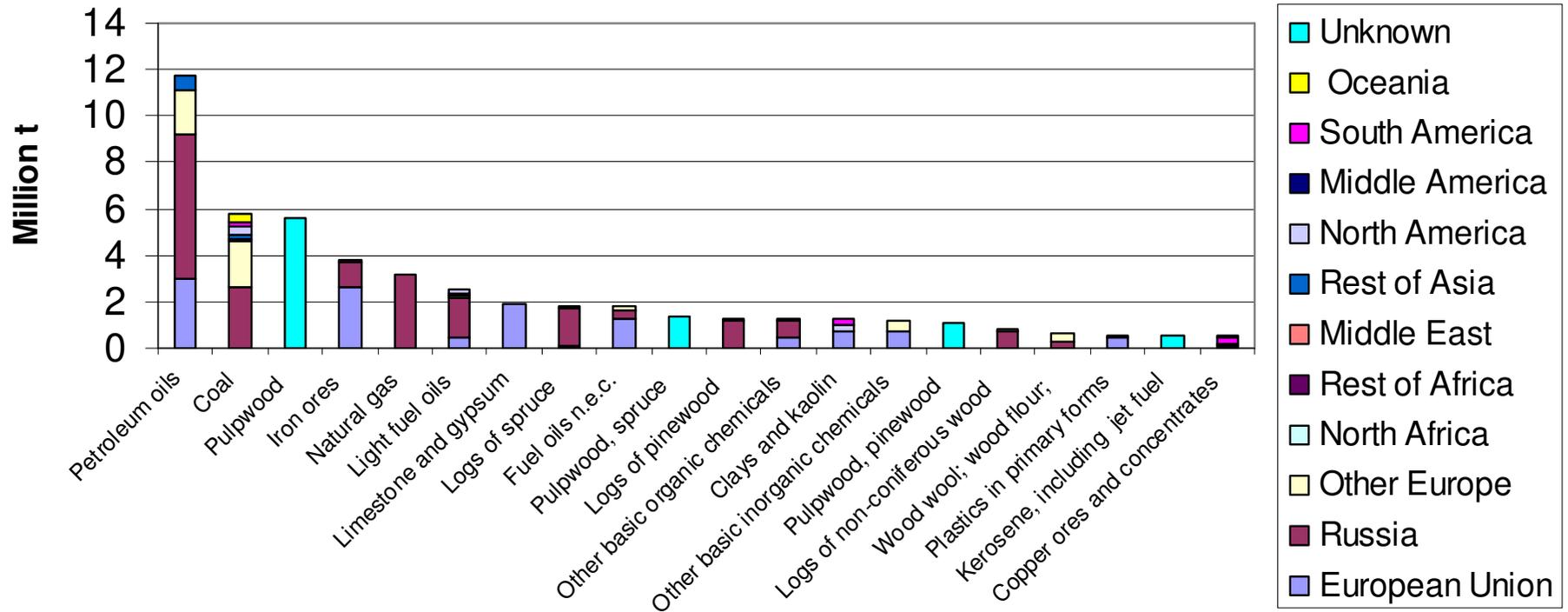
# The HYBRID model

- The IO table (with 151 industry sectors and 718 products) will include
  - main material accounts for Finland in 2002 and 2005 (import, domestic extraction, export)
  - all “relevant” environmental loads (emissions, wastes, land use) related to the industry sectors
    - option 1: LCI data for upstream (activities abroad)
    - option 2: upstream according to the EIPRO data
    - challenges: how to gather land use and toxic data?
  - characterisation factors based on the “best practices” in order to calculate environmental impact category indicator results
    - option 1: CML 2002
    - option 2: recommendations by European Platform/SETAC/UNEP/ISO
    - option 3: site-dependent approach & expert judgements
    - **normalisation & weighting**
      - challenges: land use impacts and how to assess impacts outside Europe?



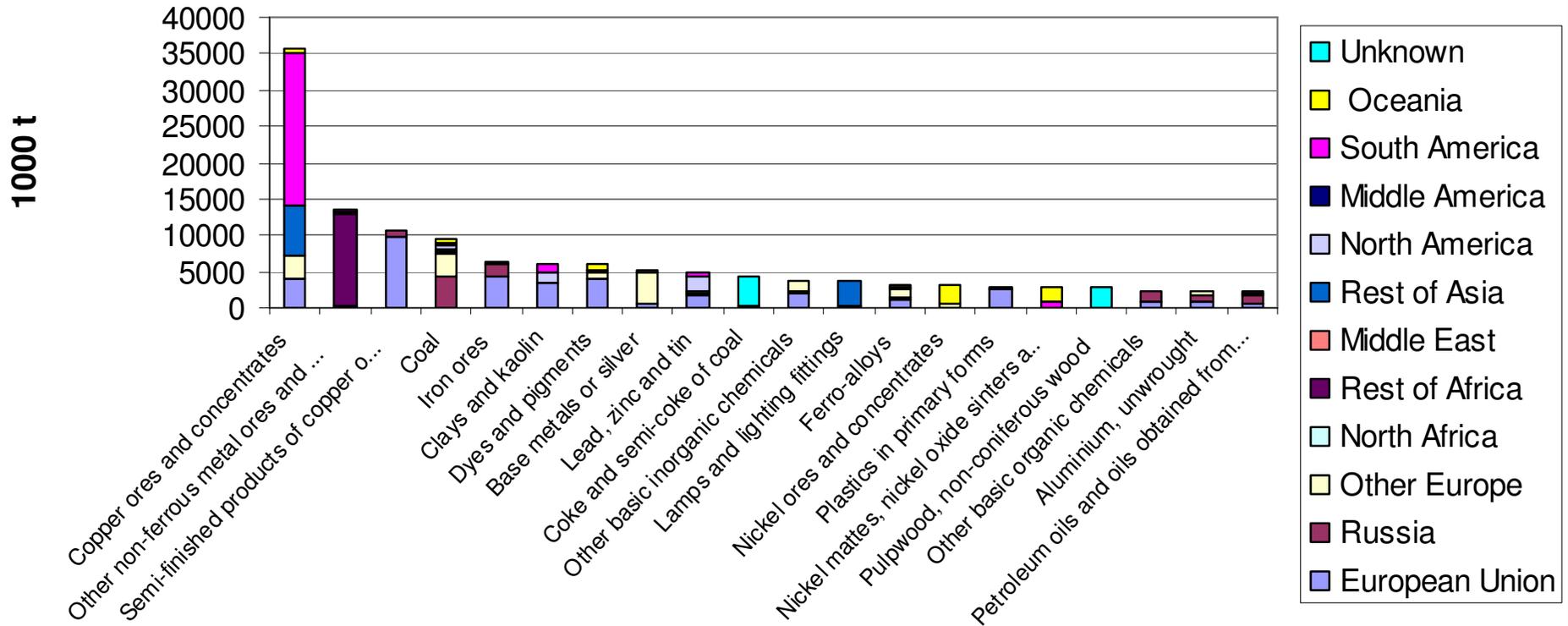
S Y K E

## Imports in 2002 - top 20



S Y K E

## Imports+indirect flows in 2002 - top 20



SYKE

## The use of the results

- To create new knowledge about the role of natural resource consumption
- To clarify how MFA indicators and MIPS explain environmental impacts
- To improve data basis and impact assessment methodology in IO methods and LCA applications
- To offer new possibilities to assess the sustainable aspects of production and consumption in the Finnish economy



S Y K E