



The webinar will begin shortly...

Can International Trade Increase Resource Efficiency?

December 8 2015

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Moderator: Paul Ekins

*Director, Institute for Sustainable Resources, UCL
Professor, Resources and Environmental Policy, UCL*

Can International Trade increase resource efficiency?

Presentation by Marina Fischer-Kowalski

on the basis of a report by UNEP'S International Resource
Panel: International Trade in Resources: a biophysical
assessment

<http://www.unep.org/resourcepanel/KnowledgeResources/AssessmentAreasReports/Trade/tabid/1060710/Default.aspx>



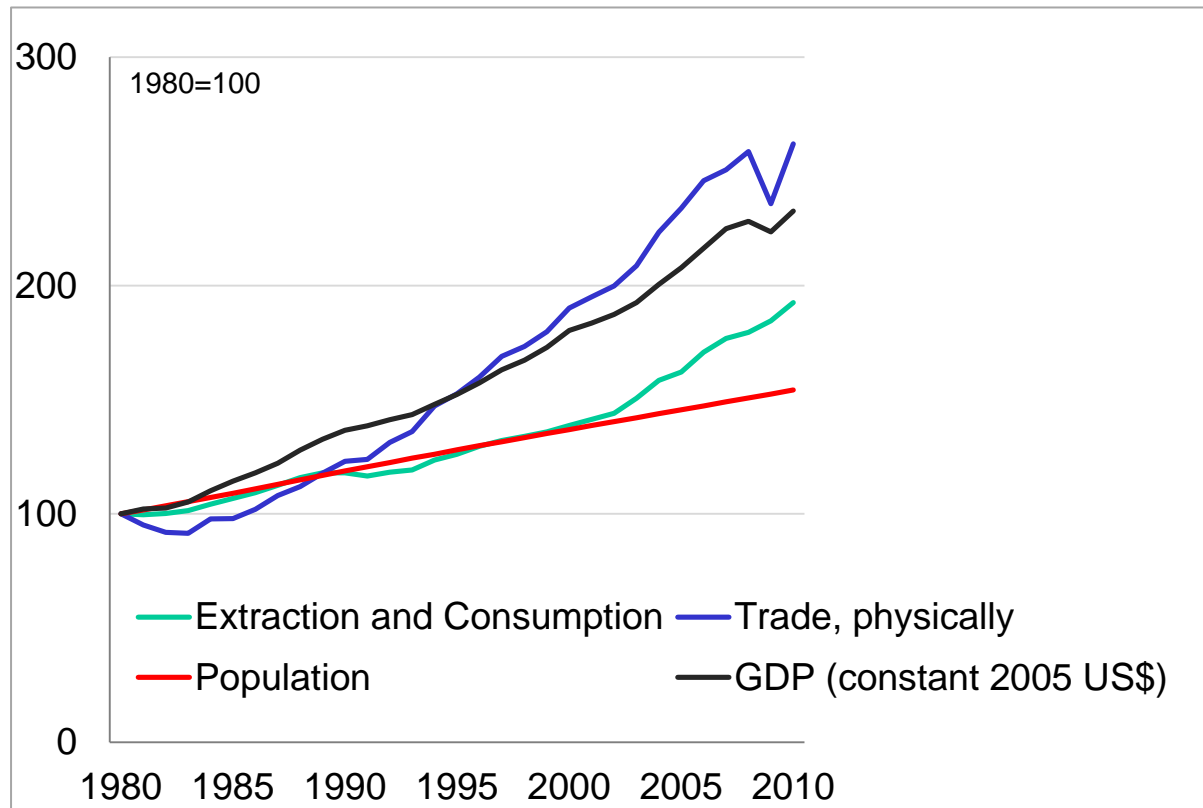
Intro

- This talk is about international trade not from a financial, but from a biophysical perspective: where do the billions of tons of raw materials annually extracted globally come from, and where do they go to?
- And beyond: What are the upstream resource requirements of these trade flows, the materials, energy, land and water used for producing traded goods, but left behind as wastes and emissions?

Agenda

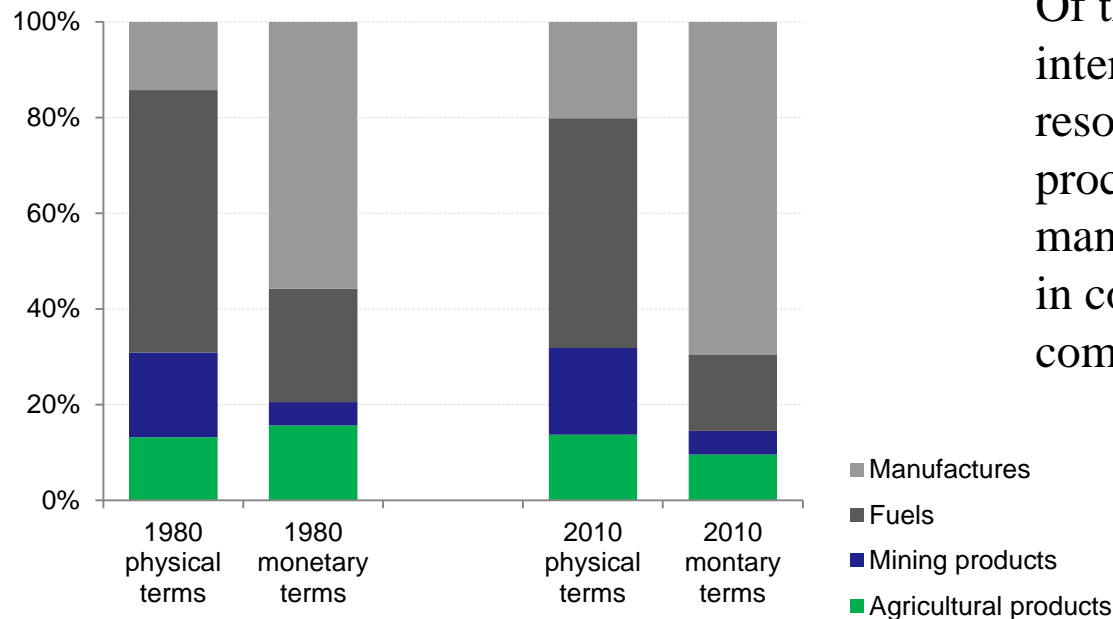
- ***Question 1:*** How important is international trade in supplying countries with resources, and how does dependency on trade change over time?
- ***Question 2:*** Which roles do countries occupy in international trade, where are the centres of use and demand, and where are the locations of international supply of resources? What factors determine this distribution?
- ***Question 3:*** How does the consideration of upstream resource requirements of international trade change the picture?
- ***Question 4:*** Does international trade improve or worsen the global efficiency of resource use?

Dynamics of international trade 1980-2010



In the past decades, the physical volume of world trade has increased faster than the human population, the volume of resources extracted globally and than World GDP

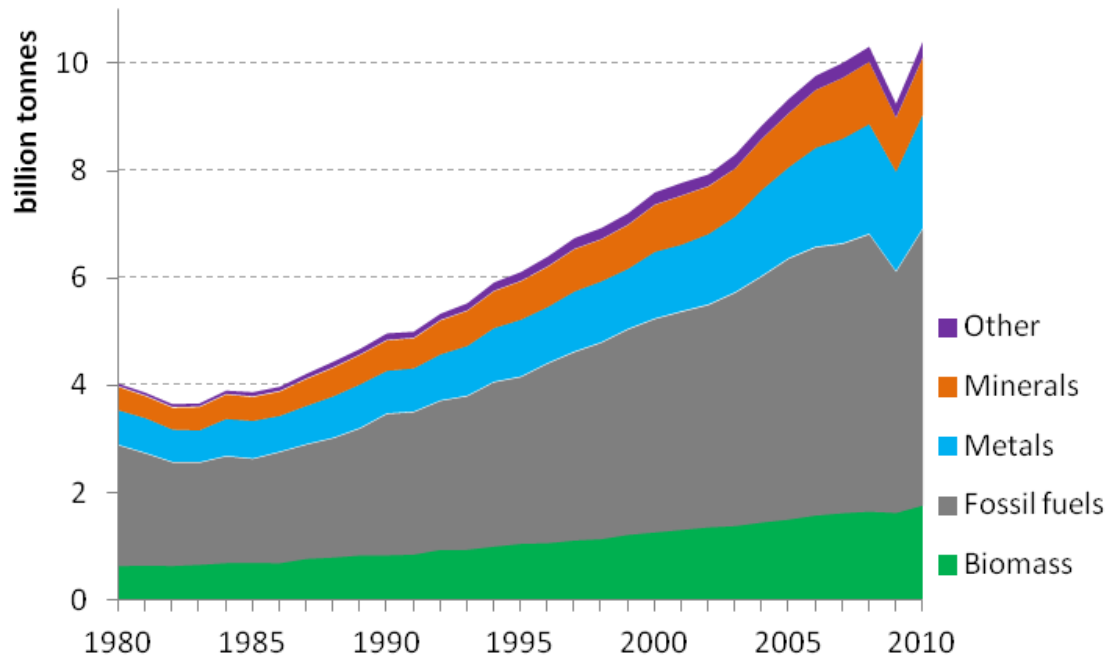
Trade in physical terms, in tons of volume, looks very different to trade in financial terms:



Of the 11 billion tons traded internationally, 80% are natural resources at a very early stage of processing – only 20% are manufactures. In financial terms, in contrast, 70% of traded commodities are manufactures.

Source: Dittrich, 2012

The composition of physical trade volumes by materials

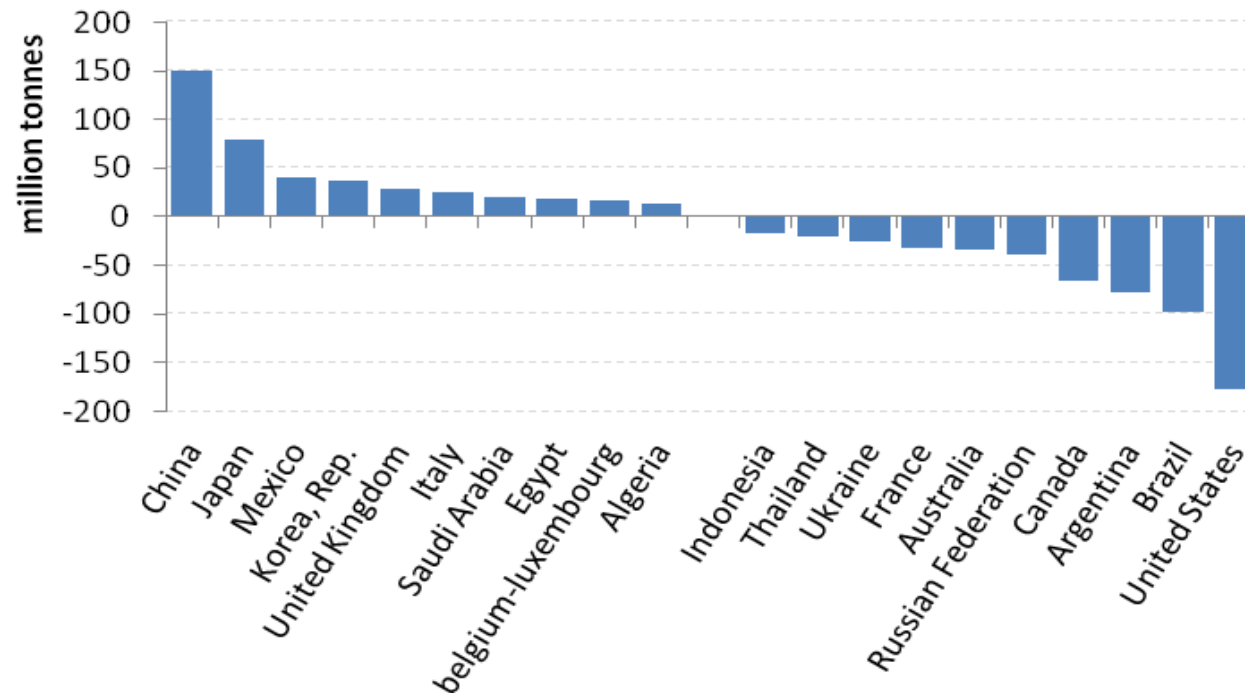


Currently, we extract 85 billion tons of natural resources annually worldwide. The global volume of international trade amounts to 10 billion tons.

Trade dependency by resource group

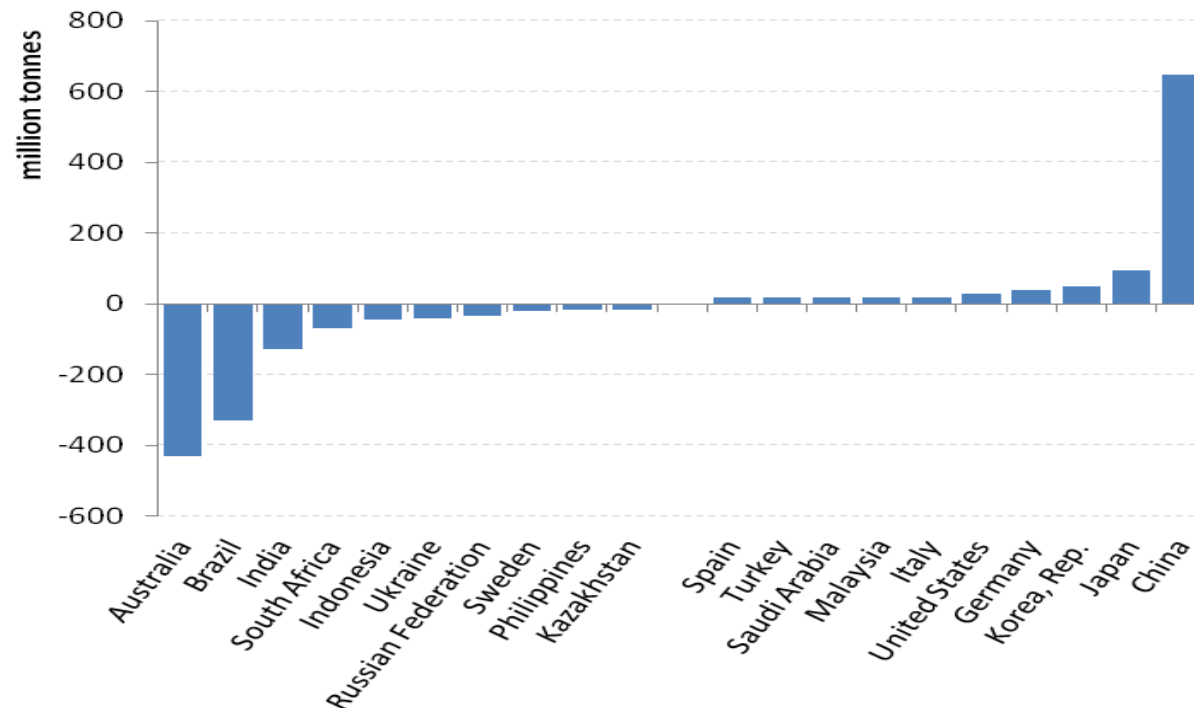
- The commodity that dominates world trade is **fossil fuels**: coal, oil and gas. It amounts to half of the global trade volume, and trade currently supplies a quarter of domestic demand.
- **Metal ores and minerals** amount to about 40% of traded resources, but countries strongly (and ever more strongly) depend on this trade, as it supplies almost three quarters of domestic demand.
- In terms of **biomass resources**, countries are – on average – largely self sufficient. More than 90% of the biomass consumed is supplied domestically.
- **Construction minerals** are hardly traded at all – they usually come from domestic sources.
- Between 1980 and 2010, across all resources, trade dependency has been rising.

Trade in biomass (products): 10 top net importers and 10 top net exporters (2010)



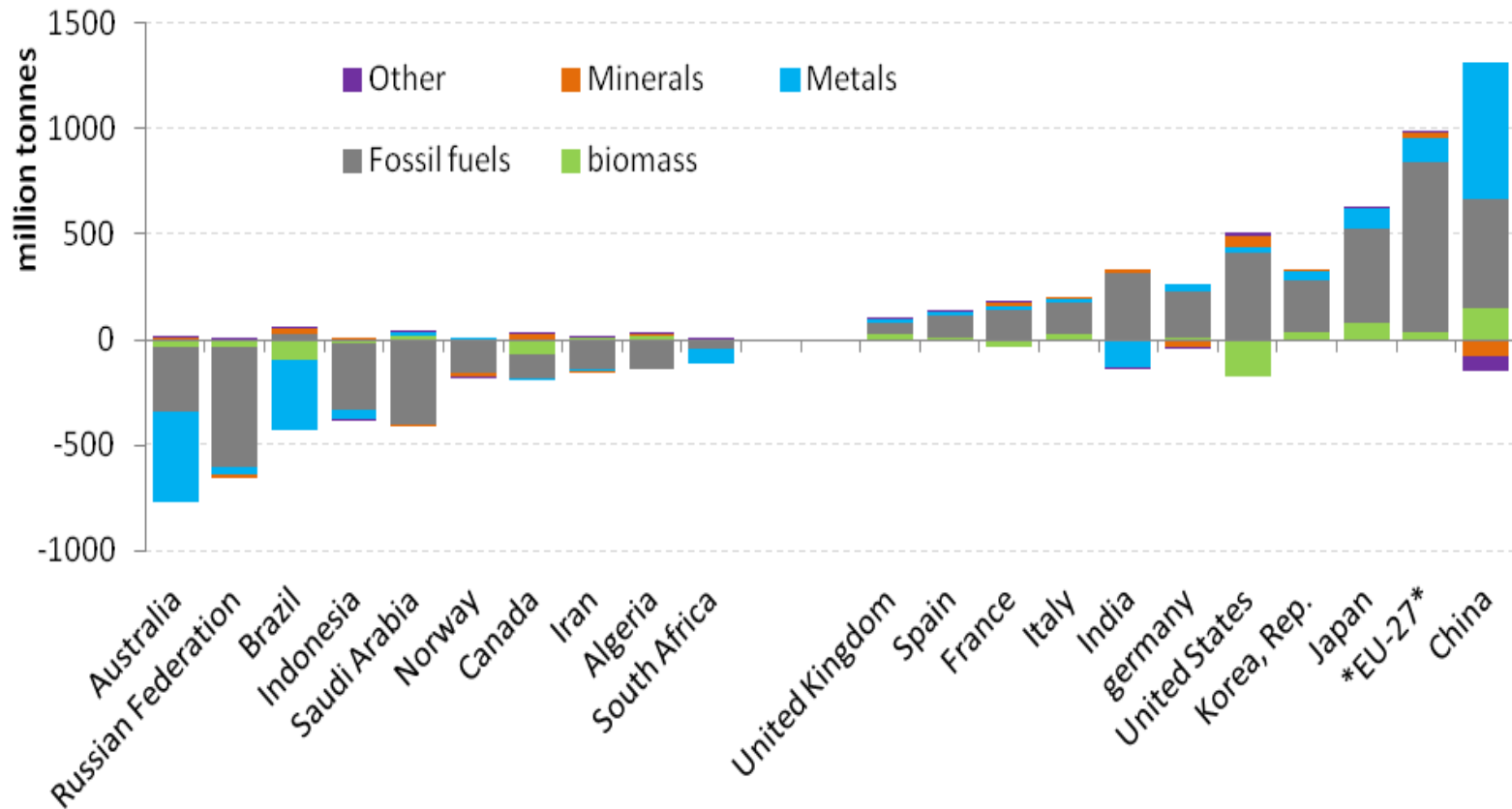
Source: Dittrich, 2012

Trade in metals: 10 top net importers and 10 top net exporters (2010)



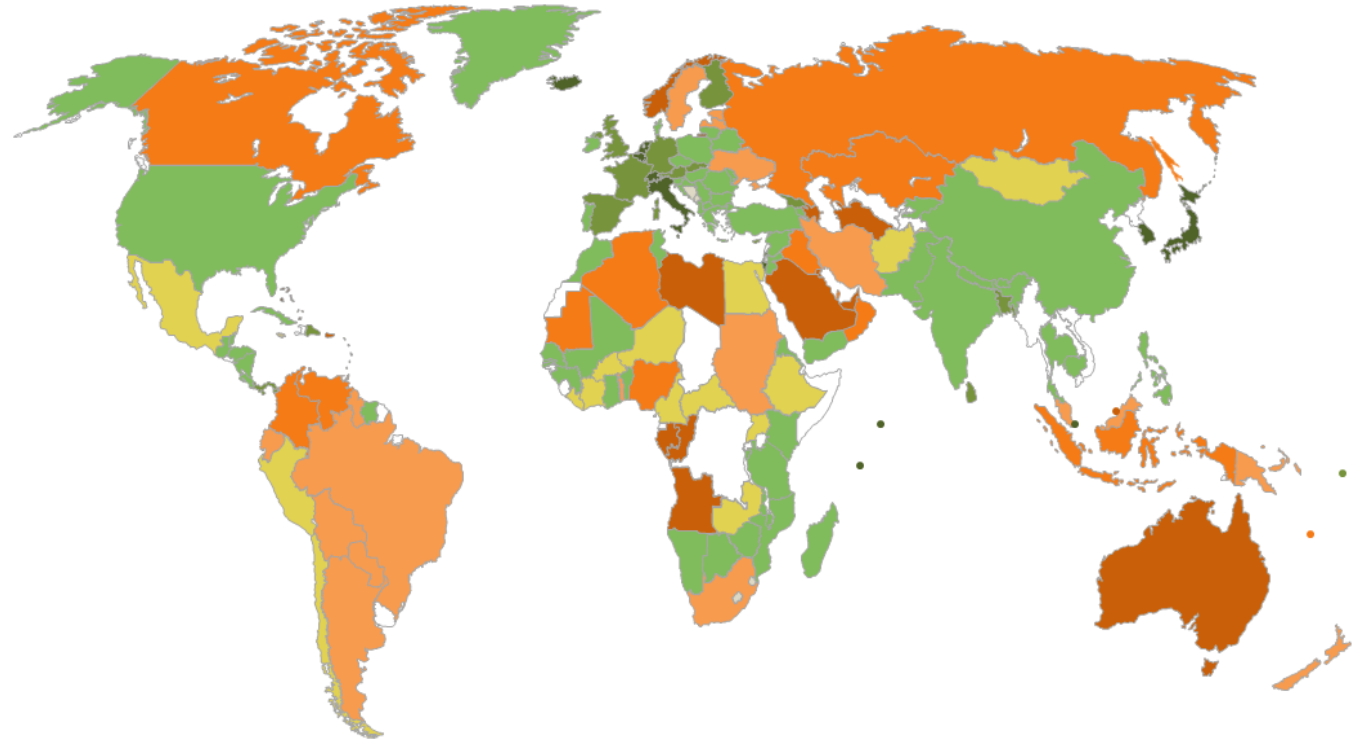
Source: Dittrich, 2012

All materials: largest 10 net exporters and net importers (2010)



Source: Dittrich, 2012

Trade volumes in relation to domestic extraction and consumption, 2010



Net-exporting countries
% of extraction which is net-exported

3 - 14 %
15 - 29 %
> 30 %

Net-importing countries
% of consumption which is net-imported

3 - 14 %
15 - 29 %
> 30 %

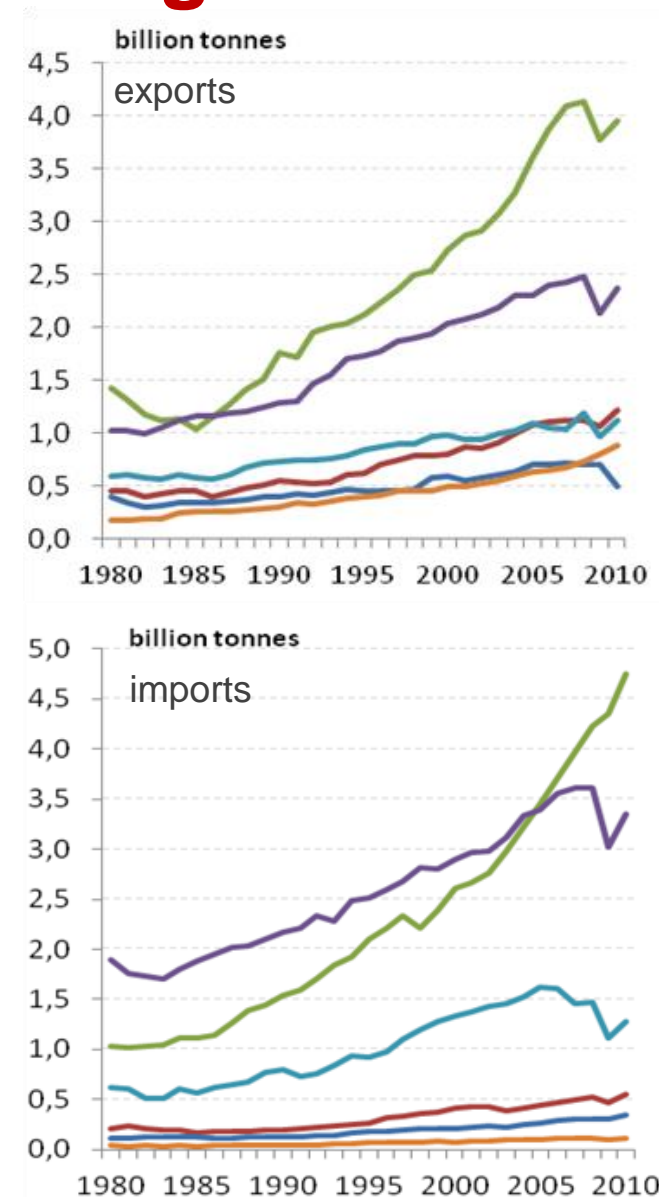
Balanced trade: +/- 2% of extraction/
consumption is net traded

Data not available in acceptable quality

Exports and imports by world regions

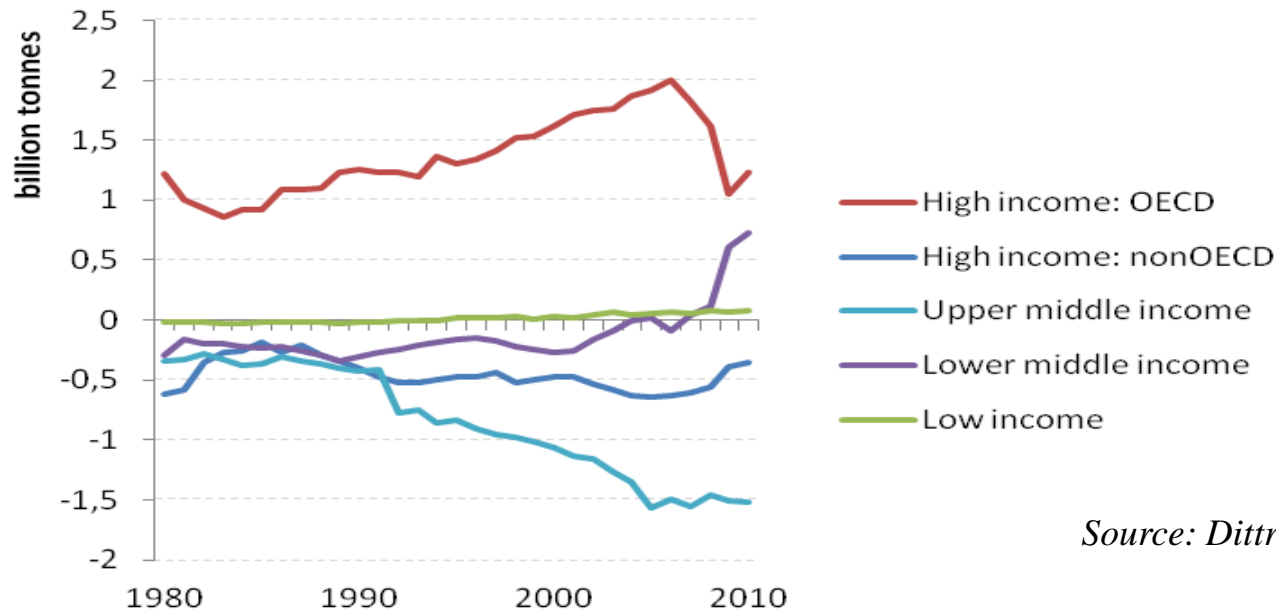
- **Asia** is the region with highest trade volumes both for exports and for imports. Asia is now a net-importer of resources. It imports high weight and low unit price raw materials and exports lower weight and higher unit price manufactures. Production wastes and emissions stay behind.
- The **European countries** come next in trade activity, both exports and imports: they mostly exchange manufactures between many small countries.
- **North America** follows in imports.

Source: Dittrich, 2012



— Latin America — Africa
— North America — Asia
— Australia & Oceania — Europe

physical trade balances by countries' income level

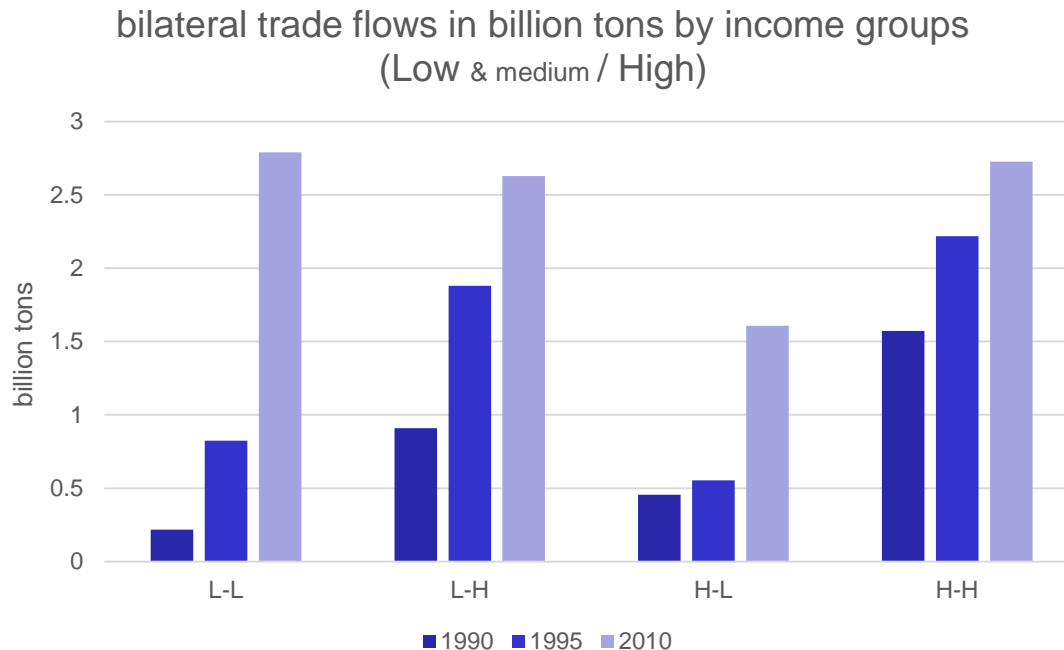


Source: Dittrich, 2012

High income OECD countries are the main net recipients of resources delivered to them by the rest of the world.

High income non-OECD countries (mainly oil producers) export larger quantities than they import.

The world of trade is changing: low and middle income countries catch up in trade activity



trade between low income countries increases very much and now surpasses trade from low/medium income to high income countries.

Source: Network analysis of bilateral trade by Pichler and Weisz, PIK. Data Source: UN Comtrade (<http://comtrade.un.org/db/>)

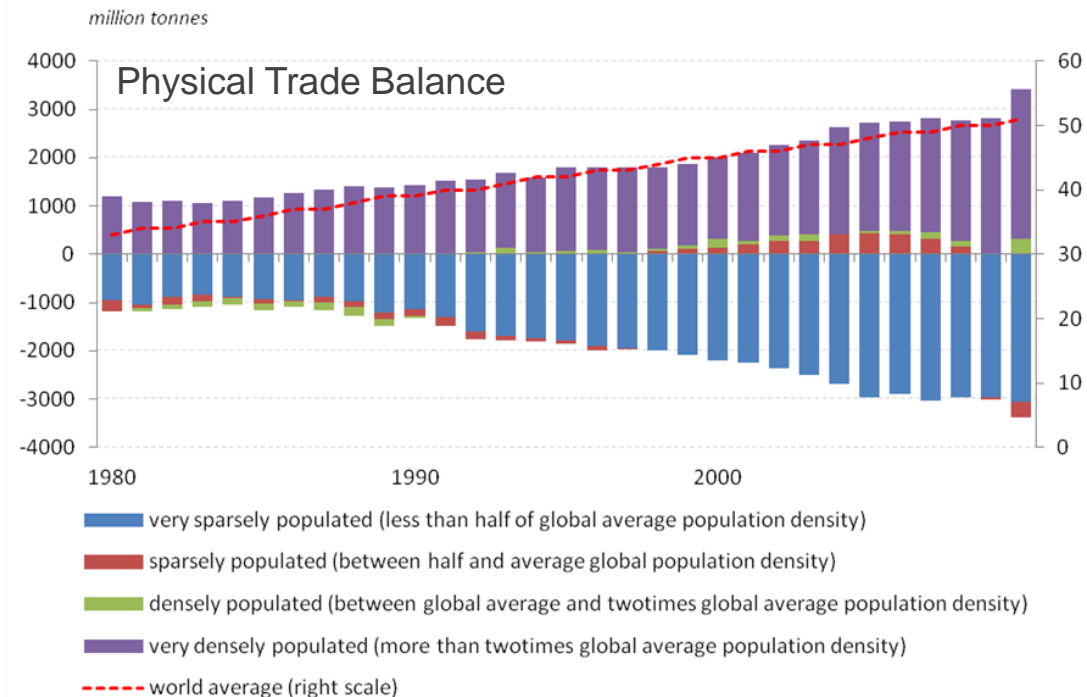
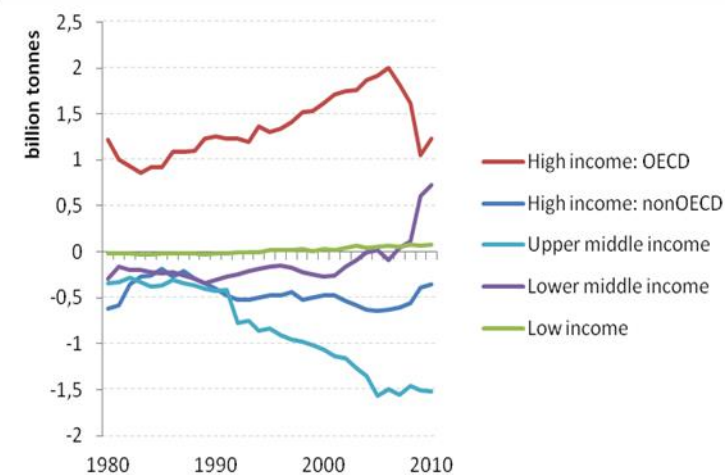
providers and demanders of resources: population density matters

- Exports of resources do not just follow the income gradient, but
- Population density is an important factor driving net-exports

→ Regions of low population density tend to be global exporters.

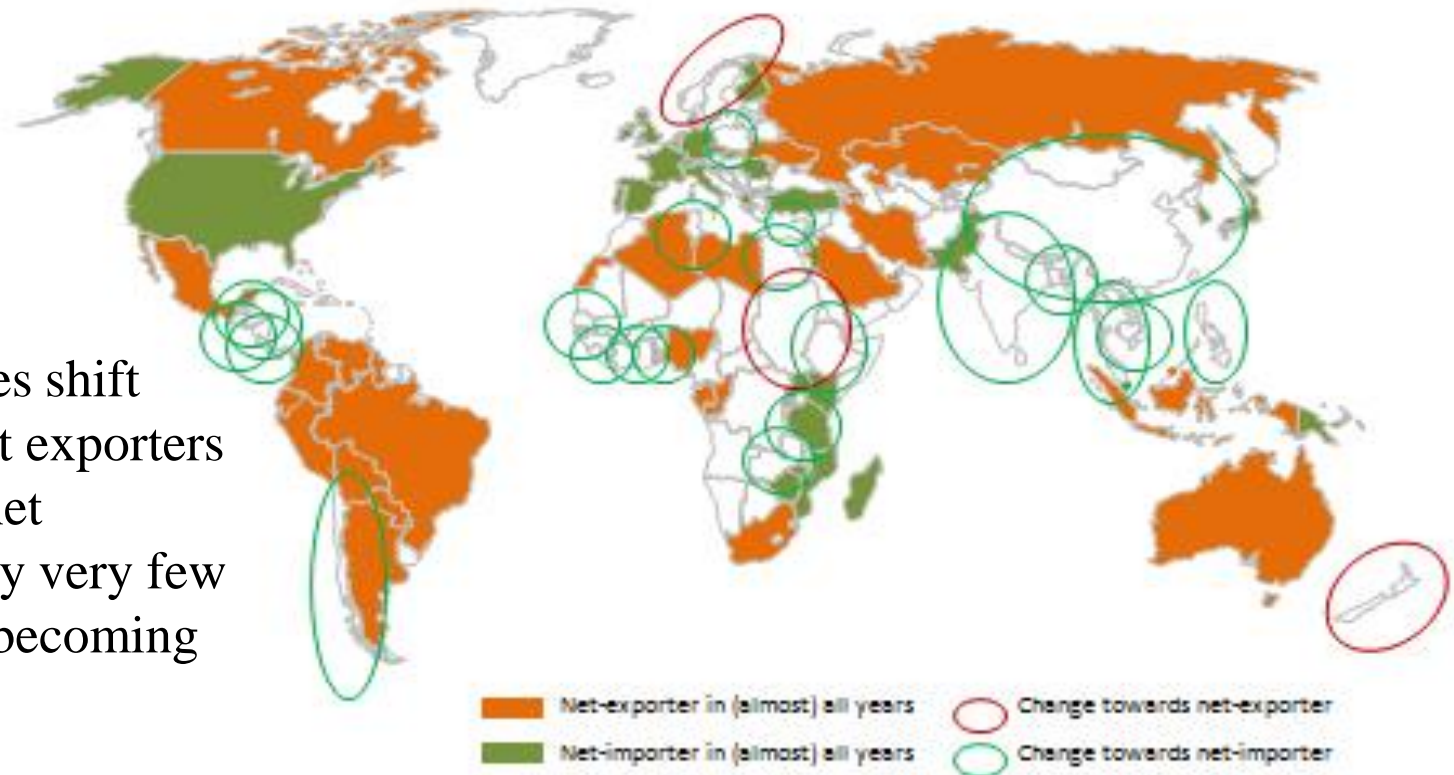
Source: Dittrich, 2012

Physical Trade Balance



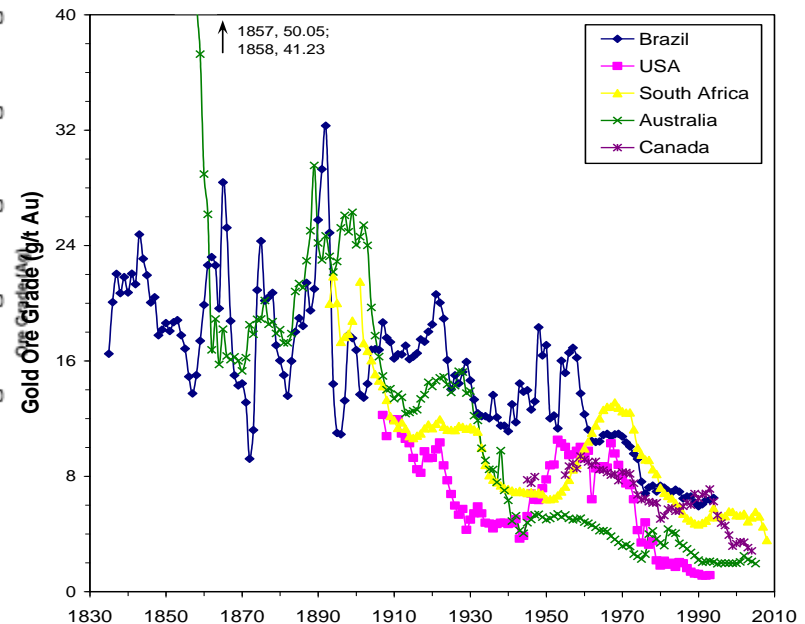
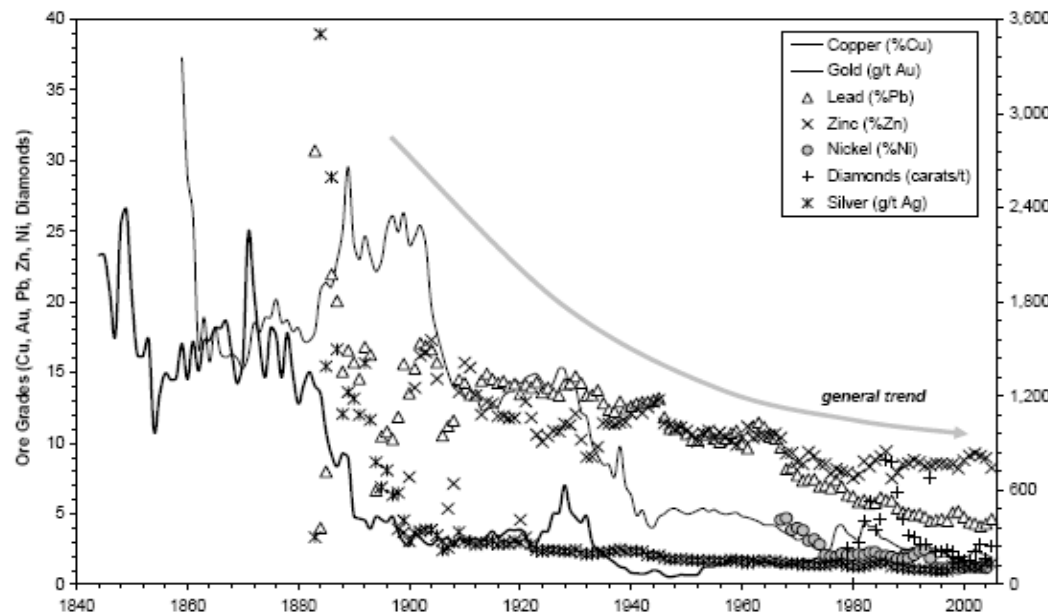
Persistence and change in net importing and net exporting countries, 1962–2010

Many countries shift from being net exporters to becoming net importers; only very few shift towards becoming net exporters



Source: Dittrich, 2012

**Globally declining ore grades in metal mining:
they increase the weight of ores traded for a
given amount of metal content
(and they increase the amount of wastes on site)**



Ore grades of Australian mines 1840-2005

Ore grades of gold mines, 1830-2010



International
Resource
Panel

(Source: Giurco et al. 2010)

Physical trade and its upstream requirements – a note on indicators

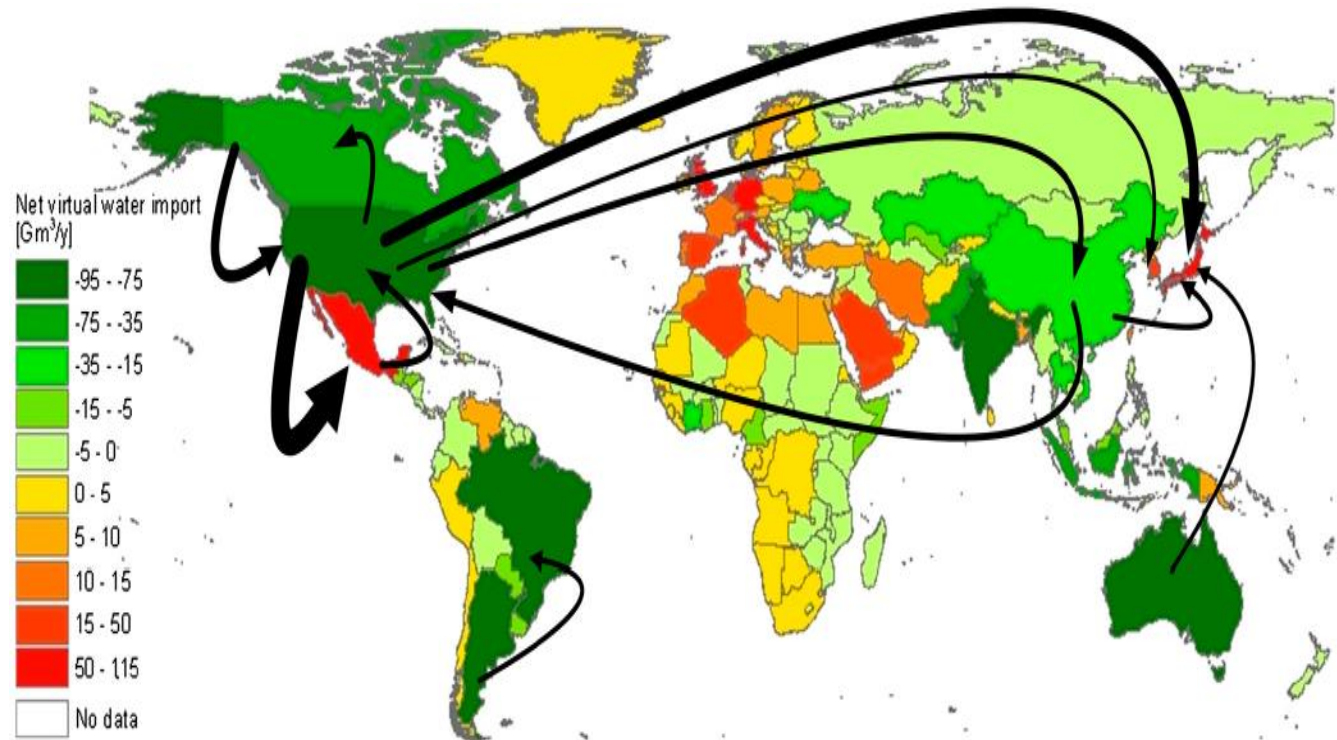
Physical trade is accounted for by the weight of the traded commodity at a country's border. Imports feed domestic consumption; unless they are re-exported, they end up within the country as wastes (and as a future resource, eventually).

Indicators: imports (I), exports (E), physical trade balance (PTB=I-E)

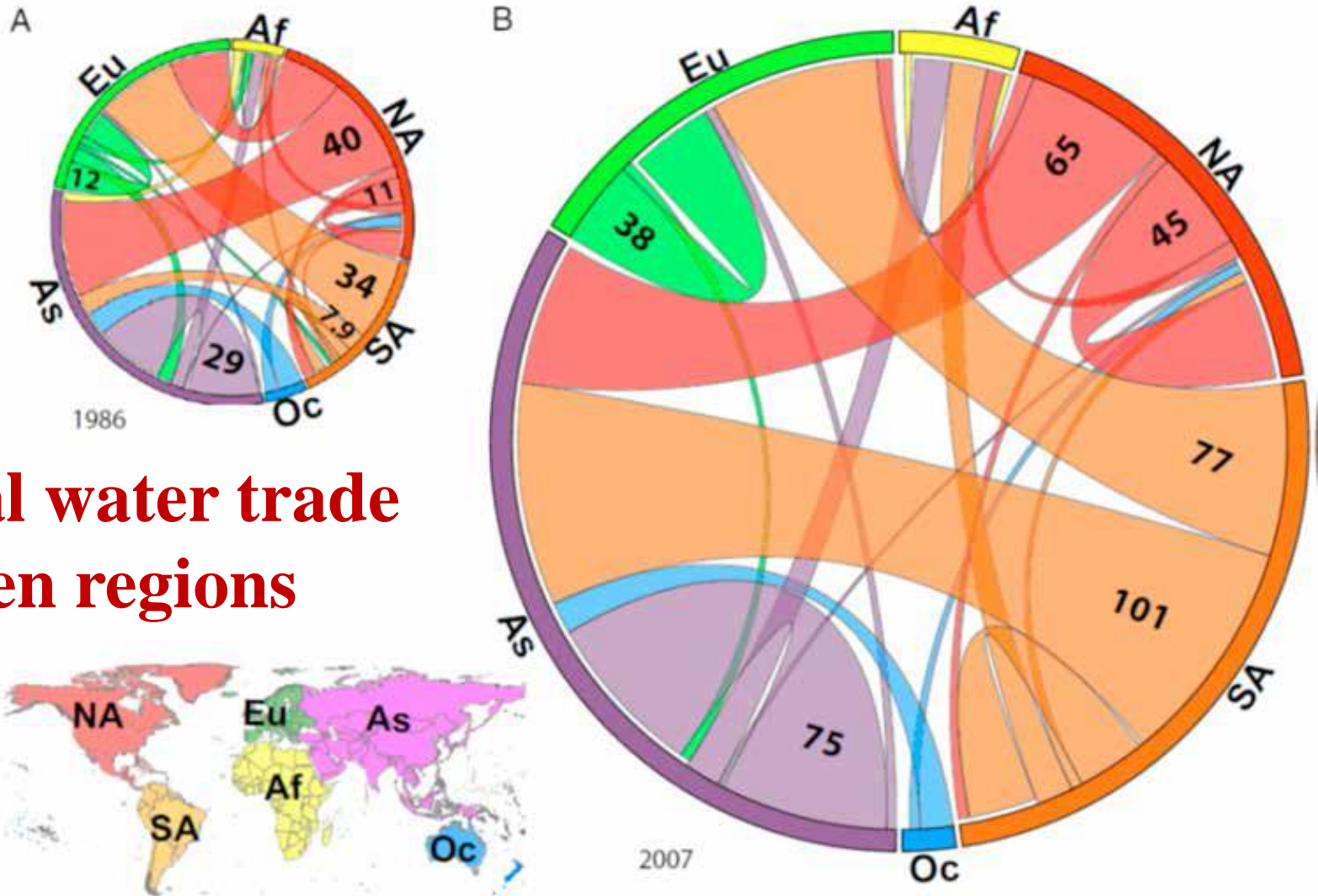
Upstream requirements of trade are the amount of resources used to produce the commodities that are then actually traded. Part of them are transformed into wastes and emissions in the countries of origin of traded commodities („environmental burden“)

Indicators: raw material equivalents of I and E, raw material trade balance (RTB), embodied water, land, labor...; Material Footprints (MF) of a country's consumption.

Virtual water balances and gross virtual water flows related to trade in agricultural and industrial products



Source: Mekonnen and Hoekstra 2011. Only the biggest gross flows ($>15 \text{ Gm}^3/\text{y}$) are shown. Reference period 1996-2005.



Virtual water trade between regions

Source: (Dalin *et al.*, 2012). Legend: Numbers indicate the volume of VWT in km³, and the colours of the links correspond to the exporting regions (colour scheme given bottom left). The circles are scaled according to the total volume of VWT. Note the large difference between total VWT in 1986 (A; 259 km³) and in 2007 (B; 567 km³)

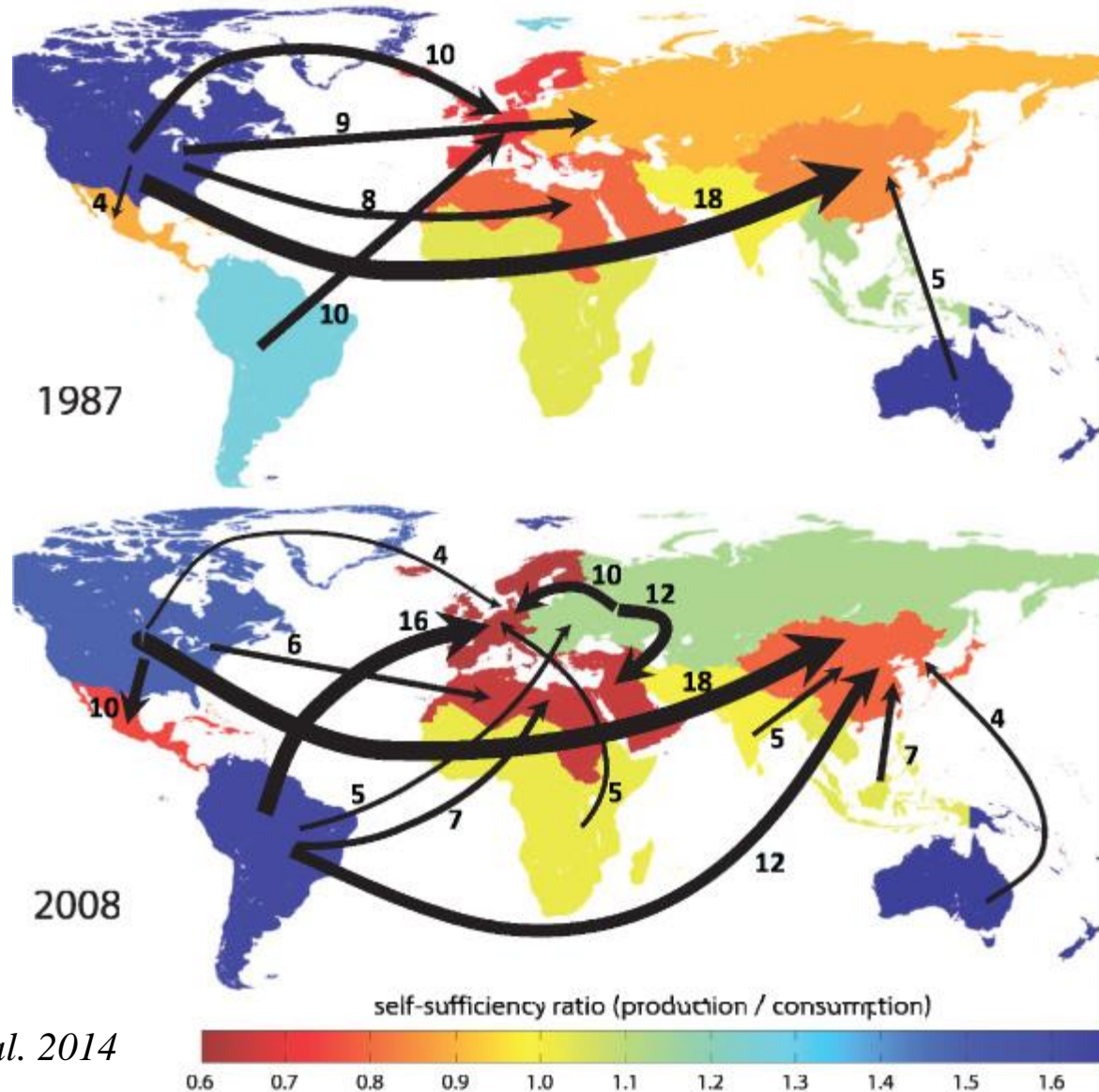
Water embodied in trade (= virtual water)

- savings through trade occur when the import of a product results in lower water use (e.g. irrigation) than would domestic production of the same product.
- The savings are the result of differences in climate, soil fertility or production technologies.
- Aggregating country-level savings amounts to global savings, which theoretically free up water for more immediate needs, such as drinking or sanitation, and may help to preserve groundwater reservoirs.
- Global aggregate savings via trade amount to several 100 km³ of savings

Croplands associated with interregional trade

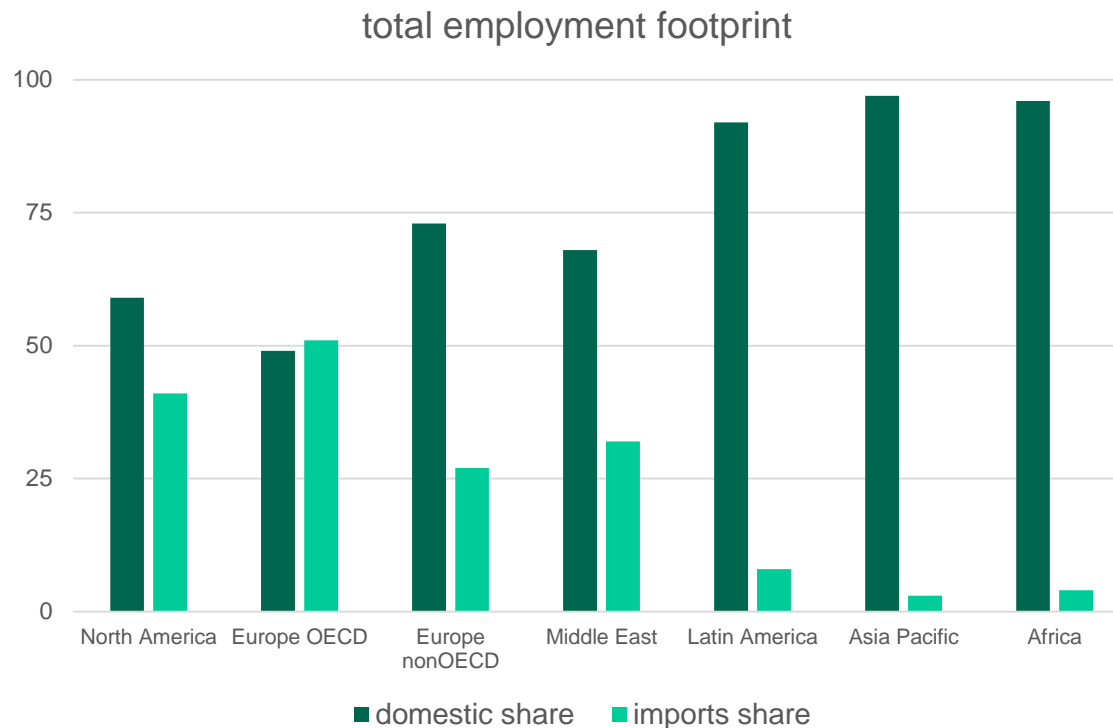
the color of the regions shows rates of self-sufficiency

Values in million hectares of cropland harvested per year; flows larger than 4 Mha are shown. The flows shown account for respectively 44% (1987) and 58% (2008) of the total area related to interregional trade.



Source: Kastner et al. 2014

Employment footprint: amount of labor required to satisfy domestic consumption



READ:

In **North America**, of all labor hours required for satisfying domestic consumption, 60% are provided domestically, and 40% are embodied in imports.

In **Asia Pacific**, of all labor hours required for domestic consumption, 95% are provided domestically and 5% are embodied in imports.

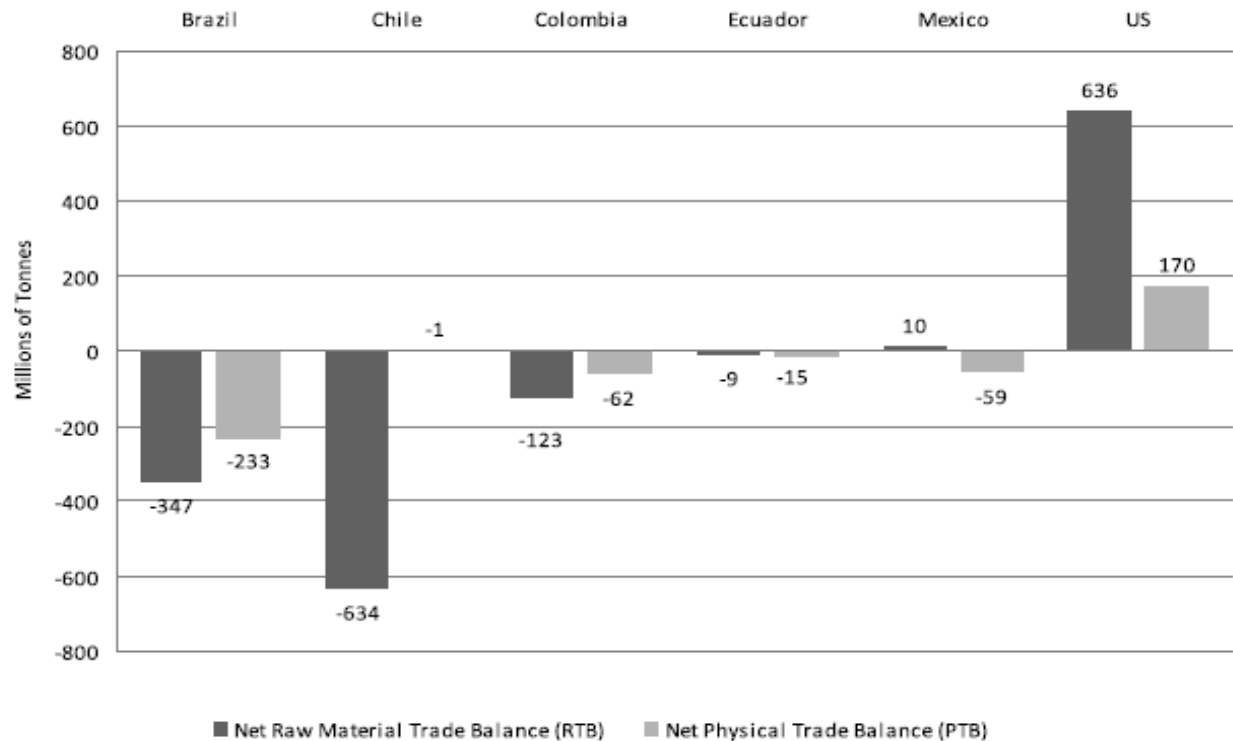
OECD Europe has the largest share of required labor embodied in imports (51%).

source: Simas et al., 2014; based on EXIOBASE model

Trade balances including upstream materials (RTB) compared to direct trade (PTB) for Latin American Countries and the US

For the US, trade balances including upstream materials (RTB) are 80% higher than PTB.

For the Latin American countries, all trade balances are negative (more exports than imports). Chile has an exceptionally large negative RTB because of its copper mining and export.



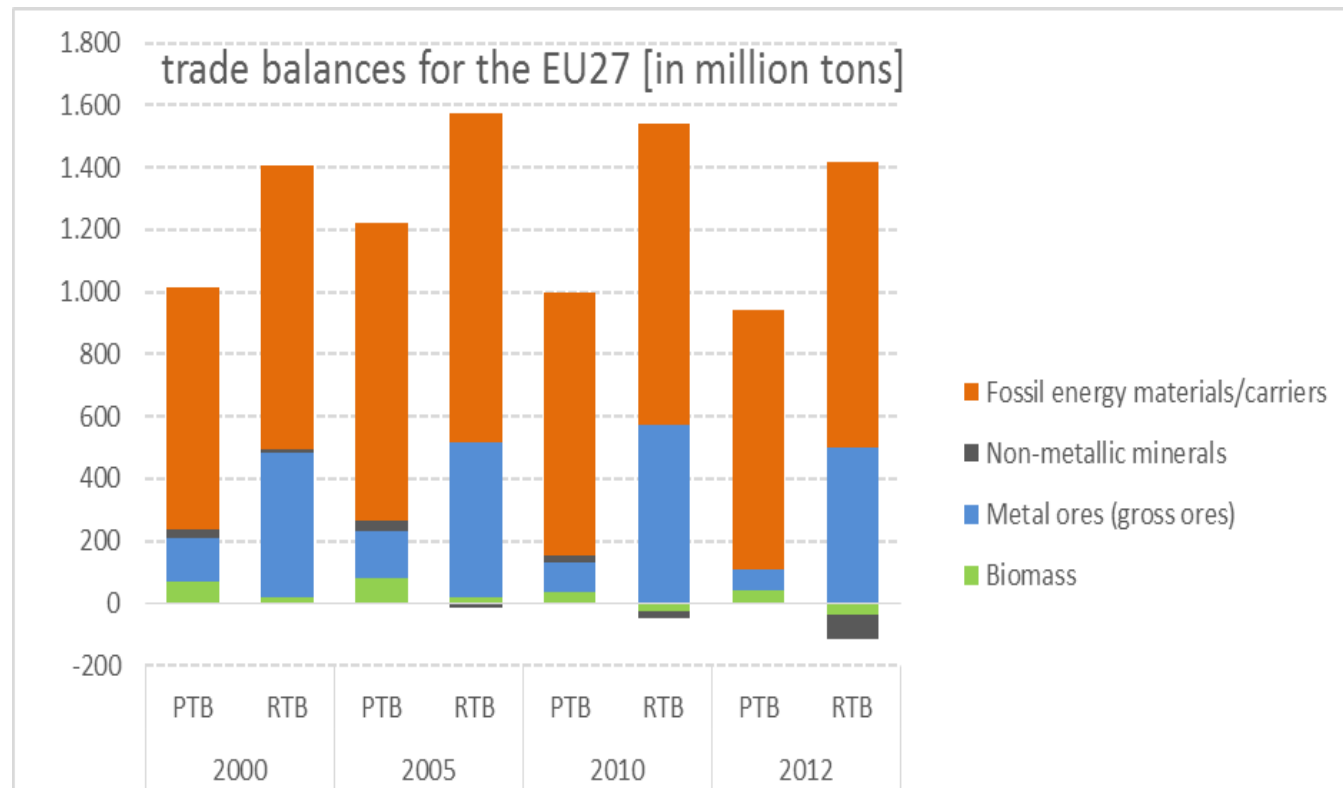
Source: Muñoz et al., 2009

Trade balances including upstream materials (RTB) compared to direct trade (PTB) for EU27

For Europe, trade balances including upstream materials are about 40% larger than (direct) physical trade balances. This is mainly due to metal imports that are associated with very large upstream flows.

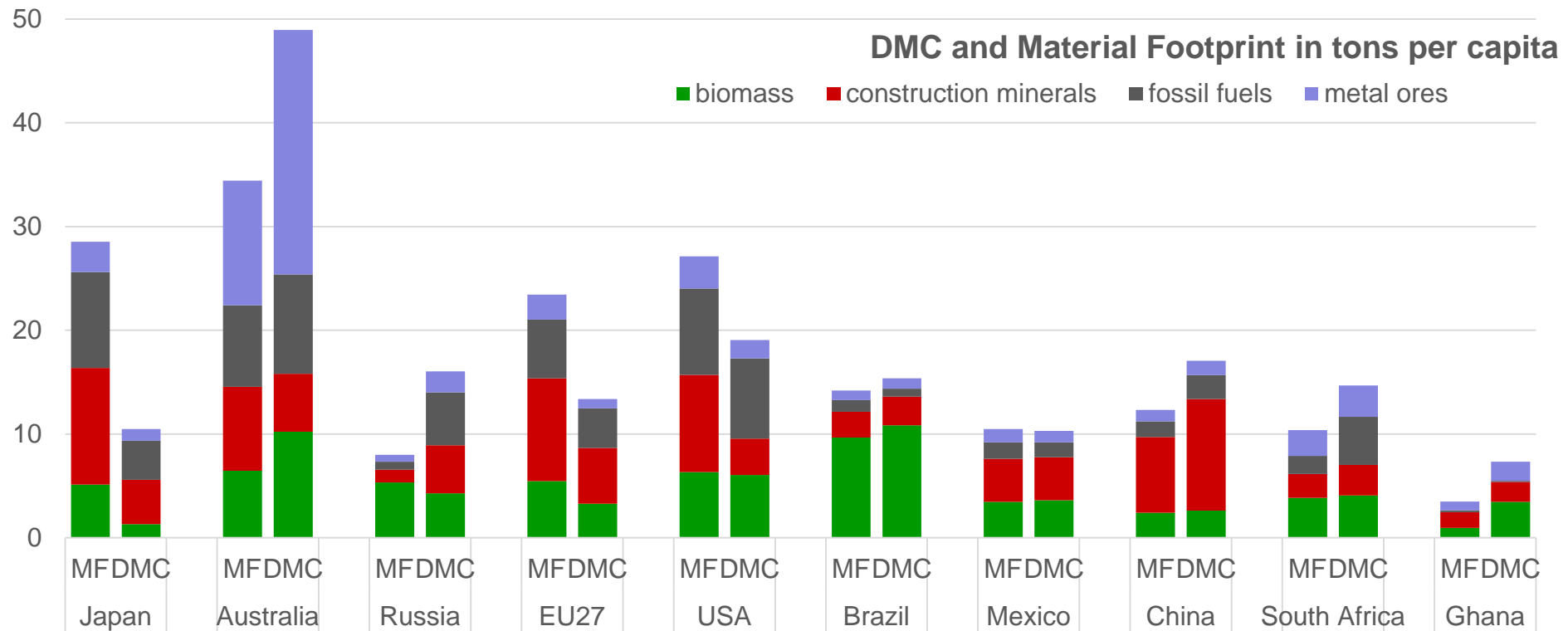
PTB direct trade balances

RTB trade balances including upstream flows



Source: Eurostat, 2014

Resource use of selected countries – with (MF) and without (DMC) upstream requirements



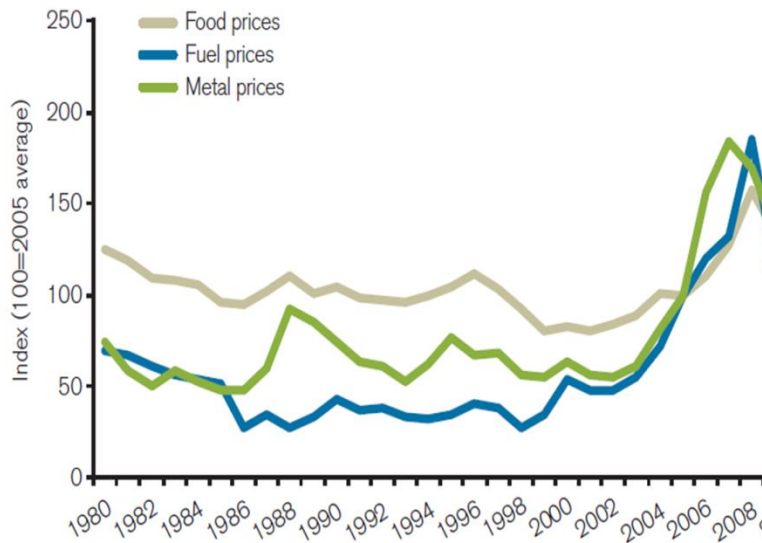
Conclusions

- International trade plays a vital role in overcoming mismatches between supply and demand for natural resources. In principle, trade allows allocation of extraction activities to regions where resources are available in high quality and where extraction activity is least resource intensive.
- As the example of virtual water shows, trade can even provide global resource savings.
- Trade serves well countries with high purchasing power to satisfy consumption, and provides an opportunity for resource-rich low income countries to develop their infrastructures and labour force – often at high environmental costs. China is an example for this.
- BUT...

BUT ...

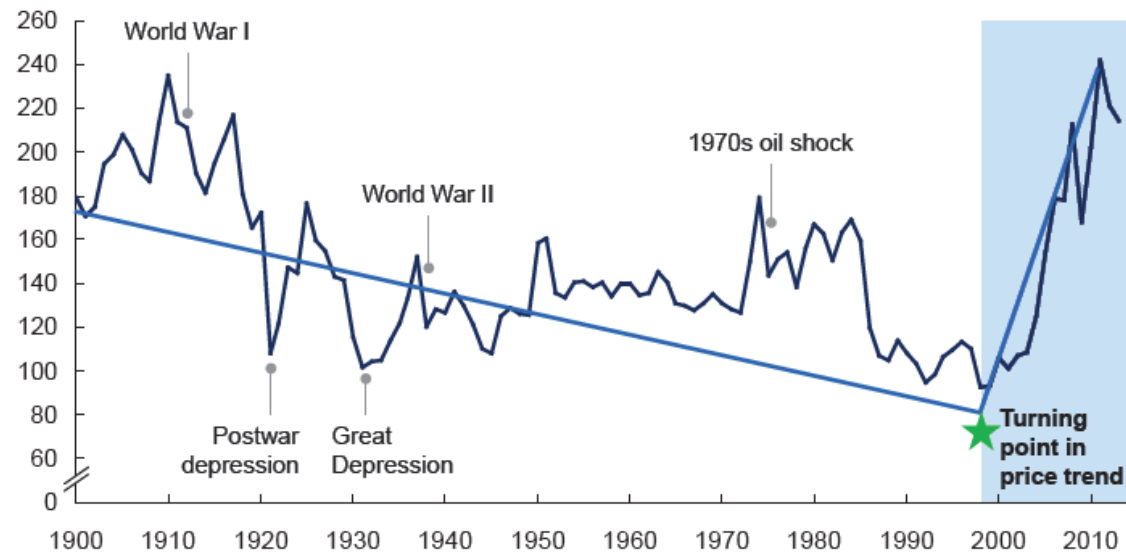
- Upstream requirements of trade are rising. This is not an indication of improved resource efficiency.
- The solutions that trade provides are not infinite: rising resource scarcity and a rising number of competitors increase pressure on the resource base and the environment and makes access increasingly difficult for poorer countries with a small or depleted resource base.
- The ongoing restructuring of the world market strengthens the position of resource-rich countries, whatever their income, and creates new conflict frontiers within and among countries (as the current occurrences among North African oil producers illustrate).

Raw material prices throughout the 20th century and beyond



Source: Chatham House based on IMF (2012).

Resource prices have increased significantly since the turn of the century
 McKinsey Commodity Price Index¹
 Real price index: 100 = years 1999–2001²



1 Based on arithmetic average of four commodity sub-indices: food, non-food agricultural raw materials, metals, and energy.

2 Data for 2013 are calculated based on average of the first three months of 2013.

SOURCE: Grilli and Yang; Pfaffenzer; World Bank; International Monetary Fund; Organisation for Economic Co-operation and Development statistics; Food and Agriculture Organization of the United Nations; UN Comtrade; McKinsey Global Institute analysis

A more sustainable global resource regime...

- would require a drastic reduction of fossil fuel use and their substitution by non-material energy sources like solar and wind energy, in line with global climate protection.
- It appears inevitable that the world economy, and high income countries in particular, turn towards a more circular economy, away from short-lived, wasteful products towards recycling and re-using the many resources they have accumulated in their stocks and waste deposits.
- Trading and using ever more virgin resources is no viable solution.




Discussant: Dale Andrew

*Independent Consultant and
Former Head of Environment Division,
Trade and Agriculture Directorate, OECD*

The background of the slide features a photograph of several wind turbines. The turbines are dark in color, and their blades are visible against a pale, hazy sky. In the distance, there are rolling hills or mountains, also shrouded in a light mist or haze. The overall tone of the image is soft and atmospheric.

Discussant: Michel Gressot

Senior Economist, Global Footprint Network




What is the role for standards in increasing resource efficiency across supply chains?

How can a clear measurement of resource efficiency be established?

Q&A *Themes*

How do we address price distorting subsidies in export markets?

How do we mobilize international correction of externalities?



Thank you for attending this webinar on “Can International Trade Increase Resource Efficiency?”

- This webinar was recorded and will be uploaded to the GGKP website: www.greengrowthknowledge.org
- If you have any further questions about the webinar please email: contact@ggkp.org
- The GGKP asks you to complete a survey which will be sent out after this webinar.