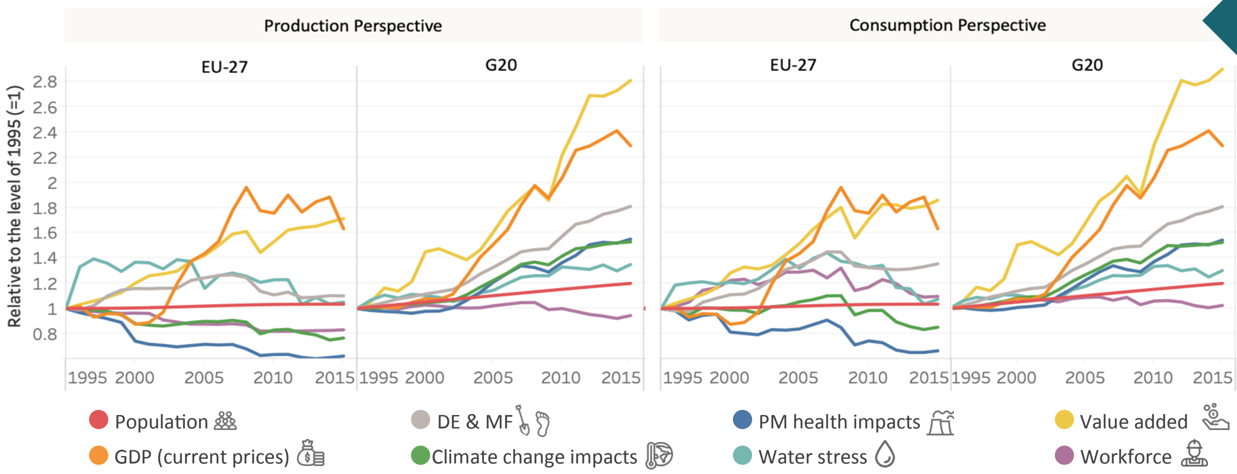
NATURAL RESOURCE USE IN THE GROUP OF 20

Status, Trends, and Solutions | European Union (EU-27)

STATUS AND TRENDS OF NATURAL RESOURCE USE

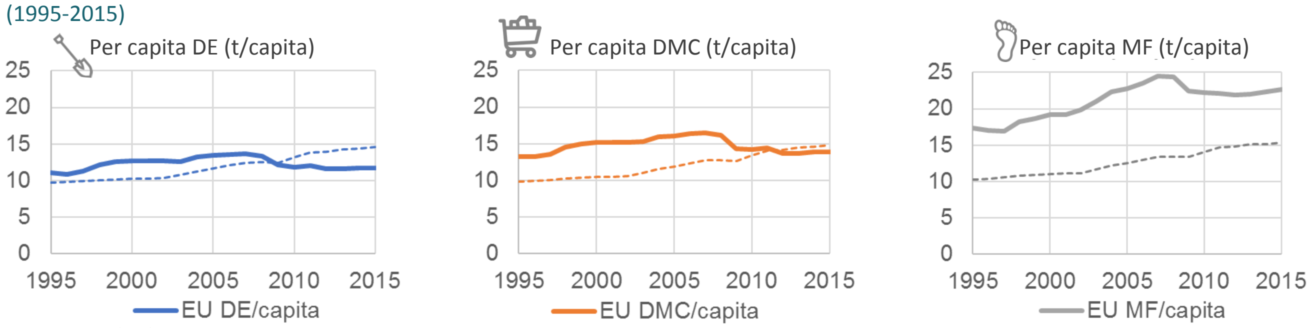
Figure 1: Socio-economic indicators, domestic extraction, material footprint, and material-related environmental impacts in the European Union and in the G20 (1995-2015)*

See glossary on page 2



*Data after 2011 was nowcasted.
Source: IRP database, Exiobase v3.4 and Cabernard et al. 2019

Figure 2: Domestic extraction, domestic material consumption, and material footprint per capita in the European Union and in the G20 (1995-2015)



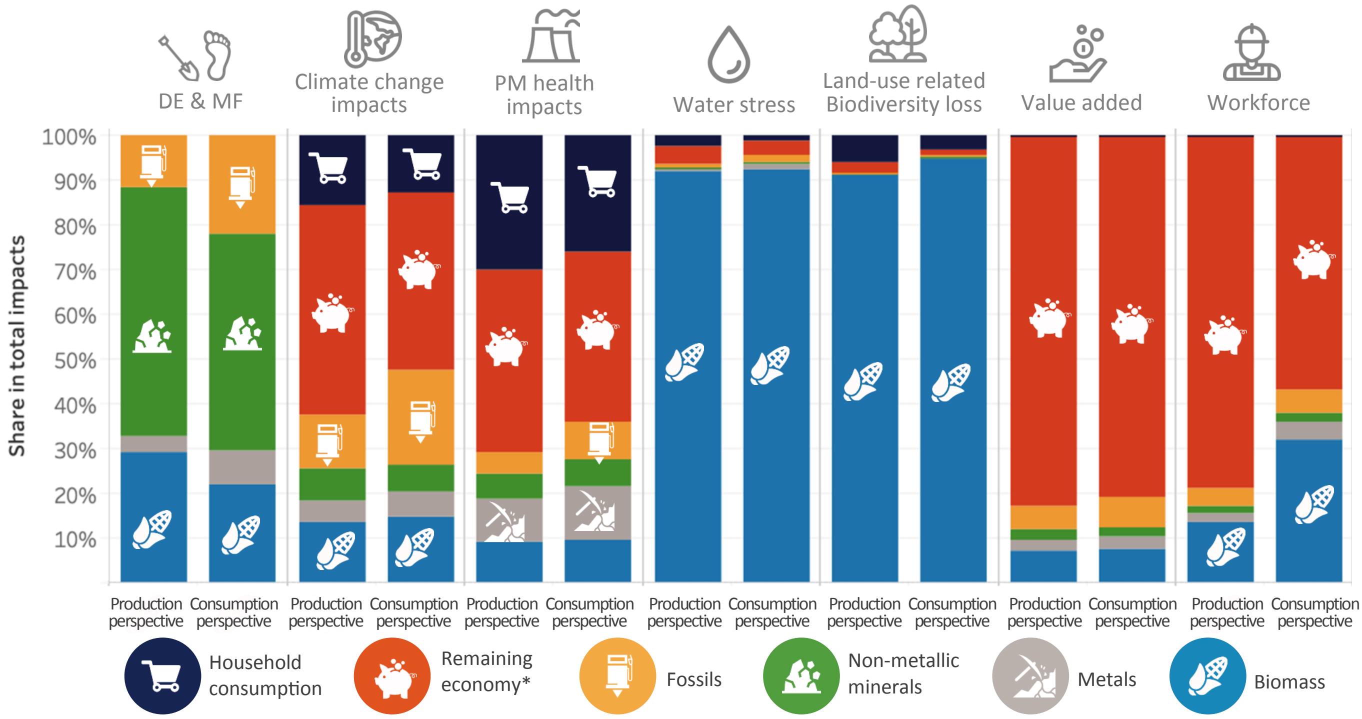
Source: IRP database

From 1995 to 2015

- Population increased only slightly (**5%**), while GDP **doubled** until the start of the financial crisis in 2007 (Figure 1). Afterwards, GDP declined slightly with some fluctuations.
- The EU's per capita DE and DMC remained constant and fell below G20 average (Figure 2). In contrast, per capita MF increased (**+30%**) and remained **50%** above the G20 average. This increase is attributed to doubling of the net material imports (Figure 7).
- Despite the increasing material footprint, material-related climate change and particulate matter (PM) health impacts decreased in both perspectives (Figure 1). This decrease is stronger in the production than in the consumption perspective. This points to strong environmental policy and technology improvements, particularly for domestically produced materials.
- Despite decreasing climate change impacts, material-related per capita climate change footprints remained above the G20 average in the consumption perspective (**+25%** in 2015, Figure 4).
- Per capita water stress footprints increased until 2007 (**+40%**), then decreased back to the 1995 level, however continue to remain above the G20 average in the consumption perspective (**+20%** in 2015, Figure 5).
- Technology improvements and increased material imports have decreased the fraction of the EU's population working in the material sector (**-20%**, Figure 1). The value added created in the EU's material sector increased by **70%**.

Contribution of Natural Resources by Category

Figure 3: Contribution of resource types to domestic extraction, material footprint, and total environmental and socio-economic impacts in the European Union (2015)



*Remaining economy refers to activities other than resource extraction and processing (e.g. manufacturing of finished products, construction).
Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

Non-metallic minerals such as sand and gravel dominated the domestic extraction amounts and material footprint (>50%), but were responsible for a minor share of environmental impacts (<7% for all impact categories, Figure 3).

The extraction and processing of resources contributed to almost 40% of domestic climate change impacts and almost half of climate change impacts from a consumption perspective. This was lower than the G20 average in the production perspective, but similar in the consumption perspective (the G20 average was approximately 50% for both perspectives).

75% of material-related climate change impacts were caused by biomass and fossils in the consumption perspective.

Outdoor particulate matter (PM) related health impacts were mainly caused by the remaining economy (>40%) and households (>20%) in both perspectives.

In line with the G20 average, water stress and land use-related biodiversity impacts were caused mainly by biomass production in both perspectives.

The material sector contributed a minor share to value added as well as domestic jobs (both less than 20%), but relied on low-income workforce in the agriculture outside the EU for food imports.

For all indicators, the share related to material extraction and processing was higher from a consumption than from a production perspective, pointing to the reliance on material imports.

Glossary

- **Consumption perspective:** The consumption perspective allocates the use of natural resources or the related impacts throughout the supply chain to the region where these resources, incorporated in various commodities, are finally consumed by industries, governments and households. It equals the domestic impacts plus impacts of imports minus impacts of exports.
- **Decoupling:** Decoupling is when resource use or some environmental pressure either grows at a slower rate than the economic activity that is causing it (relative decoupling) or declines while the economic activity continues to grow (absolute decoupling)
- **Domestic extraction (DE):** Direct, gross physical extraction of materials within a country's territory (production perspective)
- **Domestic material consumption (DMC):** Amount of materials directly used by an economy (DMC = DE + Material Imports – Material Exports)
- **Material resources:**
  - metals,
  - non-metallic minerals,
  - biomass,
  - fossils
- **Material footprint (MF):** A nation's MF fully accounts for material extraction in other countries used for local consumption in the nation of interest (consumption perspective)
- **Material intensity (MI):** Indicates efficiency of material use (MI = DMC / GDP)
- **Material-related impacts:** Environmental impacts and socio-economic benefits (value added, workforce) related to the extraction and processing of material resources (including the upstream supply chain, such as electricity generation and transport)
- **Net traded materials/impacts:** Difference between material-related impacts from a production and consumption perspective. In the case of environmental impacts, a positive value means that the material-related impacts from exports are greater than the impacts from imports (and vice-versa: environmental impacts with negative values mean that the material-related impacts from imports are greater than the impacts from exports)
- **Production perspective:** The production perspective allocates the use of natural resources or the impacts related to natural resource extraction and processing to the location where they physically occur

Key Sectors and Resources

Figure 4: Climate change impacts from material sectors in the European Union (1995-2015)*

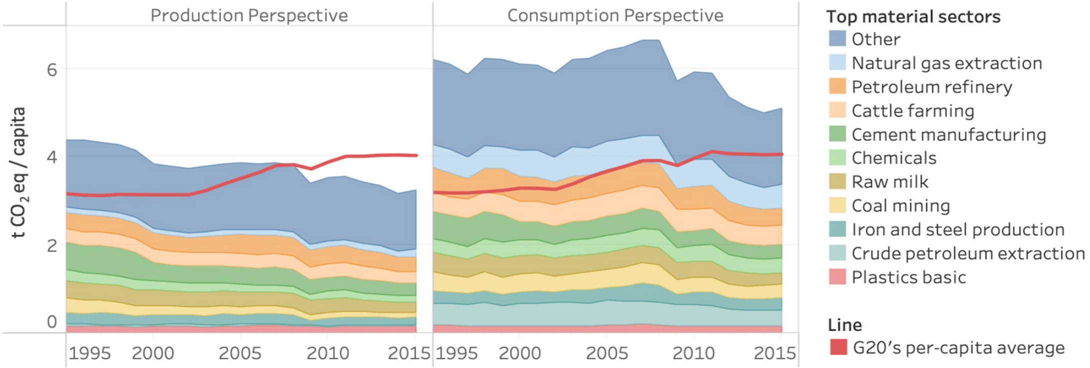


Figure 5: Water stress from agricultural crop and material sectors in the European Union (1995-2015)*

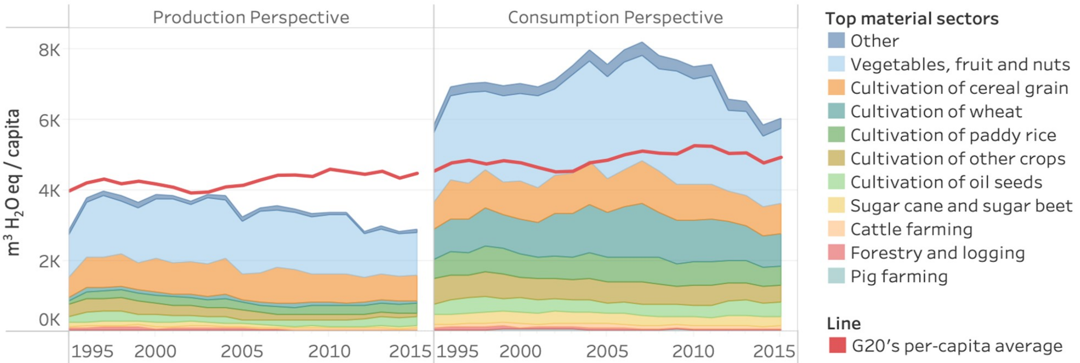
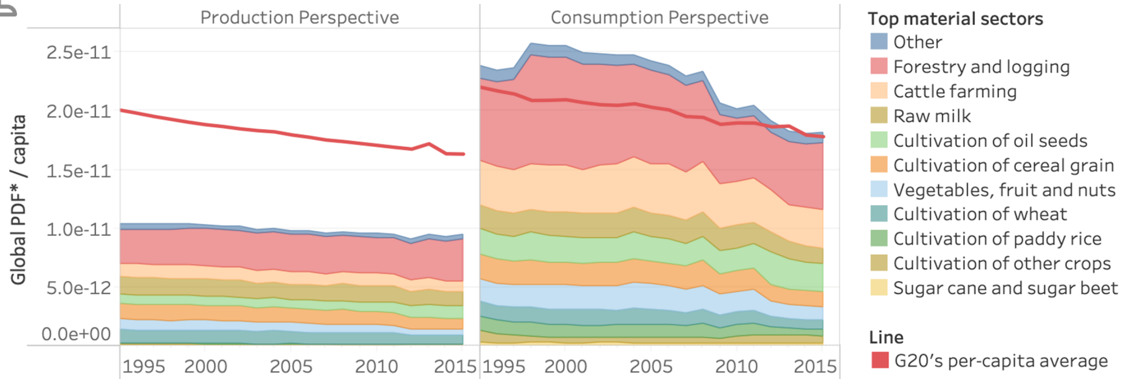


Figure 6: Land-use related biodiversity loss from agricultural crops and material sectors in the European Union (1995-2015)*



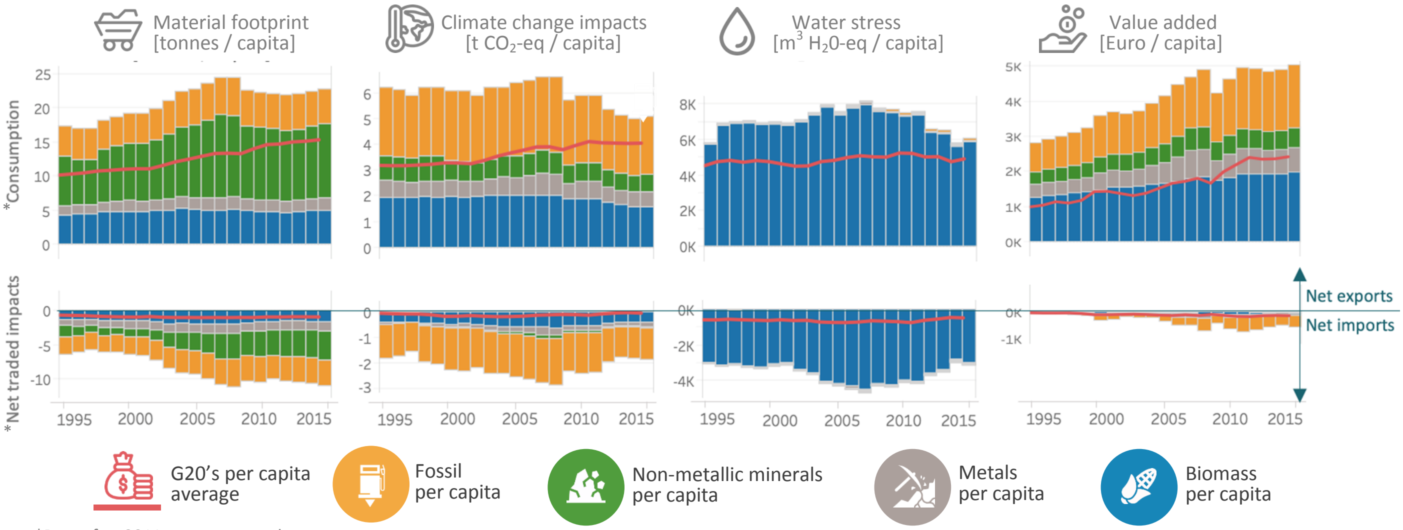
*PDF: Potentially disappeared fraction of species

*Data after 2011 was nowcasted (Figure 4, 5, and 6).
Source: IRP database, Exiobase v3.4, Cabernard et al. 2019 (Figure 4, 5, and 6).

- Half of material-related climate change impacts were caused by petroleum, cement, cattle, natural gas and coal (in both perspectives, Figure 4).
- Material-related climate change impacts were 60% higher in the consumption than in the production perspective in 2015 (Figure 4). This was mainly attributed to the import of petroleum, natural gas, coal, and chemicals.
- The majority of biomass and fossils were directly consumed by households as food, for heating and private transport. Households were responsible for 60% of material-related climate change impacts (Year 2015, data not shown here).
- Minerals mainly ended up in the construction sector, electrics and electronics and the automobile industry. These end-sectors were responsible for 25% of material-related climate change impacts (14% construction, 7% electrics and electronics, 5% automobile industry; Year 2015, data not shown here).
- From a consumption perspective, a third of the water stress impacts were caused by the cultivation of vegetables, fruits and nuts and another 50% by the cultivation of cereals, wheat, paddy rice, oil seeds, sugar cane and other crops (Figure 5).
- Land-use related biodiversity loss was 50% lower than the G20 average in the production perspective, but comparable to the G20 average in the consumption perspective (Figure 6).
- Forestry logging, cattle and raw milk production were responsible for half of land-use related biodiversity loss (Figure 6).
- Water stress and land-use related biodiversity losses were more than twice as high in the consumption than in the production perspective (Figure 5 and 6). This was mainly attributed to imports of vegetables, fruits, nuts, and wheat for water stress and to imports of wood products, cattle meat and oil seeds for land-use related biodiversity loss.
- The consumption of animal products was responsible for 24% of material-related climate change impacts, 15% of water stress, and 40% of land-use related biodiversity loss (Year 2015, data not shown here). For water stress and land-use related biodiversity loss, 65% of these impacts were caused outside the EU due to imports of animal products and fodder crops.

The environmental effects of trade

Figure 7: Per-capita consumption footprints (above) and net traded impacts (below) in the European Union (1995-2015)*



*Data after 2011 was nowcasted.
Consumption: Impacts throughout the supply chain from goods imported and consumed in the European Union.
Net traded impacts: Difference between material-related impacts from a production and consumption perspective.
Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

The EU was a net importer of all material types. Accordingly, more environmental impacts were caused outside the EU for material imports than within its borders for material exports.

Half of EU's material footprint came from imported materials (mainly minerals and fossils).

The reliance on trade was highest for fossils. More than 70% of consumed fossils were extracted abroad. Consequently, the majority of climate change impacts related to the extraction and processing of these fossils were caused outside the EU.

Although 65% of consumed biomass was cultivated domestically, the majority of water stress and land-use related biodiversity loss impacts were caused abroad. This was mainly attributed to food and wood imports from regions with significant water scarcity and high ecological value.

Despite the high fraction of environmental impacts caused abroad, the majority (>90%) of the value added related to material production was generated within the EU.

Future trends and potential Decoupling

Per capita impacts remained above or equal the G20 average in the consumption perspective. Depending on the impact category, between 40 and 70% of impacts occur outside the EU. Therefore, responsible sourcing along the entire supply chain (with a special focus on fossils for climate change and agricultural products for water stress and land-use related biodiversity loss), as well as resource efficiency and circular economy strategies are critical to lower these impacts.

A shift from fossil electricity and heat supply to renewable energy production (wind, water, solar, etc) would lower the high climate change impacts from fossil extraction and processing.

Material efficient construction and urban design (e.g. substitution of high-impact materials like cement) can decrease EU's material footprint and related impacts. This includes also resource efficient building restoration (e.g. for better insulation and fuel saving for heating) and offering good public transport systems in and between cities to lower mobility impacts.

A shift to a sustainable consumer behavior is essential to lower per capita impacts. This includes ecological housing (e.g. appropriate per capita living space), a shift from private fossils-based cars to shared electric vehicles and public transport, reduced consumption of animal products (particularly cattle products) and minimization of food waste.

This factsheet from the International Resource Panel, was prepared in cooperation with the Ministry of Environment of Japan and the Institute for Global Environmental Strategies, as a contribution to the G20 Resource Efficiency Dialogue 2019 in Japan. The document is based on research completed by the IRP for the report "Global Resources Outlook 2019: Natural Resources for the Future We Want." The data analysis and text for the G20 was prepared by Livia Cabernard, Stephan Pfister Stefanie Hellweg (ETH Zurich), and Maria Jose Baptista (UNEP) with inputs from Victor Valido (UNEP), Yingying Lu and Heinz Schandl (CSIRO). The layout and infographics were designed by Yi-Ann Chen with support from Qinhan Zhu on figure layout. Icons used are from Freepik.

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