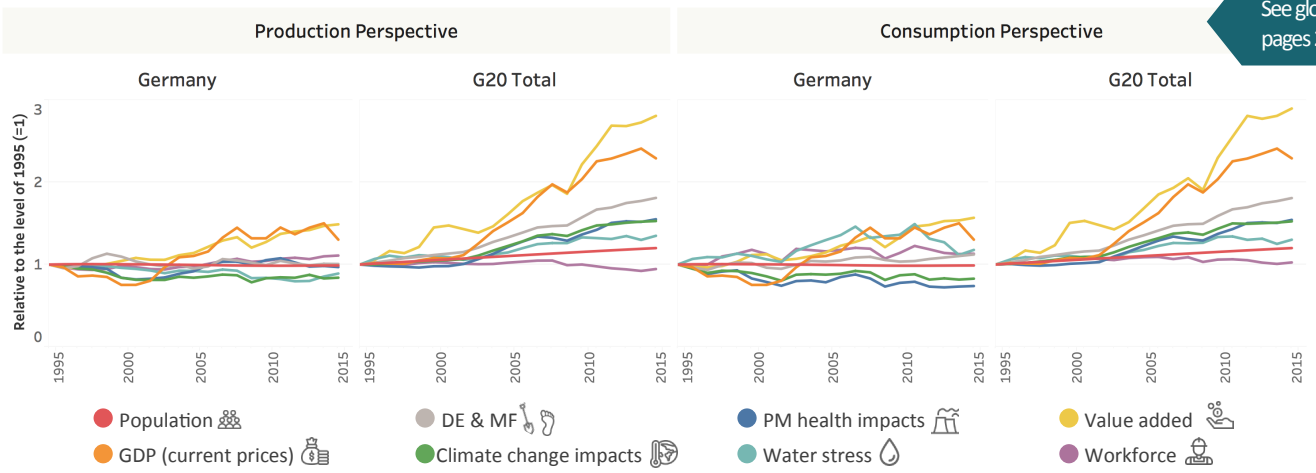
Natural Resource Use in the Group of 20

Status, Trends, and Solutions | Germany

Status and Trends of Natural Resource Use

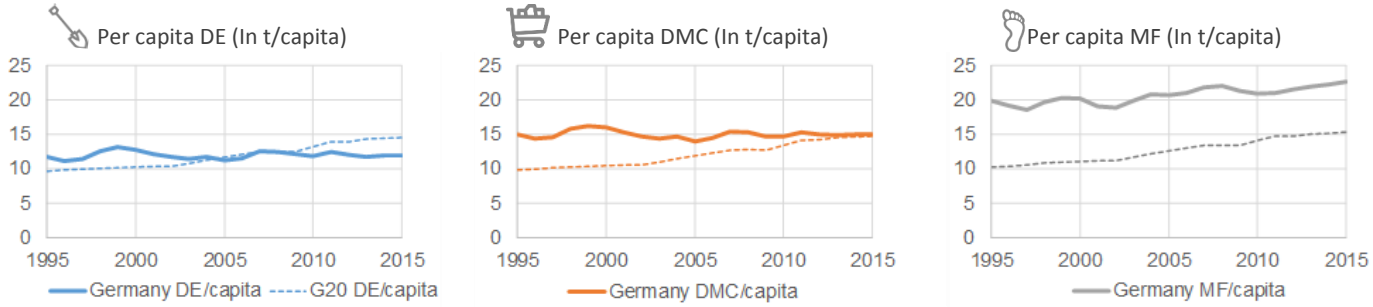
Figure 1: Socio-economic indicators, domestic extraction, material footprint, and material-related environmental impacts in Germany and in the G20 (1995-2015)*

See glossary on pages 2 and 3



*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 Germany and in the G20 (1995-2015)



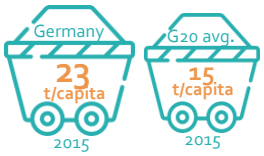
Source: IRP database

From 1995 to 2015

-1%

While population remained stable, the economy underwent a recession in the beginning of this period and recovered afterwards.

Material footprint increased to 23 tonnes/capita (G20 average was at 15 tonnes/capita in 2015). This increase occurred in the supply chain of imported products, while domestic extraction of materials remained constant.

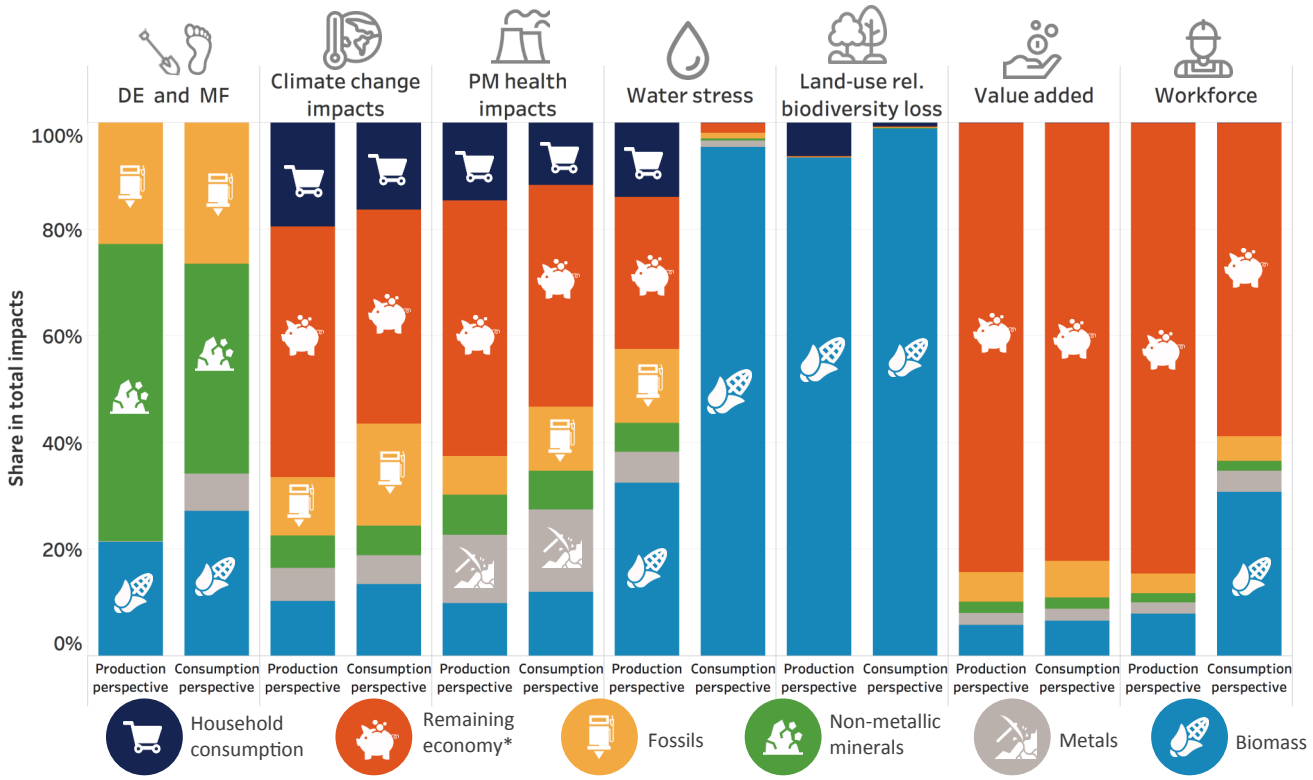


Climate change impacts related to material extraction and processing slightly decreased, but the absolute level of material-related climate change impacts remained high (>50% higher than G20 average from a consumption perspective).

Environmental impacts other than climate change showed a varying pattern between the production and consumption perspectives. Particulate matter health impacts decreased from a consumption perspective. Water stress from food imports increased, while domestic water stress was marginal.

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 Germany (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 like sand and gravel dominated the domestic extraction amounts, but contributed less to the material footprint and only caused a minor share of environmental impacts.

The extraction and processing of natural resources accounted for about 40% of Germany's total climate change impacts (the G20 average was approximately 50%).

Water stress and land use-related biodiversity loss were of minor relevance within the country. Supply chain environmental effects through imported food products were significant and comparable (for land use effects) or even above (for water stress) to the G20 average.

In line with other G20 countries, Germany's water stress and land use-related biodiversity impacts were caused mainly by biomass production (consumption perspective).

Outdoor particulate matter (PM) related health impacts mainly came from the remaining economy (e.g. electricity from coal power and transport).

Less than 20% of economic value added was created through resource extraction and processing both in the production and consumption perspective.

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 agriculture outside of Germany for food imports.

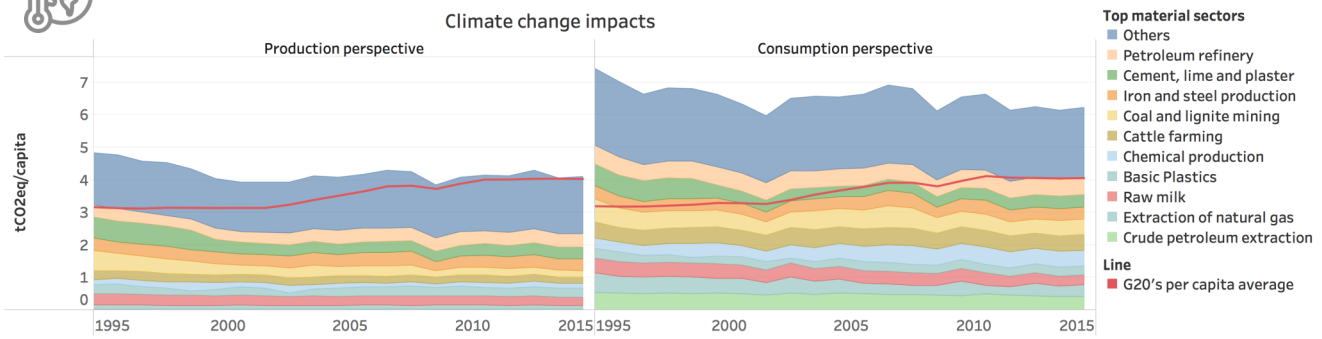
In general, for all indicators the share related to material extraction and processing was higher from a consumption perspective than from a production perspective.

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
- **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

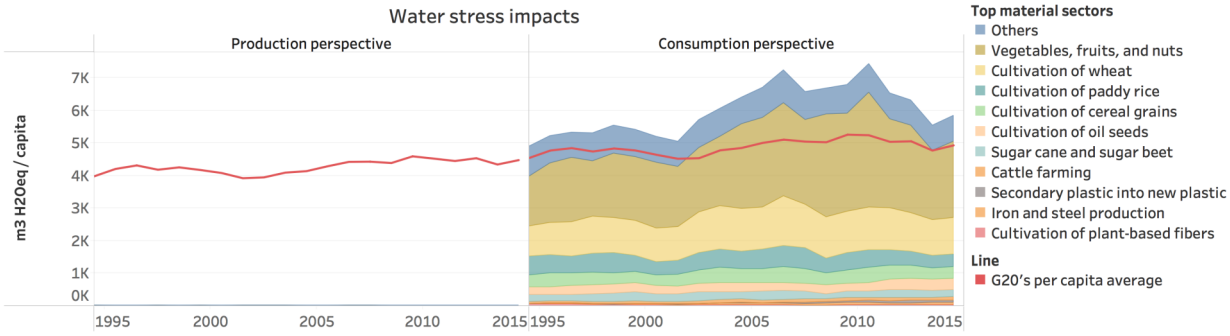
Key Sectors and Resources

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



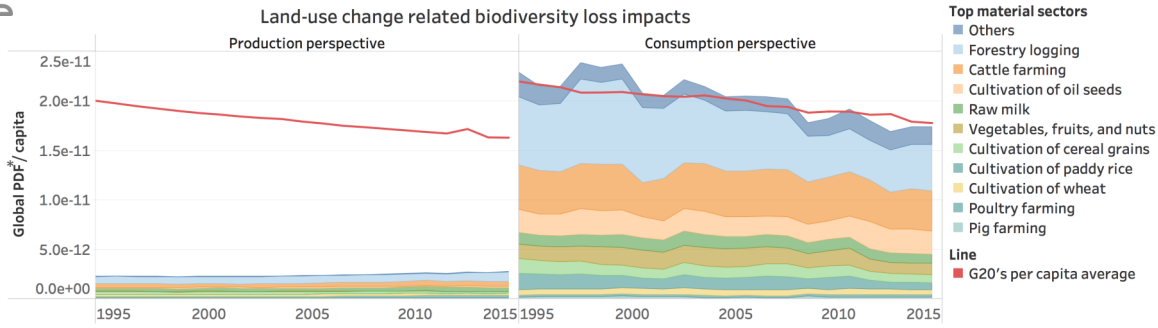
*Data after 2011 was nowcasted.
Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

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



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

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



*Data after 2011 was nowcasted.
**PDF:* Potentially disappeared fraction of species
Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

- Most of the material-related climate change impacts are caused by the production of iron and steel, cement manufacturing, petroleum refining, chemical and plastics production, cattle farming and extraction of coal, natural gas, and oil.
- From a production perspective, climate change impacts in Germany were comparable to the G20 average. From a consumption perspective, they were more than 50% higher than the G20 average. This is due to imports with large embodied greenhouse gas emissions for domestic consumption.
- The majority of biomass and fossils are directly consumed by Germany's households for food and heating.
- Minerals play a key role for Germany's automobile industry, electrics and electronics, and construction (data not shown).
- From a production perspective, water stress remains low due to low irrigation requirements and enough renewable water sources to cover demand.
- From a consumption perspective, water stress is larger than the G20 average due to increasing food imports. Water stress caused abroad is dominated by agricultural activities, such as the production of vegetables, fruits, nuts and wheat.
- Land use-related biodiversity loss in Germany is much lower than the G20 average, but comparable to the G20 average from a consumption perspective. Forestry and cattle farming are main causes of this loss through imports of wood and meat from regions with high ecological value.

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)

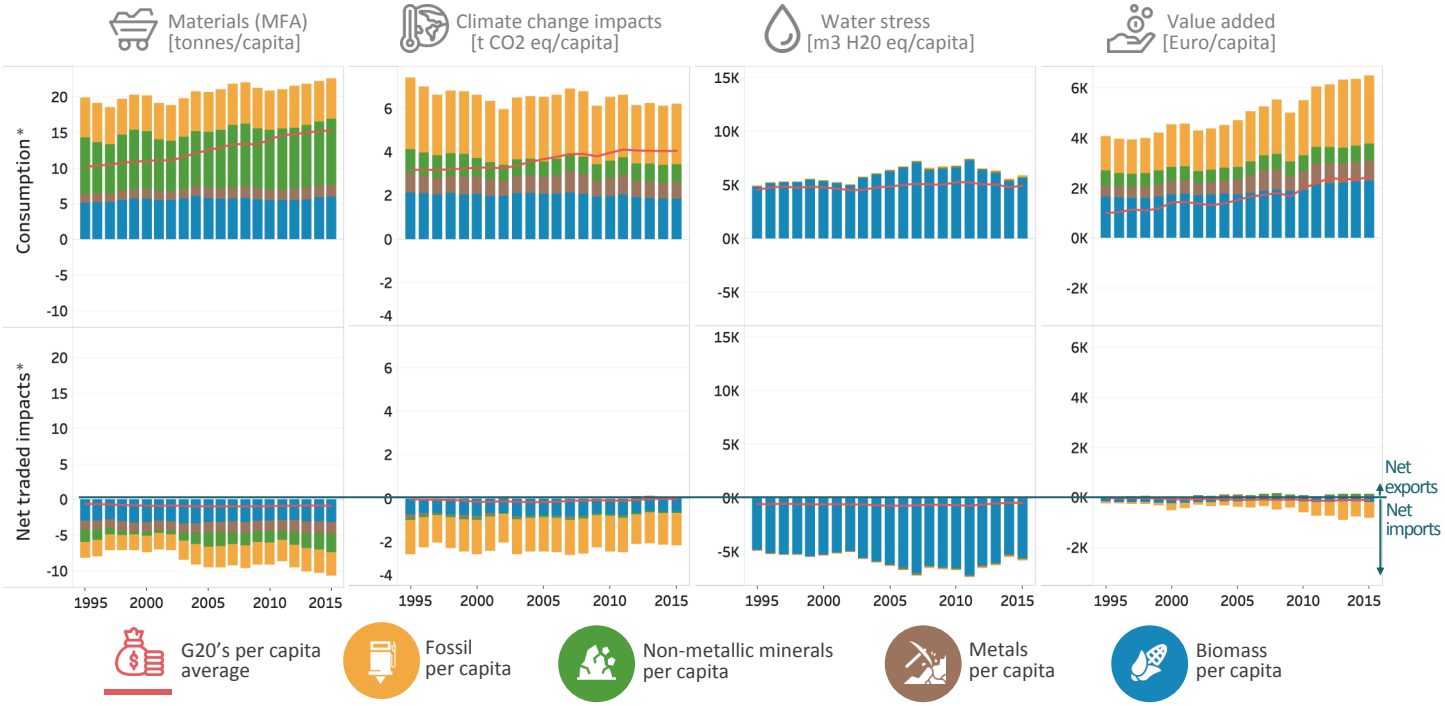
Material-related impacts: Impacts related to the extraction and processing of material resources (including the upstream supply chain, such as electricity generation and transport)

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

The environmental effects of trade

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



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

Germany is a net importer of all material types. Accordingly, more environmental impacts are caused outside Germany for material imports than within its borders for material exports.

Value added for metals and non-metallic minerals was higher within Germany than outside. This indicates that rather cheap raw materials are imported, while more expensive products are exported.

Future trends and potential Decoupling

Scenarios developed by the IRP forecast an increase of GDP for Germany of 65% to 80% and a slight decrease of population of 1% to 6% until 2060.

If ambitious resource efficiency policies are introduced, Germany could see an absolute decoupling of domestic material extraction and domestic material consumption until 2060.

Material-related climate change impacts have slightly decreased in the past two decades. However, material footprint and climate change impacts per capita remain high compared to the G20 average. Resource efficiency strategies along the entire supply chain (including responsible sourcing of biomass imports) could help decrease these impacts.

While Germany has a high share of renewables in their energy mix, the economy still relies heavily on fossils as an energy source. Increasing renewable energies and a soon exit from lignite and coal could help lower the material-related climate change impacts.

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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