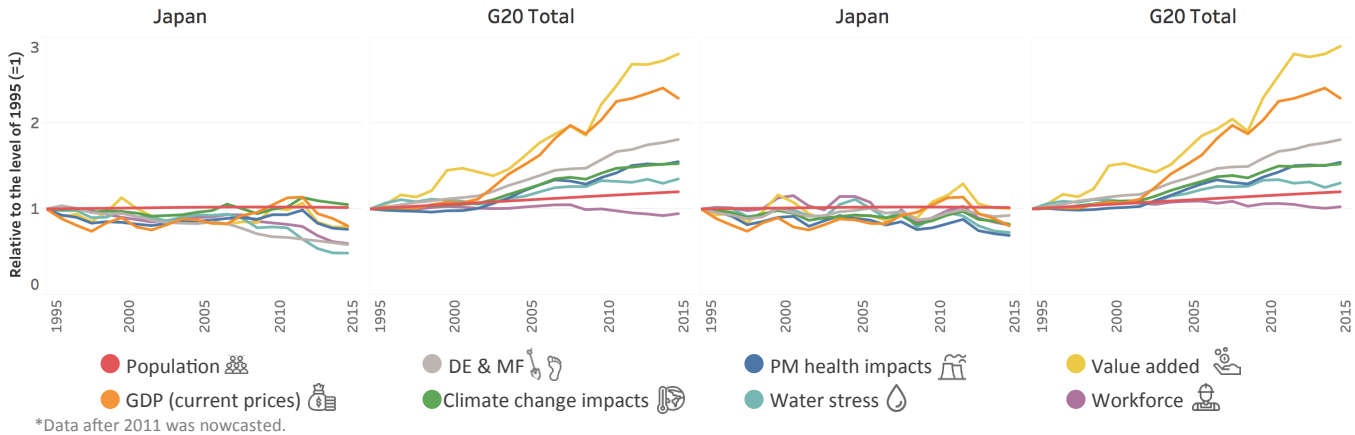
NATURAL RESOURCE USE IN THE GROUP OF 20

Status, Trends, and Solutions | Japan

STATUS AND TRENDS OF NATURAL RESOURCE USE

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

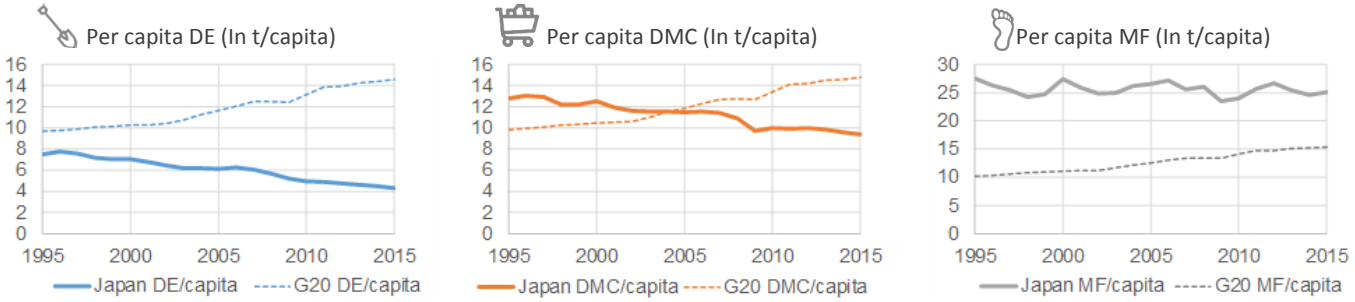
See glossary on pages 2 and 3



*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 Japan and in the G20 (1995-2015)



Source: IRP database

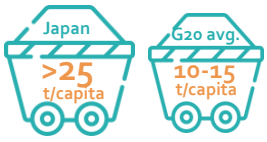
From 1995 to 2015

+2%

While the population only increased slightly, there were two economic recessions and a short recovery period.

Domestic extraction declined by **40%**

Material footprint remained stable and is higher than the G20 average.



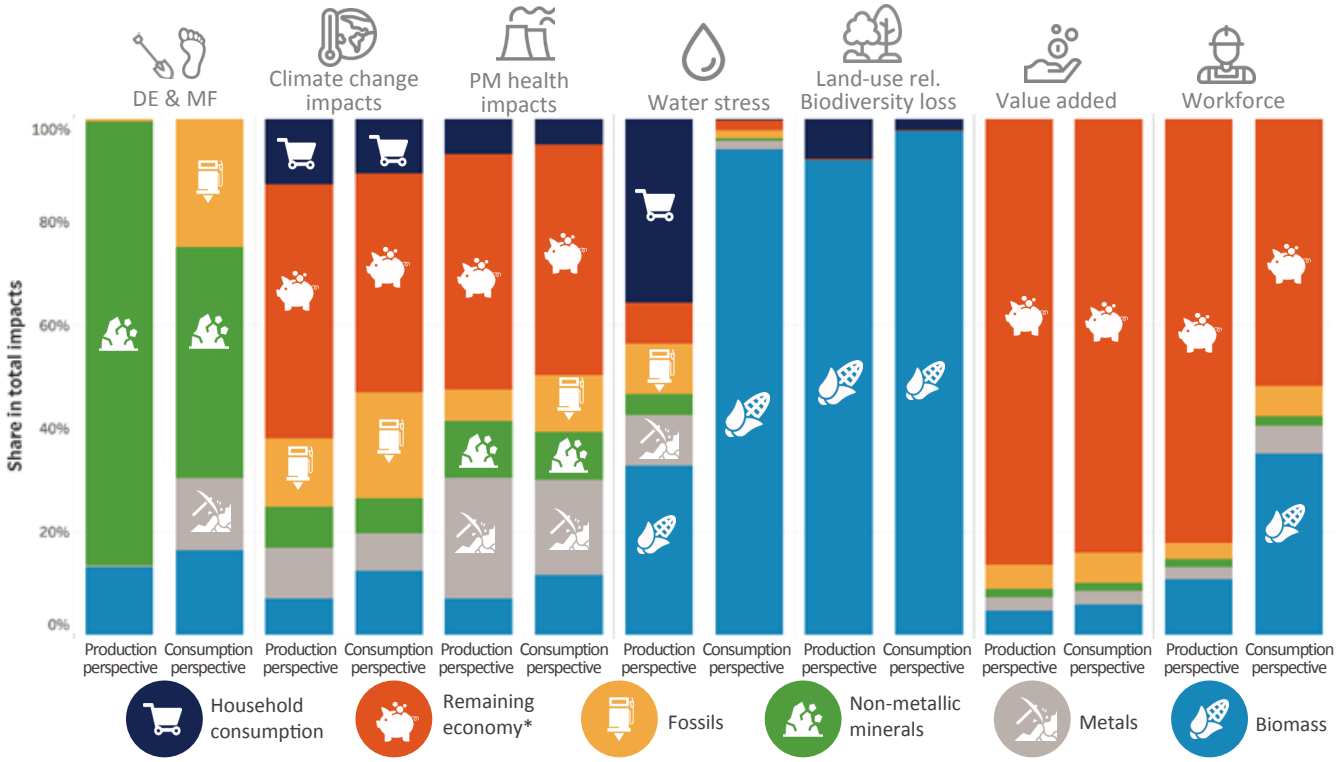
Material-related environmental footprints decreased slightly. There is slight decoupling of particular matter health impacts and water stress from economic growth (different from G20 average trends).

Domestic climate change impacts remained stable.

Per-capita impacts on climate change are **50%** higher than G20 average.

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 Japan (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 material footprint and only caused a minor share of environmental impacts.

Japan sourced almost all fossil and metal resources from other countries.

The extraction and processing of natural resources accounted for about 50% of Japan's total climate change impacts and more than 90% of Japan's impacts on biodiversity loss and water stress (from a consumption perspective), both of which correspond closely to the G20 average.

From a production perspective, the extraction and processing of natural resources accounted for about 40% of total climate change impacts in Japan.

In line with other G20 countries, Japan's water stress and land use-related biodiversity footprints were caused mainly by biomass production (consumption perspective). However, biomass resources contributed to only 33% of the domestic water stress in Japan (production perspective), compared to the G20 average of more than 90%.

Outdoor PM related health impacts were more heavily influenced by the metal processing industries and less by households compared to the G20 average. This reflects Japan's high economic development, as households do not rely on solid fuels for cooking and heating.

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 Japan for food imports.

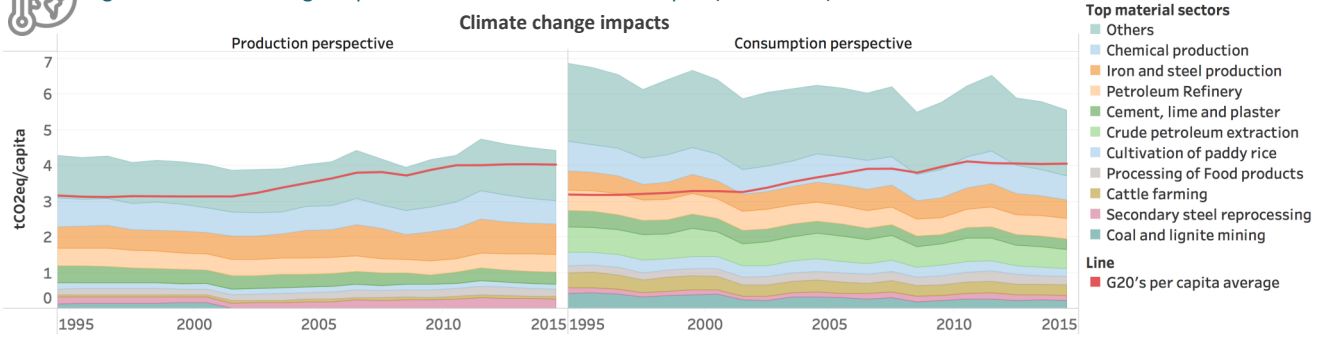
In general, for all indicators the share related to material extraction and processing was higher in the consumption perspective than in the production perspective.

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

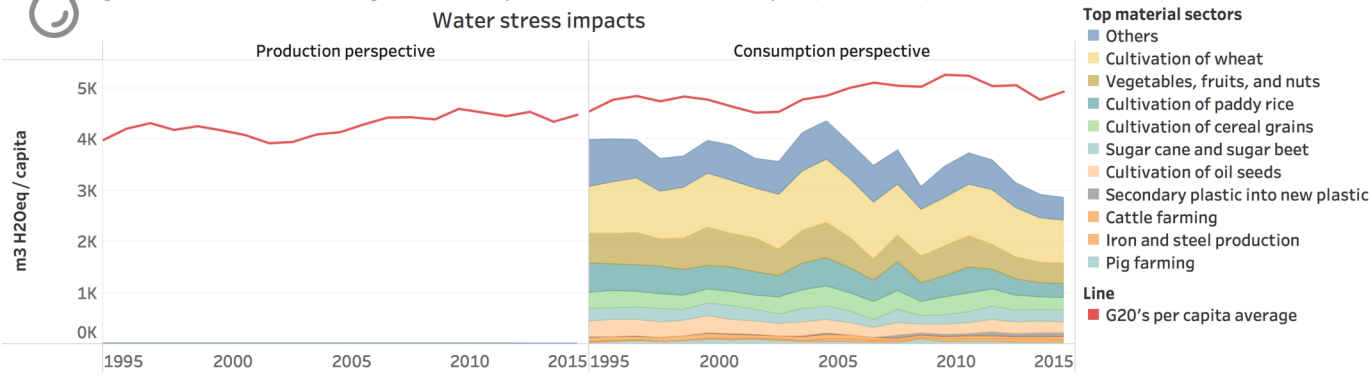
Figure 4: Climate change impacts from material sectors in Japan (1995-2015)*



*Data after 2011 was nowcasted.

Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

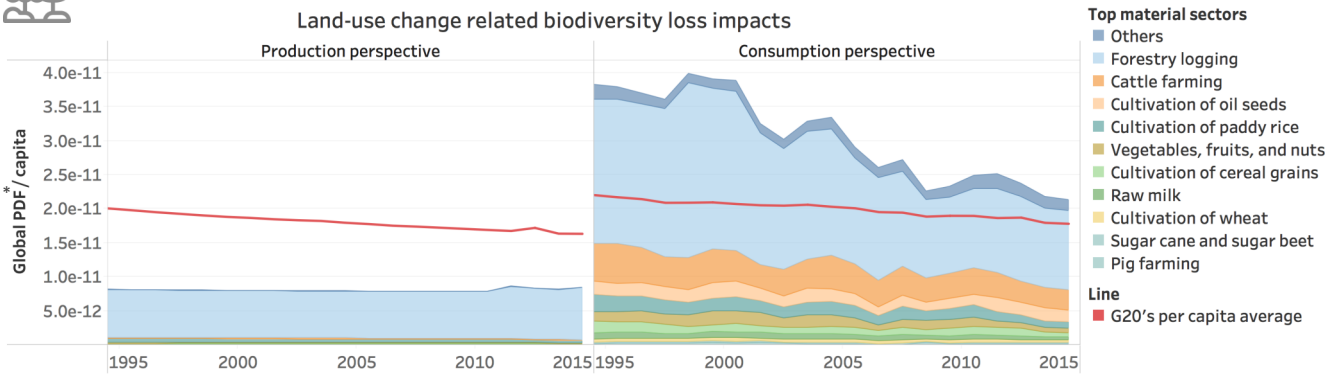
Figure 5: Water stress from agricultural crop and material sectors in Japan (1995-2015)*



*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 Japan (1995-2015)*



*Data after 2011 was nowcasted.

**PDF:* Potentially disappeared fraction of species

Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

- From both the production and consumption perspectives, most of the material-related climate change impacts are caused by the production of steel, chemicals, cement manufacturing and petroleum refining.
- From a consumption perspective, crude oil extraction is also a key sector.
- There is almost no water stress within the Japanese territory from a production perspective. This is due to the low irrigation requirements and abundance of renewable water sources to cover demand.
- Land-use related biodiversity loss in Japan is much lower than the average levels in the G20.
- Both water stress and land-use related biodiversity loss in Japan are much higher in the consumption perspective than in the production perspective. For water stress, it is still below G20 average.
- Imports of wood are the main source of land-use related biodiversity loss, followed by beef cattle.
- Imports of wheat and other crops from water-scarce regions are the main sources of water stress.

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)

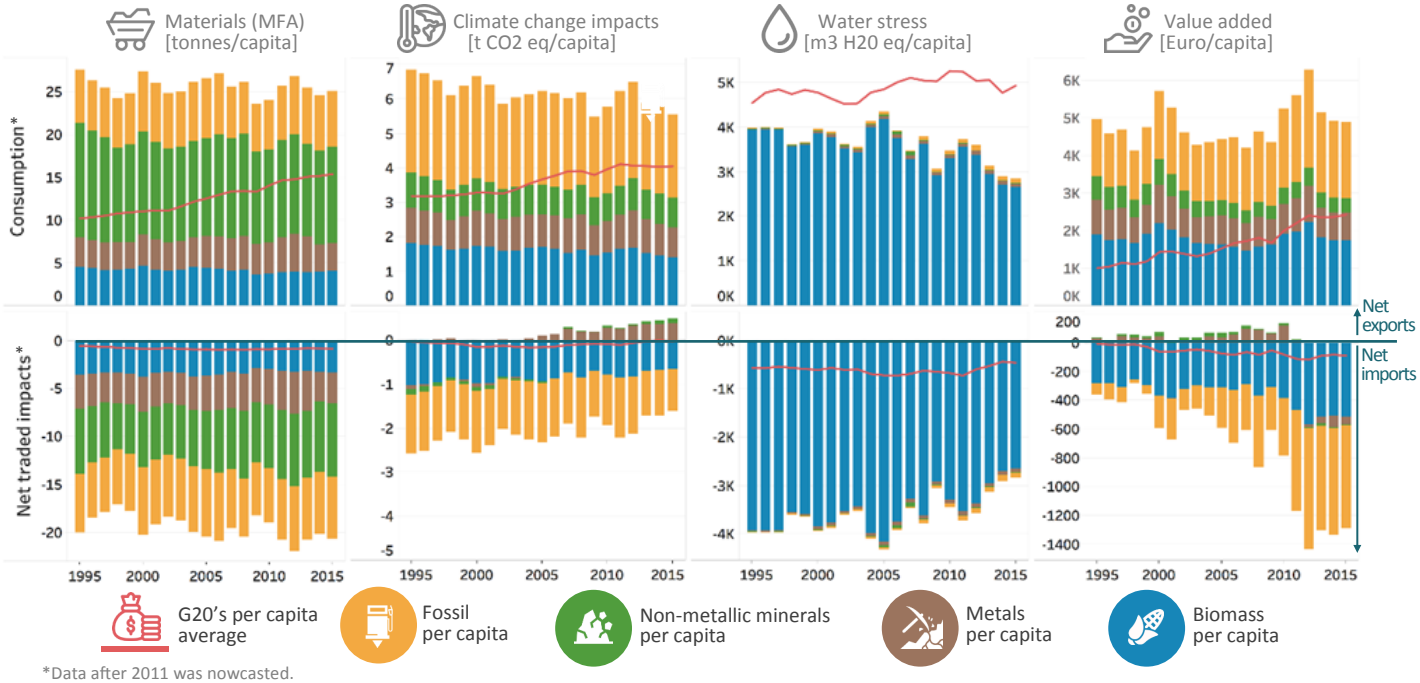
Material-related impacts: Impacts related to the extraction and processing of material resources (including the upstream supply chain, such as electricity generation and transport)

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 Japan (1995-2015)*



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

Japan is a net importer of fossils, non-metallic minerals, metals and biomass. As a consequence, a considerable fraction of the environmental impacts related to Japan's material consumption are outsourced to other countries.

Except for climate change impacts of metals, levels of both material trade and related environmental impacts have been stable since 1995.

Climate change impacts of metals have changed since 2005. Although Japan is a net-importer of metal resources by amount, metal processing with high greenhouse gas emissions takes place within Japan (e.g. steel production for export), leading to increasing domestic net emissions.

In general, material-related impacts of climate change per capita in Japan are about 50% higher than the G20 average.

A significant fraction of Japan's material-related value added is generated abroad due to the import of food and fossils (mainly petroleum).

Future trends and potential Decoupling

Material-related environmental footprints in Japan have slightly declined since 1995. However, material footprint and climate change impacts are high compared to the G20 average.

Material intensity in Japan slightly improved in the past two decades. Circular economy solutions and resource efficiency strategies throughout the supply chain (including in the design phase) in key sectors like iron and steel production could help lower material demand and related environmental impacts.

The economy currently relies heavily on imported fossils as an energy source. Increasing the mix of renewable energy sources could help lower Japan's 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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