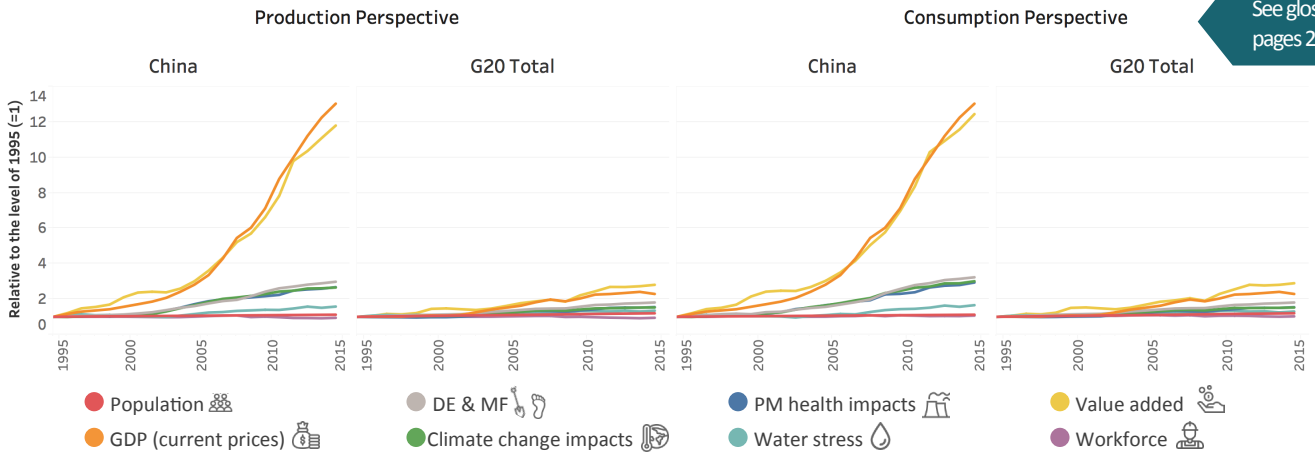
NATURAL RESOURCE USE IN THE GROUP OF 20

Status, Trends, and Solutions | China

STATUS AND TRENDS OF NATURAL RESOURCE USE

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

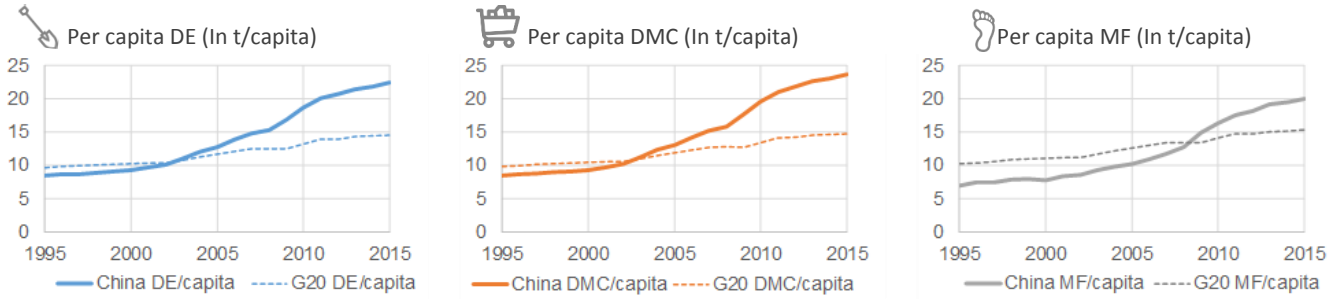
See glossary on pages 2 and 3



*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 China and in the G20 (1995-2015)



Source: IRP database

From 1995 to 2015

GDP multiplied **thirteenfold**, while population increased only slightly.

In 2015, more than 1/3 of global resource extraction and 45% of total resource extraction in the G20 took place in China .

Material footprint, climate change and particulate matter (PM) health impacts related to resource extraction and processing **tripled** and are now higher than G20 average.

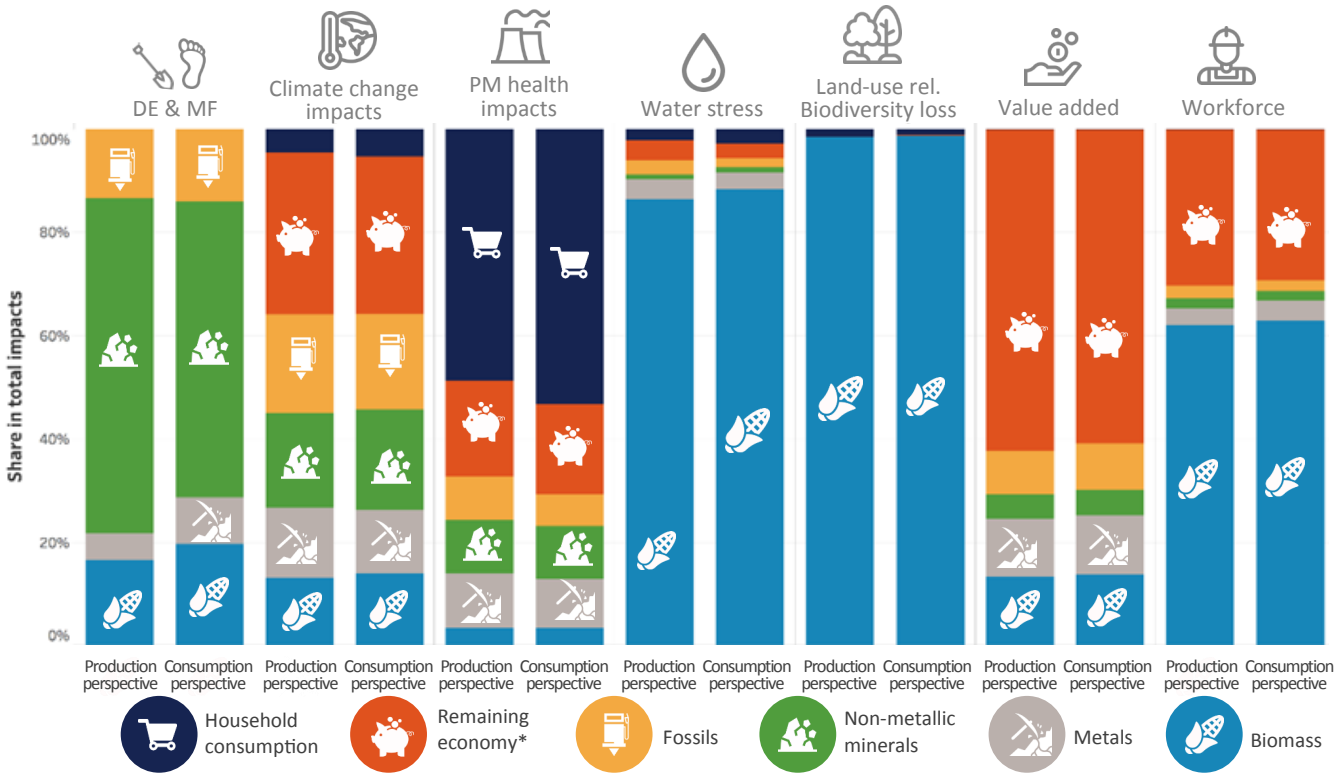
Water stress grew by **50%**

China experienced a **strong relative decoupling** of both material use and impacts from national GDP.

Material intensity and environmental impact intensity (Impacts/GDP) significantly improved.

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 China (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 domestic extraction and material footprint (higher than the G20 average), but played a comparably minor role for environmental impacts.

Resource extraction and especially material processing contributed to approximately 65% of total climate change impacts in China. This was due mostly to large build-up of infrastructure as an emerging economy.

In line with other G20 countries, water and land use-related biodiversity impacts were caused mainly by biomass production.

Outdoor PM related health impacts came mainly from household activities (e.g. heating and cooking) and industrial resource use (e.g. coal electricity).

More than one third of economic value added was created through resource extraction and processing in China. This is larger than the G20 average.

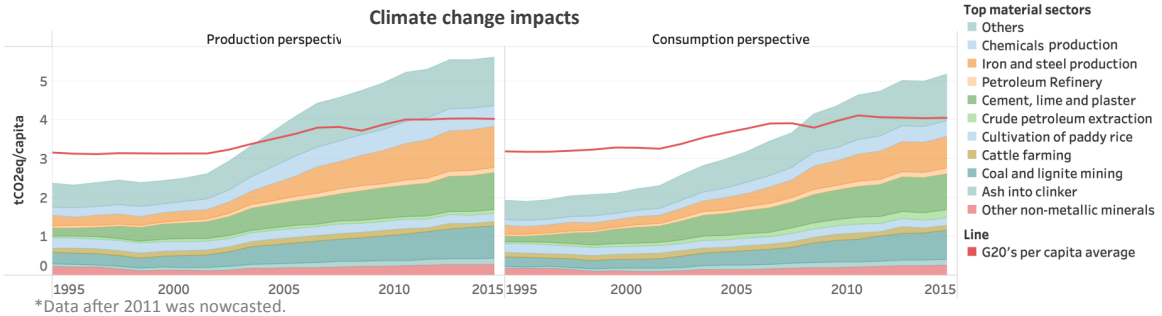
Resource extraction and processing provided 70% of all jobs in China, which were mainly low-income agriculture jobs.

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

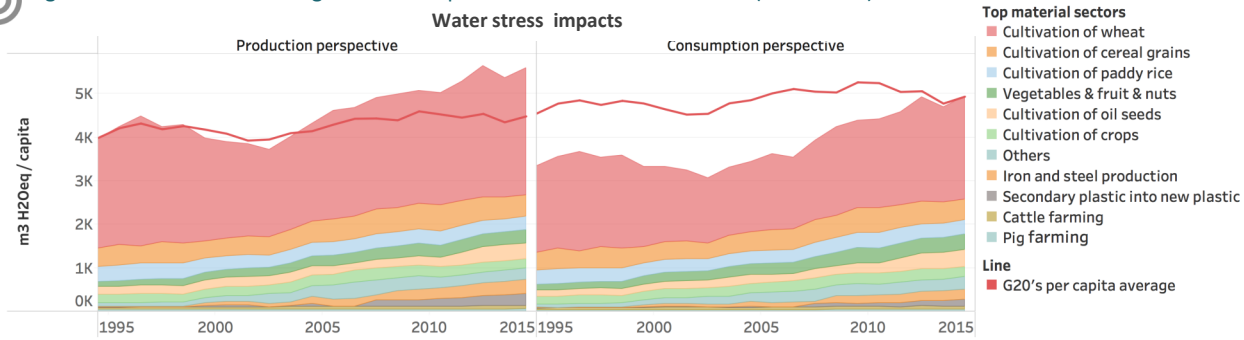
Figure 4: Climate change impacts from material sectors in China (1995-2015)*



*Data after 2011 was nowcasted.

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

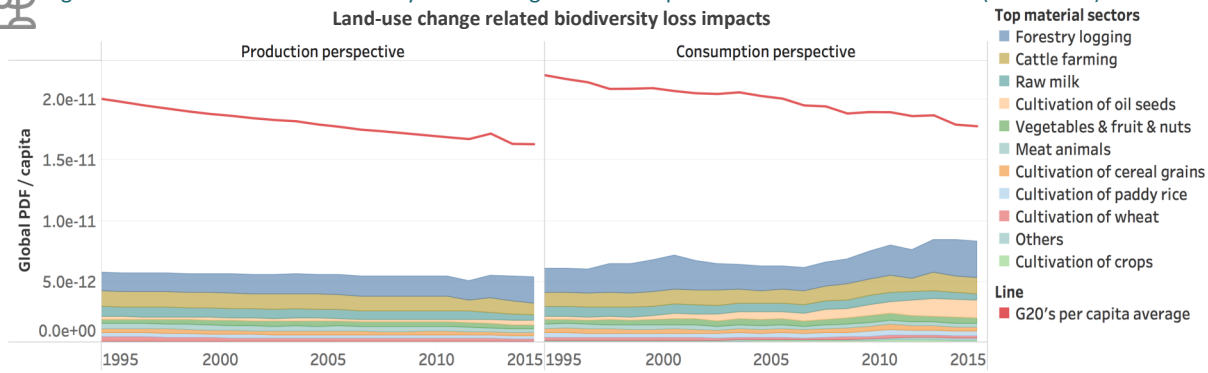
Figure 5: Water stress from agricultural crop and material sectors in China (1995-2015)*



*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 China (1995-2015)*



*Data after 2011 was nowcasted.

**PDF:* Potentially disappeared fraction of species

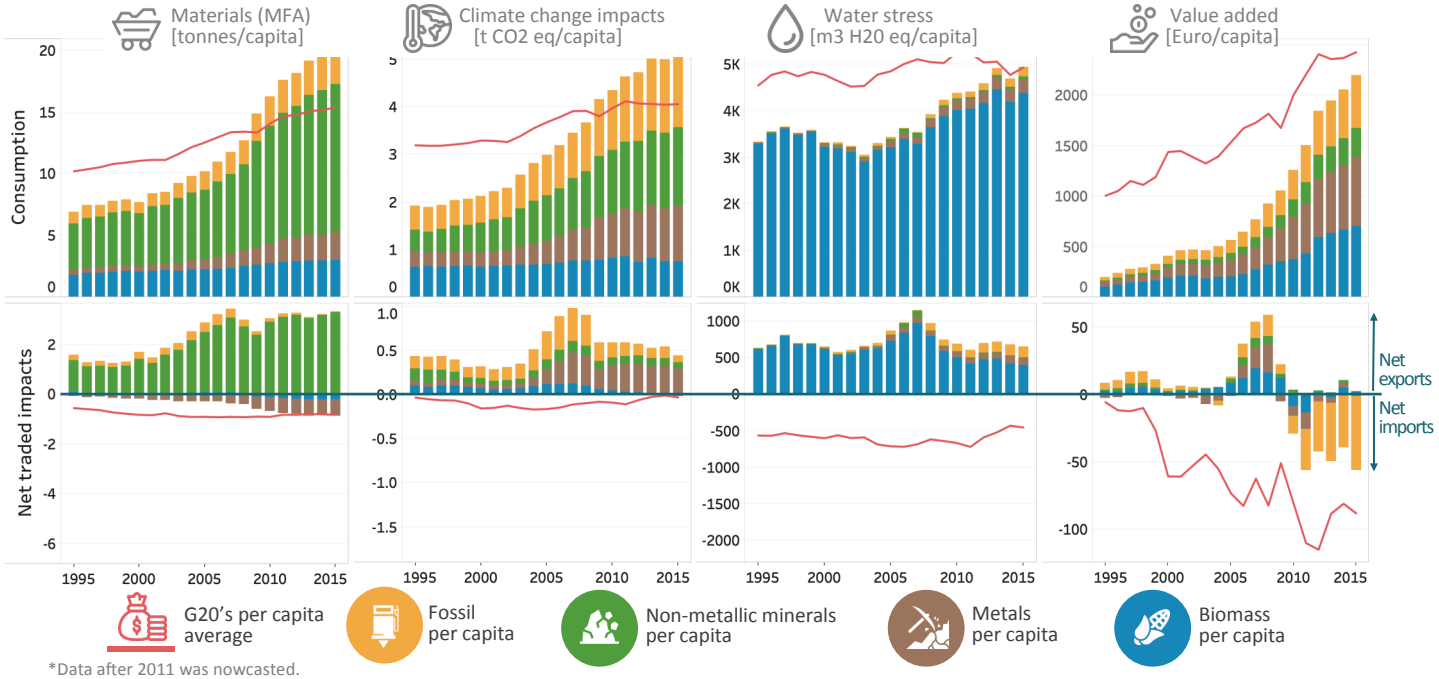
Source: IRP database, Exiobase v3.4, Cabernard et al. 2019

- In the past 15 years, build-up of infrastructure has led to major increases in climate change impacts from construction materials, particularly cement and steel.
- China has become the world's top steel and cement producer. It contributed to more than half of global greenhouse gas emissions emitted by these sectors in 2015.
- Other important material sectors include the chemical industry and mining of coal and lignite, which have grown threefold in the last two decades to produce electricity for China's growing economy.
- Water stress impacts in China are mostly produced by agricultural activities due to irrigation for wheat, cereal, paddy rice and oil seed production.
- Water stress impacts significantly increased between 1995 and 2015 due to the cultivation of oil seeds, wheat and cereals for meat production. It also increased due to the cultivation of vegetables, fruits, and nuts, and the production of iron and steel.
- Water stress impacts are higher from a production perspective due to wheat exports.
- Overall, biodiversity loss impacts in China remained below the G20 average.
- Forestry and cattle farming are the main sources of land-use related biodiversity loss.
- Impacts from the production of cereals and oil seeds increased between 1995 to 2015 from a consumption perspective, due to imports from regions with high rates of biodiversity loss.

- 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 China (1995-2015)*



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

China is a net exporter of non-metallic minerals, which dominate material exports. However, the picture is different for other resource categories.

In 1995 more fossils and biomass were exported than imported. By 2015, this situation was reversed for biomass and evened for fossils.

Climate change impacts caused by metal exports were larger than climate change impacts caused by metal imports. This is due to the energy and water intensity of metal processing taking place in China (i.e. production of steel). Impacts of imported ores are relatively low.

After 2010, value added was generated by China's domestic material production more than by its material consumption. This is mainly attributed to imports of fossils (mostly crude petroleum).

Future trends and potential Decoupling

- Scenarios developed by the IRP forecast an increase of GDP for China by a factor of ~4 and for DE and DMC an increase lower than a factor of 2 by 2060. This means relative material decoupling will happen.
- If ambitious resource efficiency policies are introduced, China could even see an absolute decoupling of material extraction after 2040.
- Material productivity has largely improved in the last decades in China. The continuation of this positive trend could have a large effect globally on the decrease of environmental impacts.
- Several types of environmental impacts have decoupled relatively from material extraction in China. Opportunities for further improvement exist, especially in the coal-based electricity sector, which is responsible for 23% of the supply chain climate impacts.
- A large share of material-related environmental impacts was caused by the build-up of infrastructure. Material-efficient urban design and circular economy solutions could help lower these 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.

International Resource Panel

UN environment programme