

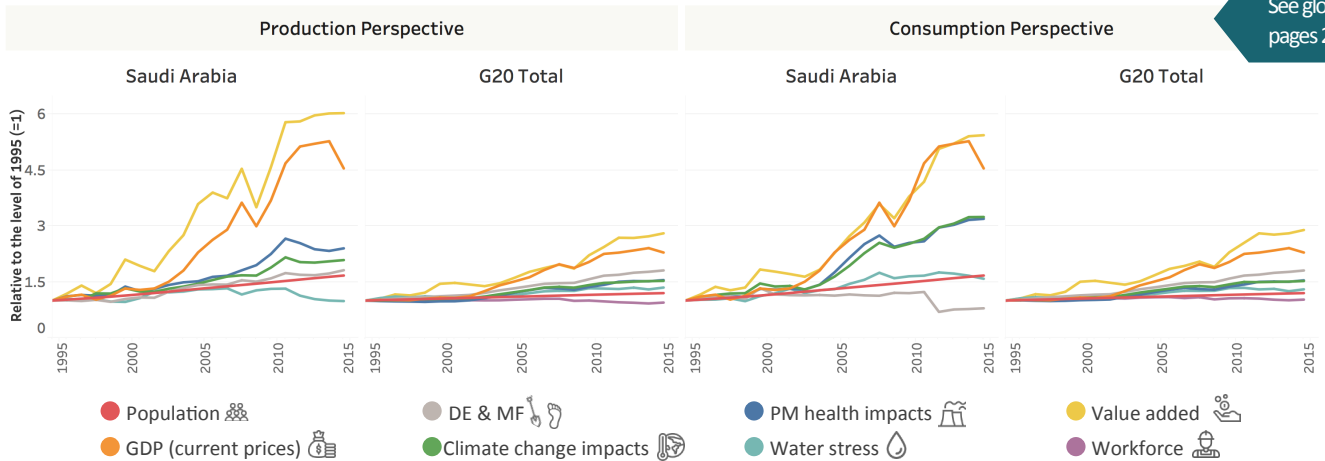
NATURAL RESOURCE USE IN THE GROUP OF 20

Status, Trends, and Solutions

Saudi Arabia

STATUS AND TRENDS OF NATURAL RESOURCE USE

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

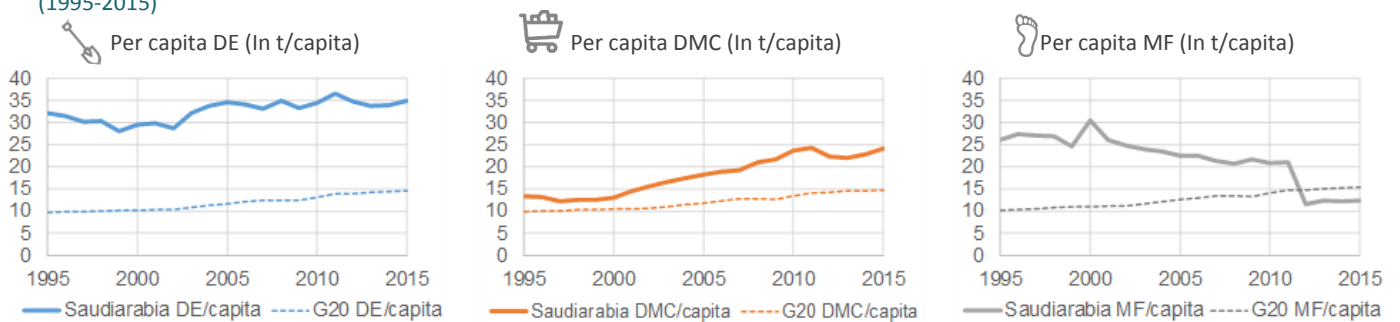


See glossary on pages 2 and 3

*Data after 2011 was nowcasted.

Source: IRP database, Exiobase v3.4, Eora 26, FAOSTAT, Pfister and Bayer 2014, Boulay et al. 2017, Cabernard et al 2019

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



Source: IRP database

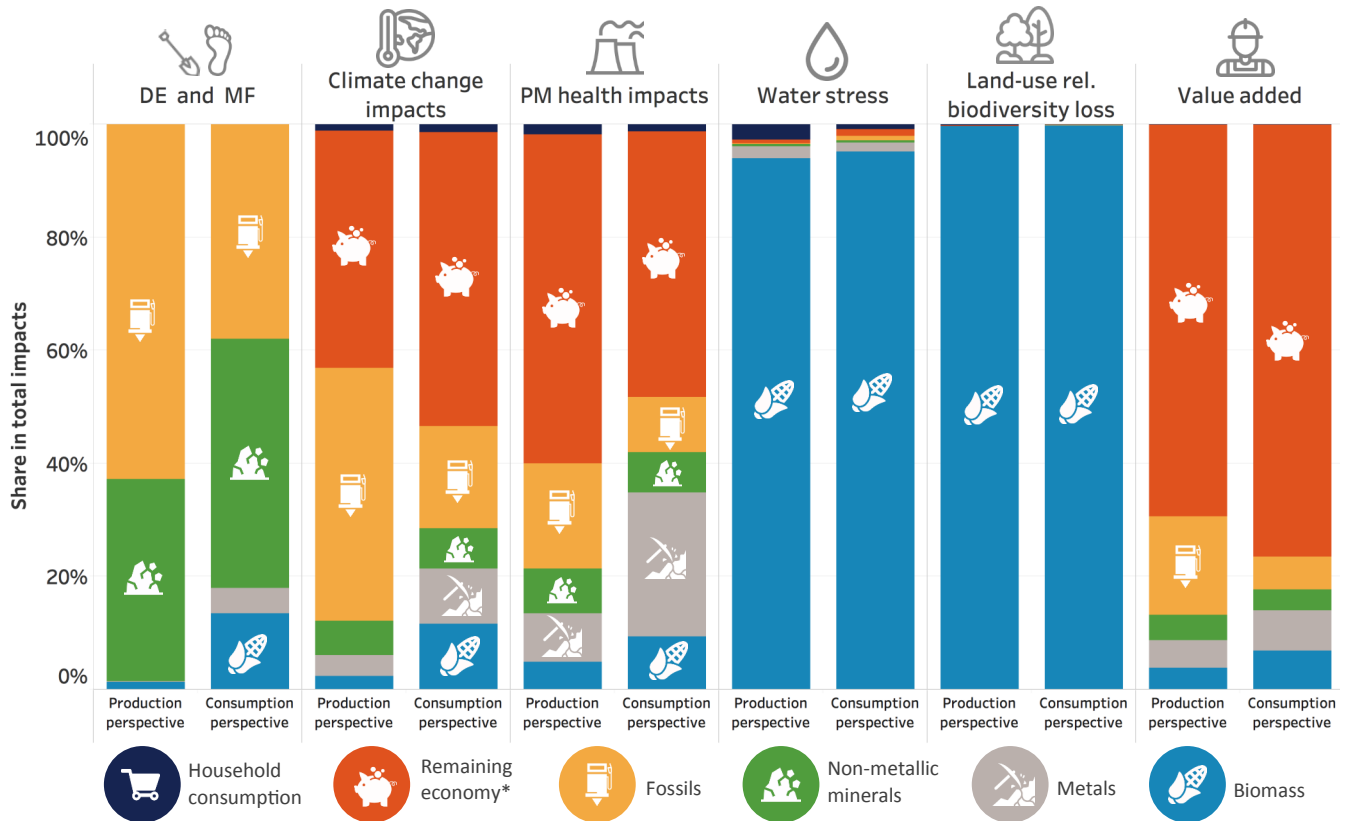
From 1995 to 2015

- GDP increased more than **fourfold** and population increased by **2/3**.
- Domestic resource extraction remained at a high level and was more than double the per-capita value of the G20 average.
- Per-capita material footprint decreased and is now comparable to the G20 average.
- Climate change and particulate matter health impacts related to resource extraction and processing increased by a factor of **2-3** and are higher than the G20 average.
- From a consumption perspective, water stress increased with population growth.
- Saudi Arabia experienced a relative decoupling from national GDP of both material use and impacts as well as added value (related to material production).



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 Saudi Arabia (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, Eora 26, FAOSTAT, Pfister and Bayer 2014, Boulay et al. 2017, OECD, Pfister et al. 2011, Chaudhary et al. 2016, Cabernard et al. 2019

- Saudi Arabia is a major global oil producer. Hence, fossil resources made up more than 60% of domestic extraction and 40% of its material footprint. Both numbers are significantly higher than the G20 average of 20%.
- From a production perspective, climate change impacts were dominated by fossil resource extraction and processing and were higher than the G20 average.
- From a consumption perspective, the contribution of resources to climate change is comparable to the G20 average (50%).
- In line with other G20 countries, water stress and land-use related biodiversity impacts were caused mainly by biomass cultivation.
- Outdoor particulate matter related health impacts were caused mainly by the remaining economy (e.g. electricity from fossil resources). However, the share of impacts from extraction and processing activities was higher than the G20 average. This is due to the extraction and refining of oil (production perspective) and to metal imports (consumption perspective).
- Economic value added of resource extraction and processing in Saudi Arabia is larger than the G20 average.
- Resource extraction and processing provides approximately 30% of all jobs in Saudi Arabia, mostly in the petroleum extraction and refinery sectors.

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)

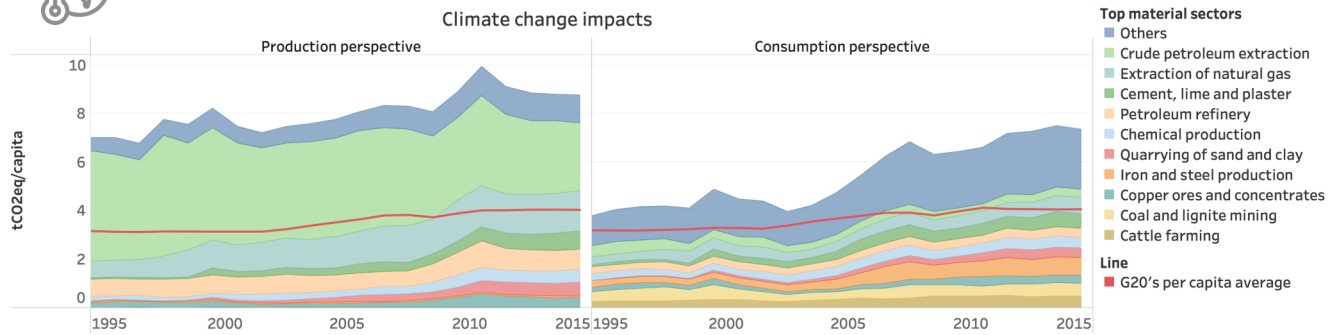
Material resources:

- metals,
- non-metallic minerals,
- biomass,
- fossils

KEY SECTORS AND RESOURCES



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

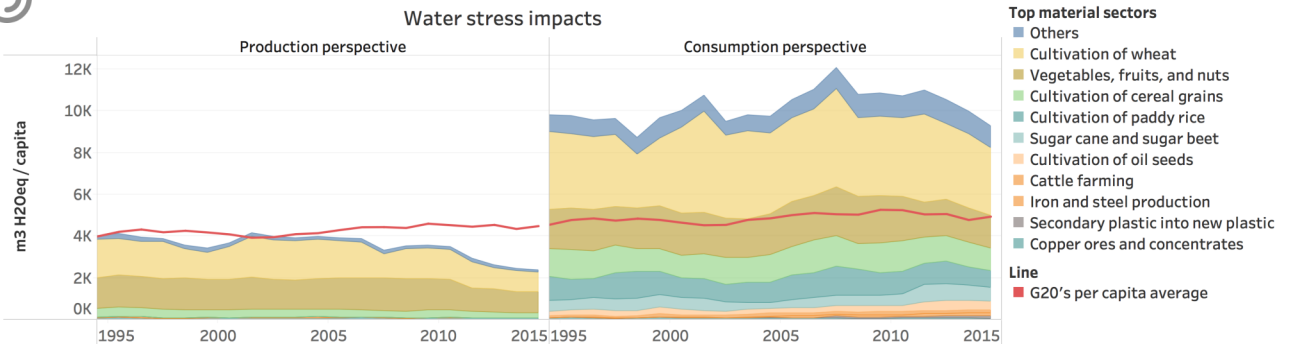


*Data after 2011 was nowcasted.

Source: Exiobase v3.4, Eora 26, FAOSTAT, Cabernard et al 2019



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

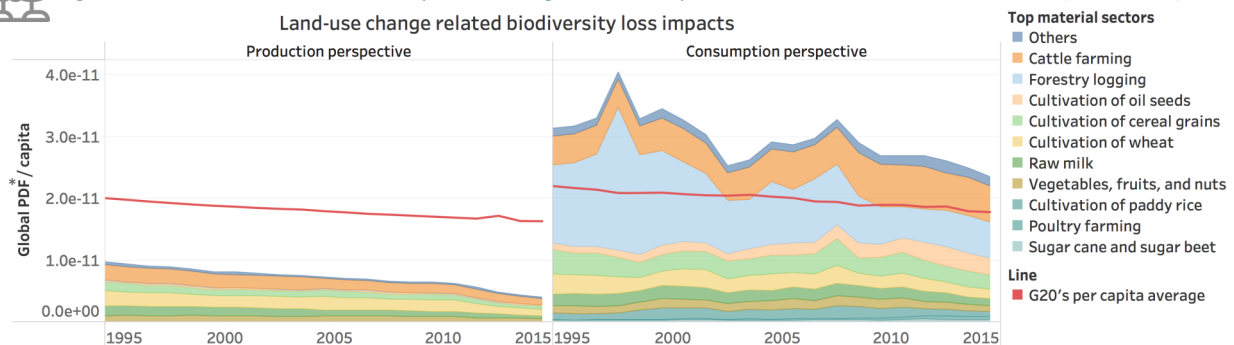


*Data after 2011 was nowcasted.

Source: Exiobase v3.4, Eora 26, FAOSTAT, Pfister and Bayer 2014, Boulay et al. 2017, Cabernard et al 2019



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



*Data after 2011 was nowcasted.

*PDF: Potentially disappeared fraction of species

Source: Exiobase v3.4, Eora 26, FAO, OECD, Pfister et al. 2011, Chaudhary et al. 2016, Cabernard et al 2019

- Climate change impacts increased and were higher than the G20 average from both a production and consumption perspective.
- Saudi Arabia is the top oil exporter in the world. From a production perspective, petroleum extraction and refinery as well as natural gas extraction cause more than 60% of domestic greenhouse gas emissions. Further important sectors are cement manufacturing, chemical production and quarrying of sand and clay.
- From a consumption perspective, iron and steel manufacturing, cattle farming and coal mining are important sources of climate change impacts, in addition to petroleum extraction and refinery as well as natural gas extraction.
- Despite severe water scarcity in Saudi Arabia, levels of water stress from agriculture activities were below the G20 average in the production perspective due to a strong reliance on food imports.
- From a consumption perspective, water stress levels remained stable and were about 50% higher than the G20 average. The main contributing food products were wheat and other cereals, vegetables, fruits, nuts, and paddy rice.
- From a production perspective, land-use related biodiversity loss remained low due to limited agricultural activities.
- From a consumption perspective, land-use related biodiversity loss decreased but remained above the G20 average. This is mainly due to imports of beef, wood, oil seeds, and cereals.

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)

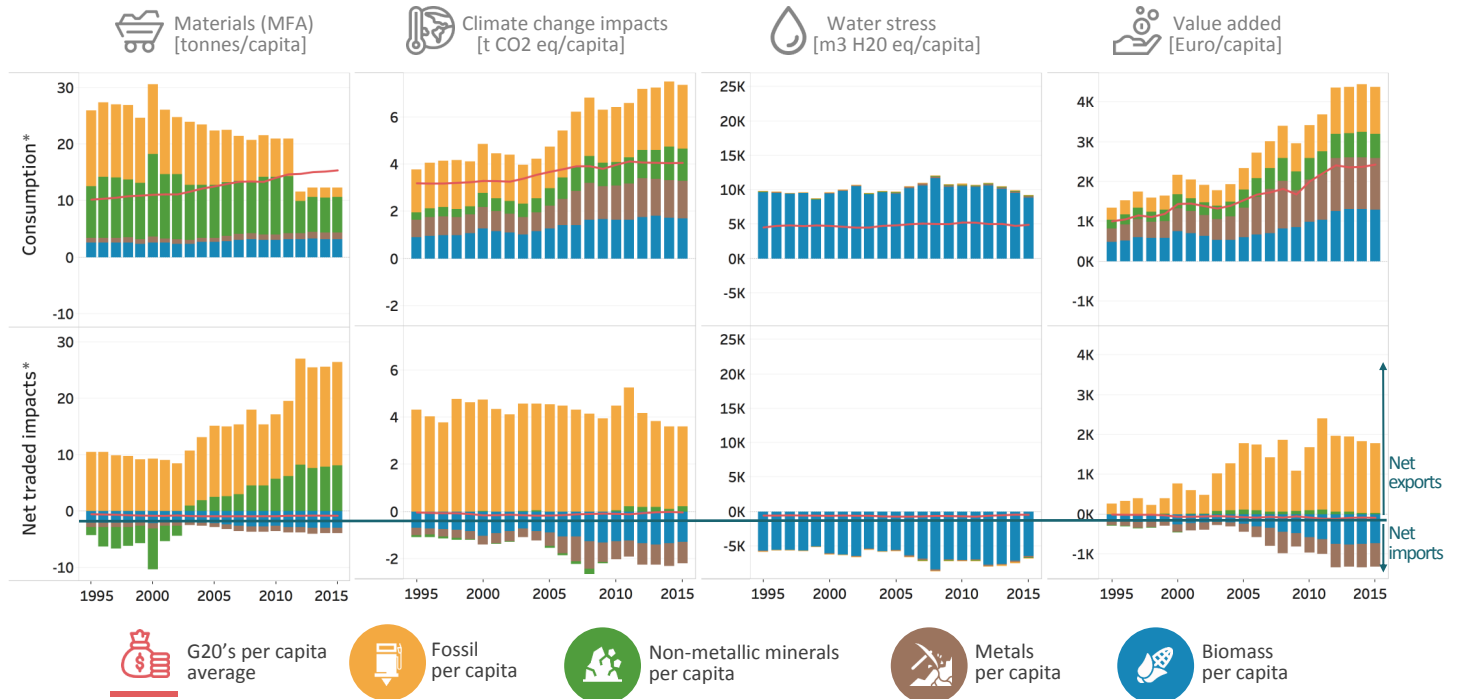
Material-related impacts: Impacts related to the extraction and processing of material resources (including the upstream supply chain, such as electricity generation and transport)

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 Saudi Arabia (1995-2015)*



*Data after 2011 was nowcasted.

*Consumption: Impacts throughout the supply chain from goods imported and consumed in Argentina.

*Net traded impacts: Difference between material-related impacts from a production and consumption perspective.

Source: IRP database, Exiobase 3.4, Eora 26, FAOSTAT, Pfister and Bayer 2014, Boulay et al. 2017, Cabernard et al 2019

- More materials (particularly fossils) were exported than domestically consumed.
- Oil extraction and refining for export caused a high share of climate change impacts.
- From a consumption perspective, metals and food imports contributed to about 40% of the material-related climate change impacts.
- Due to natural water constraints, Saudi Arabia relies on imports of many food products. Therefore, impacts of water stress and land-related biodiversity loss related to those imports occurred in other countries.
- Since 2005, Saudi Arabia maintained a high net trade surplus (value added) for fossil resources (oil).

FUTURE TRENDS AND POTENTIAL DECOUPLING

- Several types of environmental impacts have decoupled relatively from GDP in Saudi Arabia. Opportunities for further improvement exist, for example by transforming the domestic energy sector, which relies mainly on oil and gas, to renewable energy systems (particularly solar energy).
- An overall significant reduction of fossil resource use will be needed in order to meet the Paris Agreement.
- Impacts from food imports could be lowered by sourcing food products from locations with lower water stress and biodiversity vulnerability.
- Circular economy solutions and resource-efficiency policies are critical to lower the impact of materials, e.g. the elevated metal use from a consumption perspective.

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.