



Environmental Footprint and global mining: Spatially explicit analyses of worldwide raw material flows and associated environmental impacts

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Challenges of Sustainability Research, 14.09.2022

- Global demand for mining products rapidly increasing; metal ore mining has doubled in the past 20 years
- Growth in mining increasingly threatens the most vulnerable ecosystems world-wide
- Knowledge about environmental impacts of mining available on a case study level, but still scarce on a world-wide scale
- Filling this gap and linking to product supply chains as drivers is crucial to realise SDG 12 and (upcoming) EU policy demands

Impacts depend on specific location

Chile: Copper mining



<http://intradayfun.com/2011/01/10-world-biggest-holes-created-by-human-and-nature>



http://www.dw.com/image/0%2C%2C19318441_302%2C00.jpg

Brazil: Soybean production



<https://www.greenpeace.org/archive-international/en/news/features/amazon-destruction>



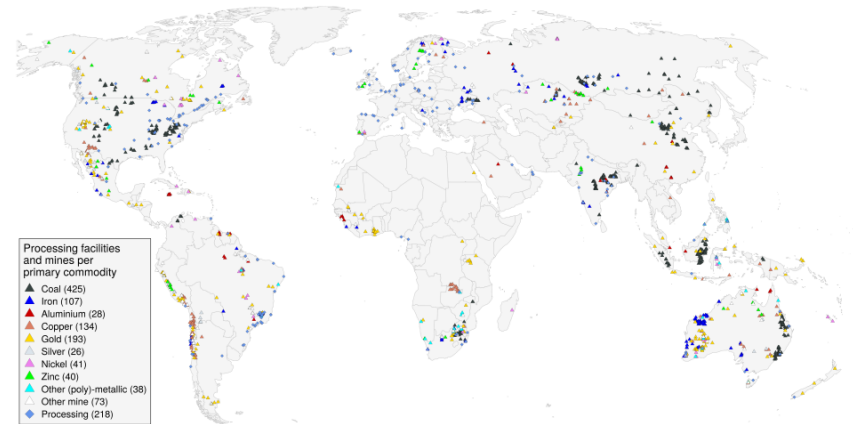
https://es.wikipedia.org/wiki/Archivo:Sembrado_de_soja_en_argentina.jpg

- Proprietary source: SNL Metals and Mining Database

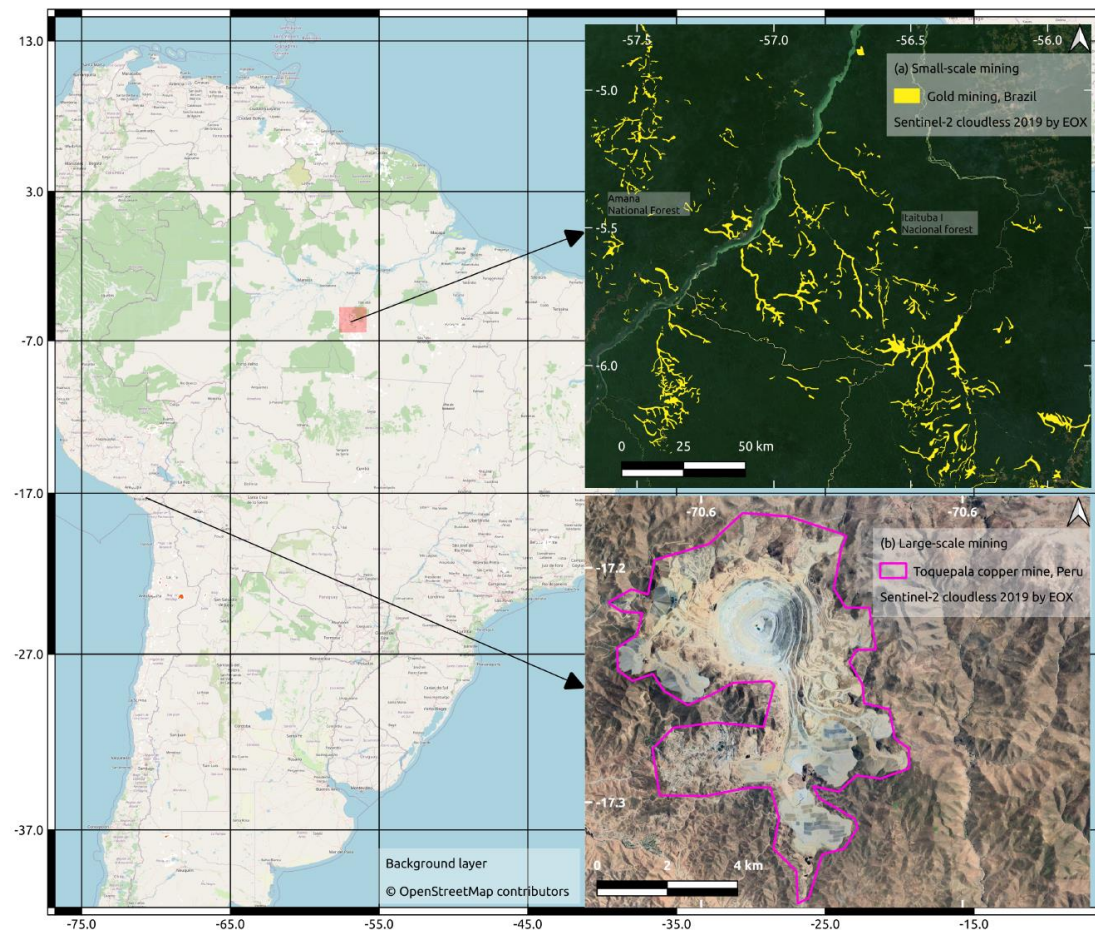
An open database on global coal and metal mining

Simon Jasansky^{1,*}, Mirko Lieber¹, Stefan Giljum¹, and Victor Maus^{1,2}

- Data from more than 2000 freely available company reports
- 1171 mines, 80 different materials, 2000-2021
- Coverage between 30-70%

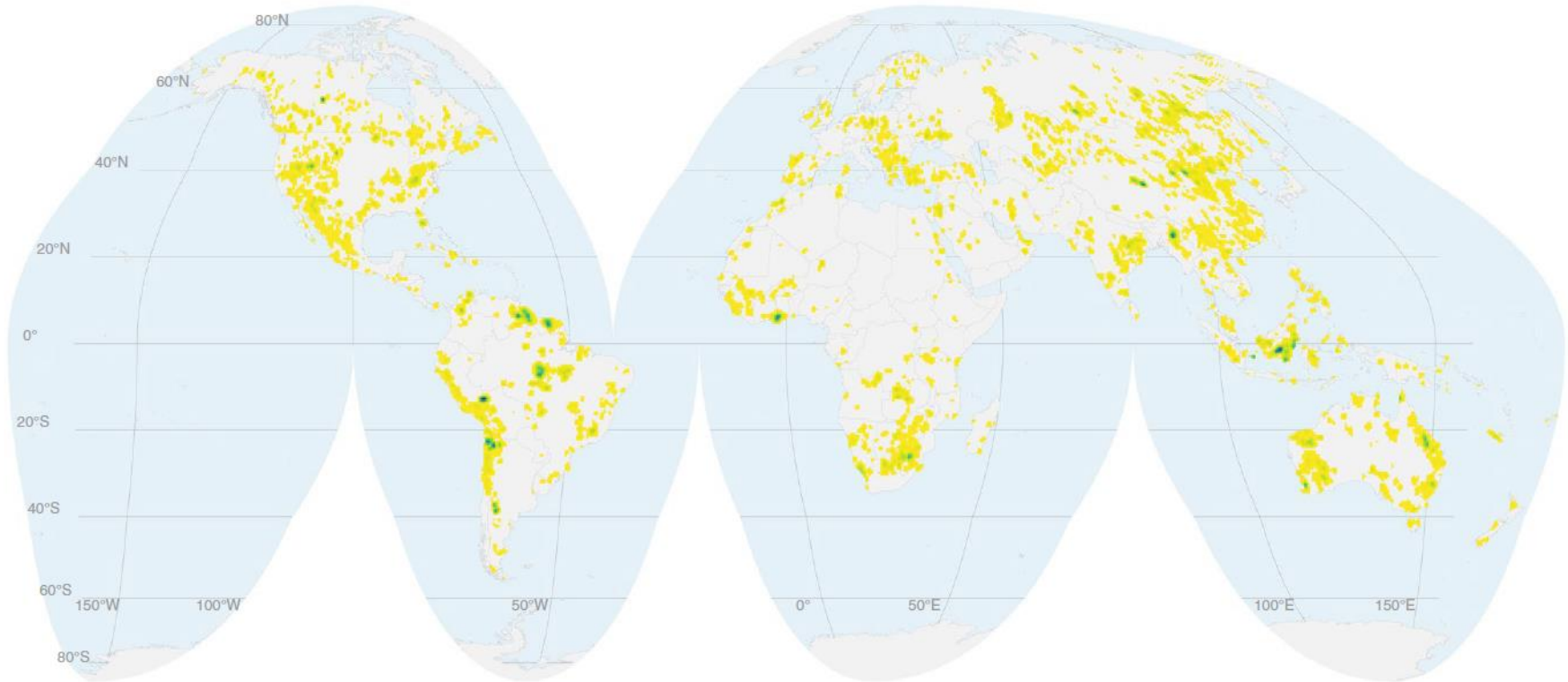


Land use of global mining

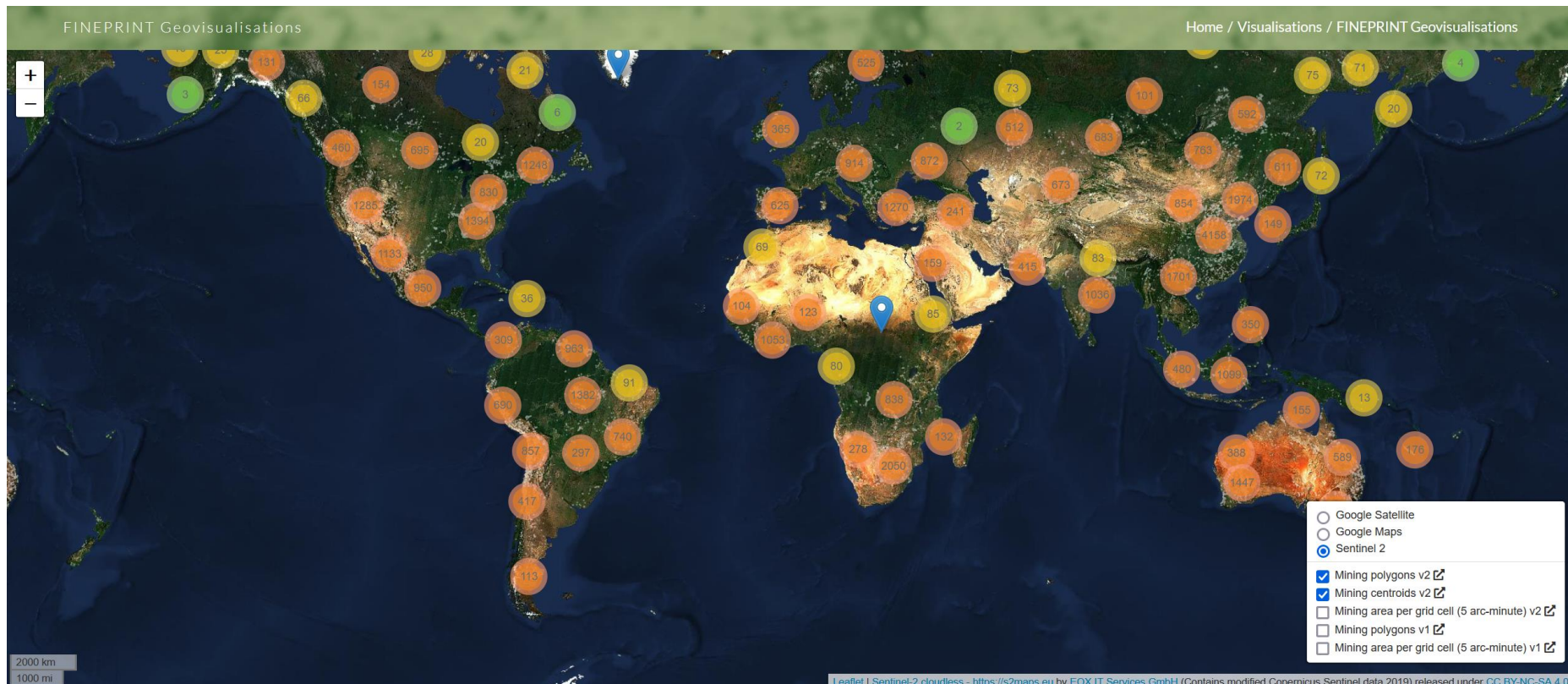


Land use of global mining

2019 satellite images: ~45,000 polygons, >101,000 km²



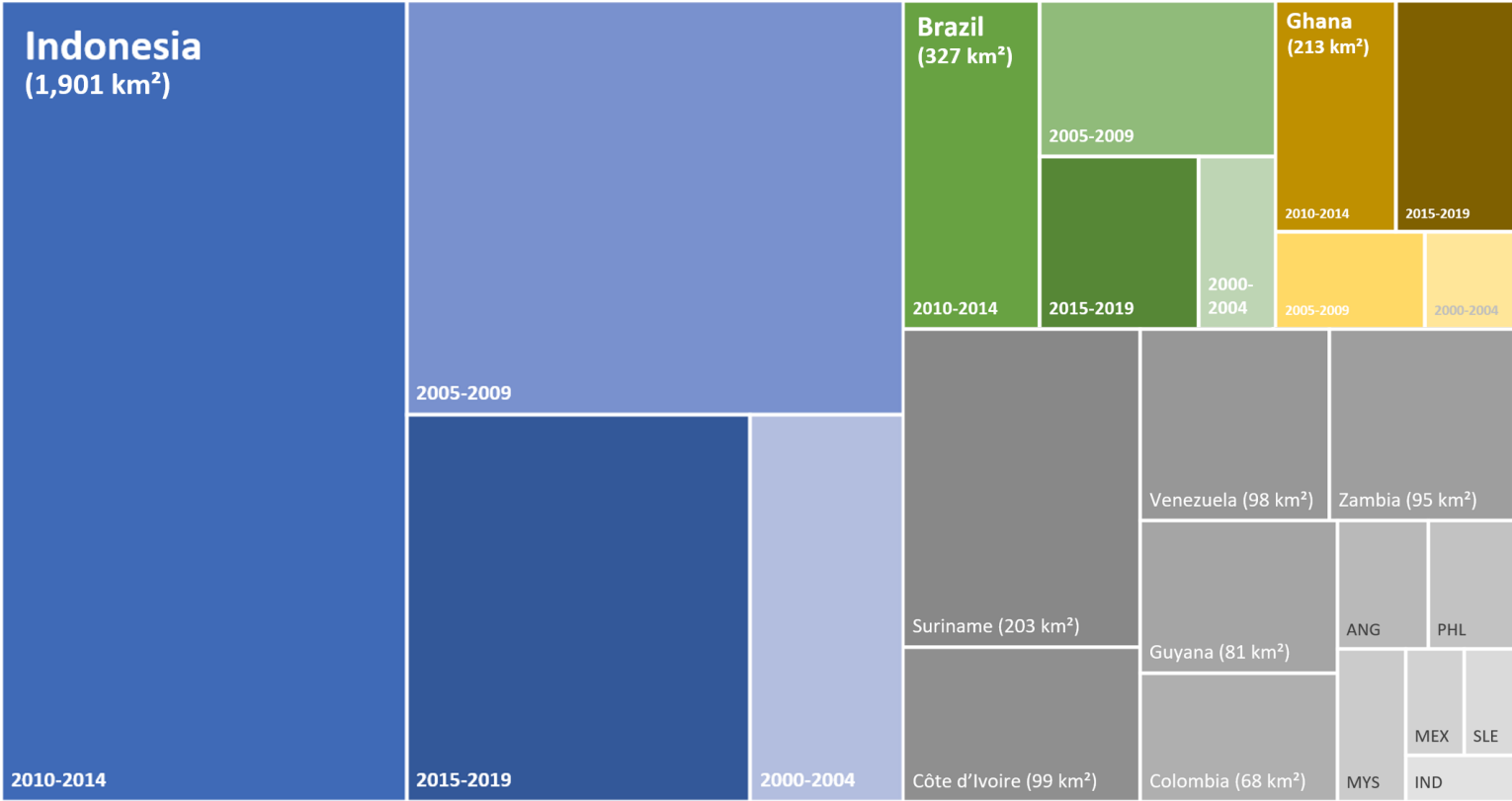
FINEPRINT Geovisualisations



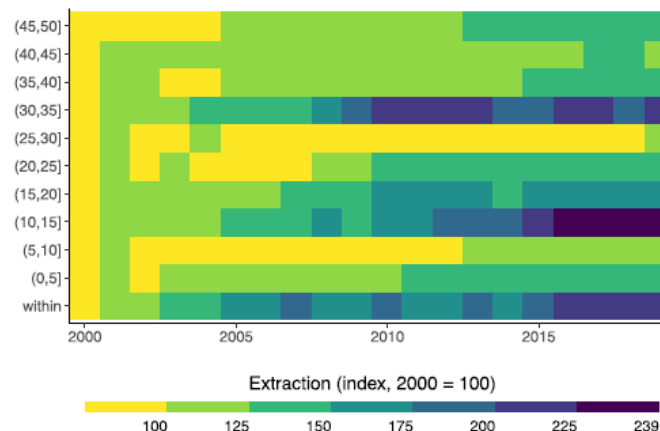
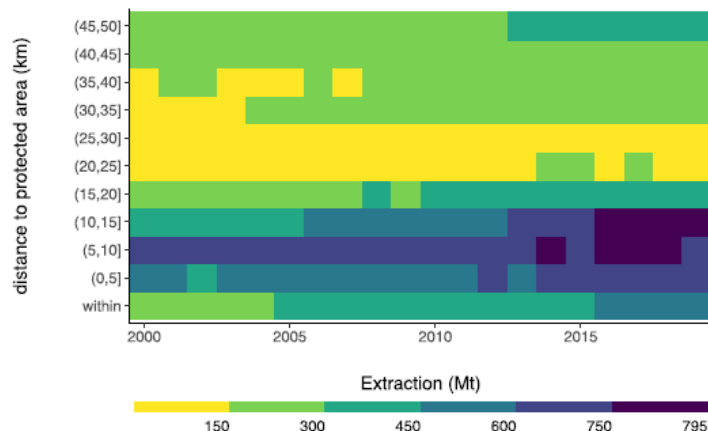
www.fineprint.global/viewer

Mining and deforestation

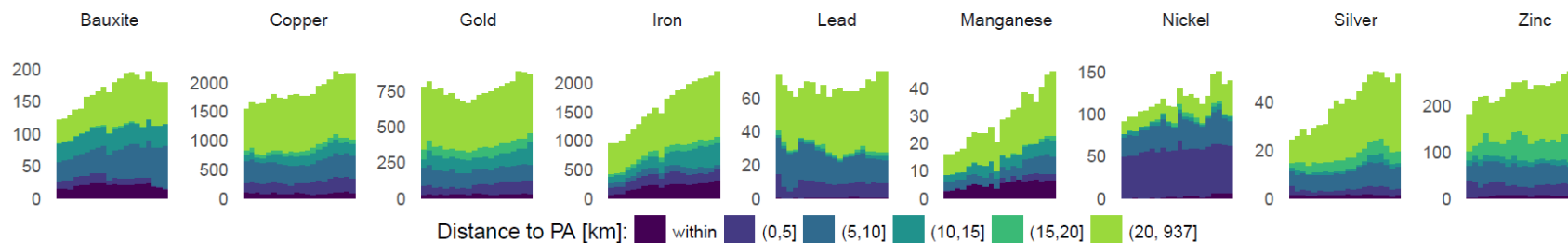
Direct deforestation in tropical forests due to industrial mining expansion, 2000-2019



Mining and protected areas



In 2019, half of global metal ore extraction took place at 20 km or less from protected territories



- Multi-regional input-output (MRIO) models
- Top-down approach on economy-wide and sector levels
- Link national economies through bilateral trade
- Monetary, physical or combined (hybrid) MRIO approaches
- Different advantages and limitations

- The extraction of which commodities was responsible for land use change and forest loss caused by mining?
- The global supply chains of which final product groups are connected to mining-induced deforestation?
- How is deforestation embodied in consumption distributed across countries and world regions?

Mining deforestation footprint

Mining deforestation footprint of Top-10 consuming countries (62% of global total),
by commodity, accumulated 2000-2019

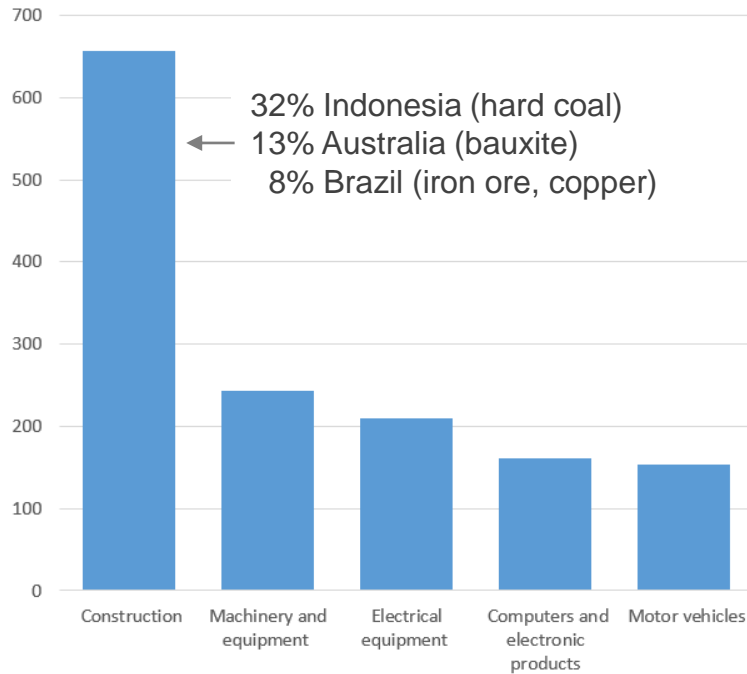
- Mining land use
- Forest loss
- GLORIA MRIO



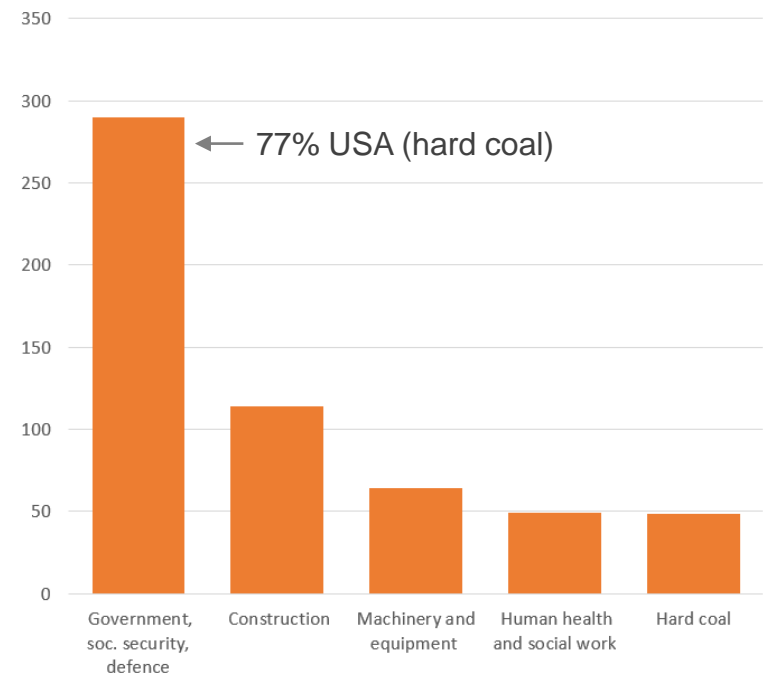
Mining deforestation footprint

Top-5 final consumption sectors, accumulated 2000-2019, in km²

China



USA



- Spatially explicit data open up a new dimension to calculate fine-scale environmental footprints
- Provide targeted knowledge to design responses by policy makers and companies
- Main data limitation: sub-national trade data to construct sub-national models in large extraction countries

Further research directions:

- Monitoring mining and metal supply chains (online tool for companies and policy makers; upcoming EU proposal)
- Mining impacts and supply chains of green energy transition



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