Mapping global extraction of abiotic and biotic raw materials

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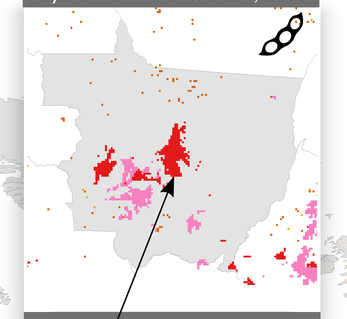
1. Introduction

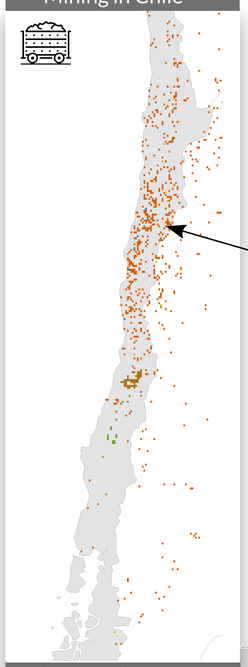
Currently, the spatial resolution of global models of raw material extraction, trade and consumption is limited to the national level. Thus, they fail to link specific supply chains to the actual geographical location of production and related impacts. Here we present our preliminary results mapping global biotic and abiotic raw materials extraction in 5-arc-minutes (around 10 km x 10 km at the equator) grid cell level.

Soybean in Mato Grosso, Brazil



The state of Mato Grosso is the largest soybean producer in Brazil. In 2003 and 2004, 48% of Amazon deforestation occurred in Mato Grosso, impacting, for example, local biodiversity andbiogeochemical cycles.

Mining in Chile

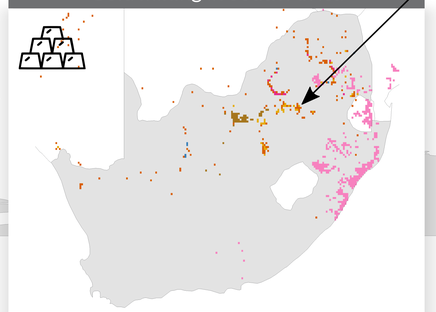


With 15.8 million tonnes in 2015, Chile was the largest copper producing country world-wide. Extracting and refining copper is highly energy, water and land intensive and creates local impacts, e.g. with contamination of soil, groundwater and surface water by chemicals from mining processes.

2. Methods

In this work, we use the spatially explicit biotic materials from MapSPAM [1] and abiotic materials from the SNL Metals & Mining Data (Source: S&P Global Market Intelligence), both for the year 2005. We aggregate the abiotic materials to the MapSPAM grid cell and display the most significant materials for each cell; a reproducible version of maps and poster is available on our Github at https://github.com/fineprint-global/poster_EGU_2018.

Gold mining in South Africa



South Africa was the world's largest gold producer until 2005 (about 12% of world production), but its production has continuously declined. Still, South Africa is among the largest gold producing with huge local impacts include civil unrest, economical inequality, social uprooting, pollution, negative health impacts and ecological destruction.

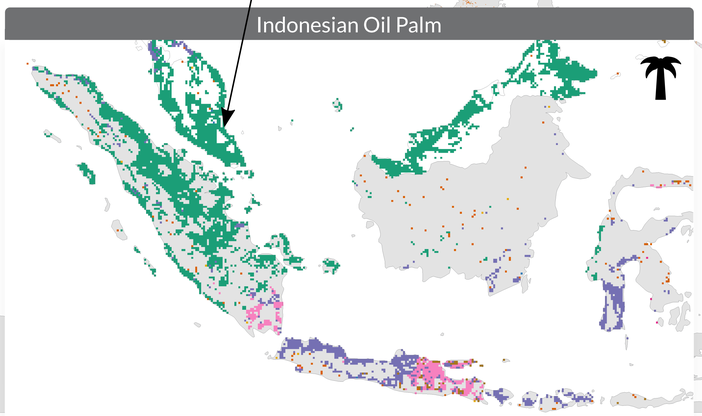
3. Conclusions

Our novel database will allow developing new methods to assess the distant interlinkages between world-wide material consumption [2] and various environmental and social impacts related to raw material extraction on a grid cell level [3]. It can boost the spatially explicit assessments of supply chains and consumption patterns in both developed and developing countries, which is crucial for the design of international policy instruments to achieve sustainable production and consumption patterns. In the next versions, our database will cover a larger number of materials as well as the production over time starting from 2000.

Legend

- Wheat
- Soybean
- Oil Palm
- Rice
- Sugar Cane
- Maize
- Copper
- Gold
- Iron.Ore
- Nickel

Indonesian Oil Palm



In Indonesia, a larger proportion of oil palm plantations was developed on already cleared degraded lands. However, rapid conversion of Indonesian forests to industrial plantations has increased since 2005, impacting for example the water cycle, increasing runoff and eventually leading to lower rainfall in the region.

4. References

[1] You, L., U. Wood-Sichra, S. Fritz, Z. Guo, L. See, and J. Koo. 2017. Spatial Production Allocation Model (SPAM) 2005 v3.2. April 3, 2018. Available from http://mapspam.info.

[2] Giljum, S., Dittrich, M., Lieber, M., Lutter, S., 2014. Global patterns of material flows and their socio-economic and environmental implications: a MFA study on all countries world-wide from 1980 to 2009. Resources 3, 319-339.

[3] Godar, J., Persson, U.M., Tizado, E.J., Meyfroidt, P., 2015. Towards more accurate and policy relevant footprint analyses: Tracing fine-scale socio-environmental impacts of production to consumption. Ecological Economics 112 112, 25-35.

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