Documentation explaining the GTAP version of the Global Environmental Impacts of Consumption (GEIC) indicator

Croft, S., Harris, M., Wood, E. and West, C.

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For further information please contact:
Maddie Harris (ukglobalimpacts@jncc.gov.uk)
Joint Nature Conservation Committee
Quay House
2 East Station Road
Fletton Quays
Peterborough
PE2 8YY
https://jncc.gov.uk/

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Within SEI's Input-Output Trade Analysis (IOTA) framework which underpins the GEIC indicator presented on the CommodityFootprints.earth dashboard, there are multiple datasets utilised as inputs representing different components of the supply chain modelling process. A key one of these is the Multi-Regional Input-Output (MRIO) table. The MRIO is a representation of sales and purchases, in financial units, between sectors of the global economy, and sales to final demand (e.g. households, governments etc.). Within IOTA, the MRIO plays a key role in the modelling of the global supply chains, specifically being utilised to model the consumption-end of the supply chain after production and initial stages of commodity trade. See our technical document for further details.

As well as playing a pivotal role in resolving the commodity flows, the choice of MRIO also impacts the form of the final outputs; in particular, the consumption-end geographical resolution and structure of the results. This is because, whilst all MRIOs provide a global perspective of the economy, different MRIOs have their own combination of sector and geographical classifications. The sectoral classification employed by the MRIO structure affects the internal resolution of the modelling process but doesn't alter the structural nature of the outputs. The geographical classification, on the other hand, determines the consumption-end geographical resolution and structure of the results, i.e., consumption-perspective results can only be provided for the countries/territories and regions explicitly represented within the MRIO.

Prior to the 2023 data release, the EXIOBASE MRIO was employed to generate results presented on the dashboard. EXIOBASE is a well-established and trusted MRIO and provides a complete (continuous) time-series from 1995-2022 for 163 economic sectors. Perhaps the biggest limitation to EXIOBASE, in this context, is that geographic coverage includes only 44 countries/territories and five large rest-of-world (RoW) regions. This means that results can only be resolved to points of consumption for these 44 countries/territories, with other countries and territories aggregated within one of the RoW regions. This limits utility of the outputs, as well as presenting an equity issue around who is able to utilise the results at the country/territory level.

To help address this issue, an additional MRIO has been implemented within IOTA, namely the latest Global Trade Analysis Project (GTAP) 11a release. Compared to EXIOBASE, GTAP has lower sector resolution (65 sectors) and more limited temporal coverage (reference years 2004, 2007, 2011, 2014 and 2017), but much higher geographic resolution (141 countries/territories - representing 96.4% of the global population - and 19 RoW regions).

Methodologically, the framework operates in exactly the same way as described in the indicator's technical document, with the differences in implementation being restricted to using appropriate concordance mapping between producing/trading countries/territories and the MRIO's countries/territories/regions, and between the individual commodities and the

associated MRIO sectors of production. Internal calculations and mathematical operations are performed on different sized arrays but follow identical logic and methodology.

The outputs for EXIOBASE on the dashboard now cover consumption perspectives for 44 countries/territories and five RoW regions for the years 2005 to 2021. The new GTAP results provide consumption perspectives for 141 countries/territories and 19 RoW regions, for the years 2007, 2011, 2014 and 2017. Both data sets share the same production and commodity resolution and classifications.