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Alexandre BORTHOMIEU, Jean-Yves COURTONNE*, Vincent JOST**, Emmanuel KRIEGER*, Guillaume MANDIL*, Mathieu MANGEOT*, Peter STURM**

** STEEP team, Univ. Grenoble Alpes, CNRS, Inria, Grenoble INP, LJK, 38000 Grenoble, France*

*** Univ. Grenoble Alpes, CNRS, Grenoble INP, G-SCOP, 38000 Grenoble, France*

An emerging research axis of the STEEP team (steep.inria.fr) of Inria (Grenoble, France) intends to contribute to the design, evaluation and debate of socio-technical alternatives for the future (e.g., horizon 2050). “Expert” quantitative modeling makes it possible to guarantee the biophysical coherence of narratives (regarding flows of materials, energy and human work) and to tackle complex issues (e.g. trade-offs between social and environmental criteria, trade-offs between geographical scales…) (Giampietro et al, 2021 ; Courtonne, 2016). In order for these alternatives to emerge in a democratic manner, the team is currently involved in both “expert modeling” and “participatory modeling” (where groups of citizens identify what they wish to model and create and evaluate their own alternatives). This communication will focus on the latest developments on the “expert” side.

We define a socio-technical alternative as a consistent arrangement of modes of production and modes of consumption. This includes biophysical and socio-political dimensions, but for the time being the emphasis is laid on the circulation of material, energy and human work between sectors and down to final consumption.

A first step towards imagining desirable futures is to properly describe the current situation. For this purpose, we use physical supply-use tables (PSUTs) to describe the French economy. We apply the methodology described in Borthomieu et al (2021), namely merging several Supply-Chain Material Flow Analyses (SC-MFA, see Courtonne et al, 2015). Handling different aggregation levels among products and sectors is useful for merging. For instance, the level of detail available for energy consumption in the agri-food chain is lower than that of corresponding material flows. The current merged PSUTs include plant agri-chains, animal agri-chains, the forest-wood chain, non-metallic minerals, 4 metals, fossil fuels, wastes and water, biomass chains being the most detailed.

We are currently mapping our own hierarchical classification with the so-called “root classification” (Lenzen et al, 2014) in order to enable future collaborations, in particular to connect our model of the French economy with international biophysical models, e.g., FABIO (Bruckner et al, 2019) and the recent iron-steel supply chain model (Wieland et al, 2021).

Collaboration with CIRED (Teixeira, 2020), working on a hybrid IO table for France based on Exiobase, will help filling the gaps in the coming months as well as comparing results.

Our presentation will show the progress made in building PSUTs for France, and will illustrate how these can be filtered and re-arranged to display EW-MFA, EW-MSA (Kovanda, 2021), SC-MFA, SC-MSA (Material System Analysis, Moll et al, 2005).

Future work also includes (i) completing the downscaling of the tables down to the level of the 13 French regions (this work has already been conducted for agriculture and wood chains), (ii) working on data aggregation/filtering and visualization to make it easier to communicate, (iii) working on a tool to help designing and evaluating socio-technical alternatives for the future based on the knowledge on the current situation.

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