Visualizing Core Structure of International Carbon Network Associated with Household Consumption

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The structure of a production network involved in supplying a given product is generally considered as quite complex. The transformation of a network into its simplified structure, or core structure, therefore, offers an effective tool for better understanding how the environmental impact associated with a product propagates throughout the entire economy. However, extracting a core structure from the production network, which is represented by an LCA database or an input-output table, is not straightforward because the network consists of vast information and typically contains many feedback loops. In order to deal with this, we elsewhere developed a method, called path-based matrix decomposition analysis (PMDA), to extract a core structure entangled in a production network. In this study, we applied PMDA to an environmentally extended multi-regional input-output table for understanding the international carbon network associated with household consumption. The decomposition by PMDA offers a scheme to extract a core structure from an inter-sector network and provide an input-output table which represents the core structure. The matrix representing the core structure is suitable to be visualized, for example, in a Sankey diagram. A graphical visualization of the core structure of international carbon networks associated with household consumption allows us to instantly compare the amount of "embodied" GHG emissions, from producer's and consumer's perspectives and even some intermediate perspectives.