Responsibility of Japanese economy for the impacts on aquatic ecosystems arising from induced water consumption in global supply chains

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Biodiversity becomes of high interest in the context of global sustainability. Freshwater consumption could threaten the freshwater species by depriving natural water resources inevitable as their habitats. Globalized economy results in remotely induced water consumption in supply chains, which makes it difficult to identify the causes of the impacts of water consumption on biodiversity. In the previous study, we have demonstrated the responsibility of our final demand for water consumption hidden in the global supply chains and its sustainability in terms of local carrying capacity of water resources based on the Global Linked Input-Output (GLIO) model. Here we advance the analysis for the assessment of biodiversity impacts by water consumption in global supply chains. The induced water consumption in the global supply chains is calculated by water consumption inventory for 231 countries at sectoral level (around 5,000 sectors) with the GLIO model. Then, the overconsumption beyond the regional carrying capacities of water resources induced by Japanese final demand was estimated by adopting the regional carrying capacity indicators developed in the previous study. The impacts of water overconsumption on the riverine fish species are assessed by adopting the characterization factors at water basin scale.
Japanese final demand results in the potential loss of 0.18 out of 11,450 riverine fish species annually, which is relatively smaller in comparison with the proportion of Japan-induced water consumption in the global supply chains to the total water consumption in the world. On the other hand, Japan is relatively more responsible for the biodiversity impacts in some specific countries that are not identified at the global level. This indicates that each country could have their own countries that they should take responsibility for. In terms of influential commodities that induce the large potential of biodiversity loss in the global supply chains, food-related goods consumed by Japanese accounts more than half of the total loss of biodiversity, however, fossil fuel-based products, metal- and mineral-based products, and electricity and utilities surprisingly accounts for 1/4 of the total loss associated with Japanese final demand regardless of their relatively small volumes of induced water consumption.