Biodiversity in input-output analysis: the indirect drivers of biodiversity loss

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Abstract

In 2010, the European Union established its growth strategy for the ten years ahead, the EU 2020 Strategy. The Resource-Efficient Europe is one of its flagship initiatives, framed under the principle of sustainable growth. One of its key proposals is the EU Biodiversity Strategy to 2020 to halt biodiversity loss and ecosystems degradation. This strategy highlights the importance of reducing the impacts of EU consumption patterns, particularly for resources that have significant negative impacts on biodiversity. Understanding how consumption drives biodiversity loss due to land use change can provide new pathways for biodiversity conservation. In this work, we developed a biodiversity extension to EXIOBOASE, a global multi-regional environmentally extended input-output database. We used the countryside species area relationship to measure the number of species lost due to the activity of the land use sectors and analyze how consumption indirectly drives biodiversity loss.

CONFERENCE THEME: 3. Development, consumption and well-being; 3.5. Patterns of trade, production, and consumption.

Extended abstract

In 2010, the European Union (EU) established its growth strategy for the ten years ahead, the EU 2020 Strategy (EC, 2010). The strategy states that Europe should seek a smart, sustainable and inclusive growth. The Resource-Efficient Europe is one of the flagship initiatives of the EU 2020 Strategy, framed under the principle of sustainable growth. It seeks to support the transition to a resource-efficient and low carbon economy by boosting economic performance while reducing resource use, ensuring the security

of supply of essential resources as well as fighting climate change and limiting the environmental impacts of resource use. One of its key proposals is the EU Biodiversity Strategy to 2020 to halt biodiversity loss and ecosystems degradation. This strategy is built upon six main targets and twenty key actions. Action 17 highlights the importance of reducing the impacts of EU consumption patterns, particularly for resources that have significant negative impacts on biodiversity (EC, 2011). One of the main drivers of biodiversity loss is land use change. Land use change encompasses all the human transformations of natural landscapes.

Environmentally-extended input-output (IO) analysis has been increasingly used to identify the economic drivers of environmental impacts. Namely, the embodied impacts associated with a consumption activity and the impacts embodied in international trade. Environmental impacts analyzed within an IO framework include, among others, emissions of pollutants and appropriation of natural resources. One study has focused on the impacts of consumption on biodiversity (Lenzen et al., 2012). The authors found that 30% of global threats to species occur due to international trade, and consumption in developed countries is the main driver of these threats (Lenzen et al., 2012).

In this work, we developed a biodiversity extension to EXIOBOASE, a global, detailed multi-regional environmentally extended input-output database. We used the countryside species area relationship to measure the number of species lost due to the activity of the land use sectors. Whereas Lenzen et al. (2012), inform on the number of threats exerted by each sector, here we focus on land use sectors and provide information on the number of species lost due to each land use sector activity. Species-area relationship (SAR) models are a common approach to study the response of species to the loss of habitat area (Arrhenius, 1921; Brown and Lomolino, 1998). The SAR is one of ecology´s few laws. It considers the area as the only explanatory variable for the number of species in a region. The SAR assumes that the number of species is mainly determined by habitat size, that is area, and that the habitat is uniform and continuous. Hence, when using these models, land use change is only represented by habitat loss, and so may fail to capture correctly those situations where land use change cause habitat modification instead of real habitat loss. Alternative forms of the SAR, such as the multihabitat SAR, have been developed in order to address this problem. These models include not only area but also habitat information. Pereira and Daily (2006) proposed in 2006 the countryside SAR model. The countryside SAR is up until date the model that provides more fine-tuned analyses of species responses to habitat change since it integrates the differential use of habitats by the different species, which leads to a better fit of the model to empirical

data (Pereira et al., 2014).

This work provides important insights into the linkages between economic activity and biodiversity loss. In an increasingly globalized world there is a spatial disconnect between production activities and the final consumer (Hertwich, 2012). Understanding how consumption drives biodiversity loss due to land use change can provide new pathways for biodiversity conservation.

References

Arrhenius, O., 1921. Species and Area. J. Ecol. 9, 95-99.

Brown, J.H., Lomolino, M.V., 1998. Biogeography. Sinauer Associates, Sunderland.

EC, 2010. Europe 2020 - A strategy for smart, sustainable and inclusive growth.

EC, 2011. Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (No. COM(2011)244 final). European Comission, Brussels.

Hertwich, E., 2012. Biodiversity: Remote responsibility. Nature 486, 36-37.

Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., Geschke, A., 2012. International trade drives biodiversity threats in developing nations. Nature 486, 109-112.

Pereira, H.M., Daily, G.C., 2006. Modeling biodiversity dynamics in countryside landscapes. Ecology 87, 1877-1885.

Pereira, H.M., Ziv, G., Miranda, M., 2014. Countryside Species?Area Relationship as a Valid Alternative to the Matrix-Calibrated Species?Area Model. Conserv. Biol. 28, 874-876.