

Looking at the supply chains from producer to consumer responsibility. (Water) Footprints at the micro and meso scale in Spain

Extended Abstract ESEE (600-1200 words)

The footprints of production and consumption have been widely computed and discussed in the literature of input-output (IO) with different treatment of responsibilities (Gallego and Lenzen, 2005; Hoekstra and Janssen, 2006; Ipek Tunç et al., 2007; Lenzen, 2008; Lenzen et al., 2007; Marques et al., 2013; Marques et al., 2012; Rodrigues and Domingos, 2008a, b; Serrano and Dietzenbacher, 2010). Among the key issues to obtain coherent measures we find for example the question of imports assumption, which deals with how imports are computed (whether the same domestic technology is assumed for them, or bilateral or multilateral trade is accounted). The possibilities of taking a producer, a consumer or an income based approach have also contributed to methodological and ethical discussions in accounting for responsibility. But also the theoretical and “fair” link or share between them has been widely discussed in the studies above. Our focus here follows from this discussion but focuses more on the spatial links. Consumption and production impact differently the environment and society at different spatial and temporal scales. Often local to global links are not accounted, and hence the levels of spatial aggregation play an important role. The importance of those links, together with the importance of interregional trade and ecological flows, gives increased importance to assigning, tracking and identifying responsibilities at intermediate sectoral levels, and at the specific localization of production and consumption. This link of top-down and bottom-up approaches, tracking the economic and virtual water flows involved, identifying specific hotspots of environmental impact on production and consumption is the main contribution of this work.

In the past years, we have combined the information of a multiregional input-output (MRIO) model for the 17 Spanish regions (plus the regions of European Union and Rest of the World) with GIS and micro data to lower the spatial scale, especially in order to provide information at the level of local municipalities. This implies that we are able to localize the information of impacts and water footprints in origin with the business level data. But also, as the main advancement in this work, also to localize the final demand further (mainly of the consumers), i.e., at the destination, and link the supply chains, impacts and responsibilities from producers to consumers. This has led us to perform specific applications, such as the influence of regional consumption (and particularly of tourists) on localized vulnerable and ecologically sensitive areas of other regions.

To complement the information of the MRIO model, we use several national, regional, municipal and city/village level statistics. The information of impacts and water footprints, is localized in origin with the business level data (SABI, 2013) and agricultural land cover data (EEA, 2007). The main sources of data for tourism in Spain are the Institute of Tourism Studies (EGATUR, FAMILITUR) and the Tourism Satellite Accounts for Spain (TSA, which can be reached from the National Statistics Institute, NSI). From this institute and the regional ones, we also get the total of final demand from the domestic and foreign tourism expenditure by Autonomous Region (AR) of destination. We also obtain great sectoral detail of expenditure by residents and non residents for the ARs of Andalusia

(IEA, 2010), Balearic islands (Balears, 2008), Canary islands (Canarias, 2004) and Galicia (IGE, 2001, 2010). The travel and overnight stays by AR and province of origin and destination, distinguishing by hotels, rented housing, own housing and other types of housing. The Census of Population and Housing (INE, 2014) is used to distinguish between residents and non-resident/visitor population (by provinces, municipalities and cities/villages), making use of the distinction between main and secondary houses.

The main type of results obtained are on embodied blue and green water footprint of households and of tourism (distinguishing domestic and foreign) per municipality, and their link to the origins of production, where the main ecological impacts take place. In the results we show the very different distribution of impacts of domestic households, national and foreign tourism. The highest classification of $1.9\text{hm}^3/\text{km}^2$ per year only appears in the figures for households, since obviously the impact takes place throughout all the year. It shows essentially great conurbation areas of Barcelona, Madrid, the Basque country and Valencia.

The maximum concentration of water footprints occurs for foreign tourism, compared to the more distributed ones of households, and particularly of national tourism. The main hotspots (in orange and red) are quite logically located at the coastal (especially eastern and south) areas, main islands such as Mallorca (in the northeastern Balearic islands), Tenerife and Las Palmas (in the southeastern Canary islands), Madrid and a few municipalities in the north. In general also the tourism in the islands, even when the volumes in terms of number of tourism might be of the same magnitude than other peninsular municipalities, usually entail large water footprints. The reason is the usual higher expenditure (in this type of consumption) per capita. Truly a huge part of this expenditure takes place transport, travel agencies, and even other (financial, insurance) services, which are low water intensive directly, but they are not negligible in terms of embodied volumes.

The more spread out location of the (blue and green) water footprint of national tourism. It results in a more widespread distribution of footprints across municipalities. We may observe a smaller concentration in the coastal areas than foreign tourism, but also a much stronger distribution around the municipalities of the main cities, especially around the central region of Madrid. This may be due to the fact that the national (domestic) tourism within Spain has the behavior of “beach and sun” type, but also it is popular the destination and type of expenditure of “mountain”, “rural weekend” or “family village” type.

These analogous results are provided as an Appendix for each of the Spanish municipalities with more than 20,000 inhabitants (representing respectively about 69%, 59% and 40% of the total WF of households, foreign and nation tourism in Spain).

All in all, it is emphasized the importance of IO studies in analysing the macroeconomic structures of regions and the ecological impacts associated with domestic final demands and trade, and in particular of consumption and even more specifically of a type of consumption, tourism, allowing us to conclude that, in order to avoid or minimize impacts on water and other resources, we must consider technological options, industrial demands, trade patterns, and the lifestyles of citizens and their particular behavior as tourists, directly and indirectly.

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