A disaggregated MRIO model for the Ebro River Basin (Spain)

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A previous study about the Ebro Delta Environmental Flows, which considers only two regions (Aragon and Catalonia), revealed us the existence of a seed of water-conflict between these regions of the Ebro River Basin. That previous work suggests the need of analyzing the water flows and water needs between all the regions in the basin. This encouraged us to study the water-related environmental issues from a basin perspective.
To assess water uses and to get a deep socio-economic and environmental view, the present work aims to construct a multiregional input-output (MRIO) model for the whole Ebro River Basin and linking it with Geographical Information Systems (GIS). In this way, the environmental impacts will be identified much more concretely, and the river can be treated as a water stream. In other words, we will be able to identify the pollution hotspots and quantify the environmental damage in concrete areas as well as along the water stream. In addition, being able to recognize the river and its tributaries as a water stream allows to simulate more realistic scarcity scenarios.
The Ebro River runs for 565 miles (910 km) in a south-easterly direction across northeast Spain to its delta on the Mediterranean coast midway between Barcelona and Valencia. It has the largest discharge of any Spanish river, and its drainage basin, at 33,000 square miles (85,500 square km), is also Spainâ€™s biggest. The Ebro River Basin (ERB) provides water to more than three million people in more than 1,700 towns and villages. The basin is characterized by high levels of evaporation and evapotranspiration, and low, irregular rainfall. Another main feature about this basin is that it contains, partially, nine autonomous communities of Spain: Aragon, Cantabria, Castile la Mancha, Castile-Leon, Catalonia, Valencian Community, La Rioja, Navarre, and Basque Country. So, the developing of its input-output table (IOT) implies to construct a MRIO table.
This integrated table and the associated model would be the first for this large region. The main data, for 2010, come from the Regional IOTs obtained from the Regional Statistical Institutes of each autonomous community (updated and harmonized to 2010 using the GRAS algorithm), the Spanish interregional trade (c-intereg) database and the Environmental Satellite Accounts from Spanish Statistical Institute. The regions are not completely in the basin, so, we approach the part of each of the sectors that are inside the basin with data from â€œAnalysis System of Iberian Balancesâ€• database (SABI in its Spanish acronym). With this, we pass from the administrative borders to the physical one for the whole basin. However, we maintain the administrative borders inside the basin for our analysis. This allows us to obtain a more detailed interregional analysis as well as to gain in accuracy when disaggregating the primary sector. Moreover, we will be able to study some conflicts scenarios between regions.
The main contribution of this work is the elaboration of a MRIO table for a basin which is not conformed by complete administrative regions. Due to our interest in water, we have disaggregated the most water-related sector: primary sector has been disaggregated into 36 crops (18 irrigated and 18 rainfeed) and 6 livestock groups using data from MAPAMA (Ministry of Agriculture, Livestock, Fisheries and Environment of Spain). As the effects in water resources are usually located in small and specific areas, and MRIO models usually inform about environmental impacts at a country or regional level only, we propose to extend the MRIO model with GIS layers using ArcGIS software. In this way, we will be able to estimate the water footprint for specific hotspots in the water stream and to propose and analyze scarcity scenarios. We will also analyze and plot water-yield and water-scarcity maps at municipality level.
Meanwhile, we have also developed a hydro-economic model for the Ebro River Basin. For this model, using the information contained in the MRIO table we design different cost and revenue functions for each crop and for each region. Moreover, the MRIO table will also be useful for several

applications, such as the calibration of a computable general equilibrium (CGE) model. In fact, we are working on linking the CGE with the Hydro-Economic Model.