The requirements of water to feed a megacity: explorations for Mexico City with a multi-regional input-output database

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The continued urbanization process characterizing the global economy challenges the adequacy of consumption patterns with respect to the conditions of ecological sustainability, already deeply compromised in the 21st century. In particular, the satisfaction of the urban demand for food usually requires complex supply chains spanning large distances and involving several industrial activities, from large-scale agriculture and food processing to retail and several kinds of services for food preparation. Global agriculture famously claims about 70% of the global demand for water and has been described accordingly as the strongest driver for stress and scarcity of the worldâ€™s water. This dynamics, however, is only a response to the complex task of satisfying the particularities of consumption patterns of an increasingly urban global population. Therefore, any promotion of water sustainability requires a sound understanding of the links between water demand and availability, food production, trade, and consumption patterns of increasingly urbanized economies.

This paper explores these links for the case of Mexico City and the Mexican economy. Housing 22 million people, the metropolitan area of Mexico City is the worldâ€™s fifth largest, and satisfying its food demand requires a productive effort of macroeconomic scale. The paper estimates the national demand of water associated with this productive effort. To do so, the paper first defines Mexico Cityâ€™s demand for food products and estimates both its magnitude and its distribution across the 32 Mexican states. That is, the exercise first represents the urban demand for food in an input-output model by selecting the relevant activities in the Mexican industrial classification, which is also used in North America and very similar to international standards. Then, it describes the national supply chains that become active to generate the required output, and estimates its water requirements at the state level. This procedure allows to not only provide an aggregate figure for the volume of water required to satisfy the cityâ€™s food demand, but also to distinguish the places of origin at the state level within Mexico. Finally, to assess whether these water requirements contribute to local scarcity, the paper looks at their relationship with the local situation of water availability or stress.

In terms of methodology, the paper features an environmentally-extended input-output computation with a multi-regional input-output (MRIO) database defined for Mexicoâ€™s 32 states. Recently produced by the Mexican office for statistics, this database describes the structure of the Mexican economy as of 2013 at the state level with 79 products. To account for the urban scale, the paper benefits from the definition of Mexico City as one of the countryâ€™s states in the MRIO, although it adjusts the database to include the neighboring municipalities that complete the metropolitan area. The environmental extension of the MRIO consists of data from Mexicoâ€™s water agency estimating the water requirements for each of the 79 products in each of Mexicoâ€™s states, and data also describing the economically relevant availability of water. Finally, the paper discusses the possibilities and the limitations of Mexicoâ€™s new multi-regional database to describe the links between water, food and cities with a standard application of input-output methods.