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Food vs water security in cities: A georeferenced sustainability assessment of peri-urban agriculture in metropolitan Barcelona using water vulnerability maps.

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The Fitness Check on EU water legislation concluded that there is a need to integrate water issues into other policies such as those related to urban planning. The increase of population in urban areas is expected to raise urban food demand about 50% to 60% globally by 2050. This intensifies the use of water for irrigation purposes as urban planners implement peri-urban agriculture as a way to increase food security and protect ecosystem services from urbanization. If not properly planned, urban and peri-urban agriculture can result in increasing pressures over water resources, such as aquifer depletion or nitrate pollution which impact the overall status of the water bodies. As cities start promoting local agriculture, it is important to provide policy makers with tools to determine the impacts of food production on water resources, from a geo-referenced, systemic water-energy-food perspective.

In this work, we propose a method for the regionalized assessment of the tradeoffs between peri-urban food production potential and the associated impacts over water resources and apply it to the Metropolitan Area of Barcelona (AMB). AMB is the most populated urban area of the Mediterranean coast and sixth in Europe. With over 5 million people, the AMB only produces between 7% and 10% of its food demand and the new Metropolitan Urban Master Plan (PDU) scenarios foresee a growth in agricultural land of up to 20%.

The method we propose includes three stages. First, we map peri-urban agricultural land uses available from the local land use classification by CREAM and reclassify them to Copernicus' CORINE land cover taxonomy in order to facilitate replicability and comparability of results. Second, we use the Water Framework Directive water body status index (high, good, moderate, poor, bad) to create physical vulnerability maps of water bodies. Third, we study how water use relates to water impacts using the vulnerability maps. Following this method, we assess the water-

food tradeoffs for four scenarios of agricultural land change, classifying agricultural land according to their food supply potential and water impacts. This method can be used to assess agriculture in other metropolitan regions.

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