Are we at a watershed? An integrated assessment model for Italy

Topic: Special session: From Basins to Planet: Unraveling Water-economy Interactions across Scales with MRIO Models
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As global warming intensifies, the availability of water poses an increasing challenge for countries such as Italy. Italy's socioeconomic structure places significant pressure on domestic and international water resources, especially through imports. In 2014, more than half of Italy's total water footprint (WF, 126,453 MmÂ³) was sourced from abroad. The agricultural sector is the largest contributor, accounting for 78.6\% of the WF---70.9\% domestically and 83.7\% externally. As climate change concerns grow, efficient water management is crucial, yet research often overlooks the complex interactions between socio-economic factors and water resources.

To address this gap, we extend the EUROGREEN (D'Alessandro et al., 2020; Distefano and D'Alessandro, 2022) model by integrating a new hydrological module that explores the water-economy nexus.
EUROGREEN combines Post-Keynesian macroeconomics and ecological economics into a dynamic macro-simulation model that enables the assessment of various scenarios and public policies regarding their social, economic, and ecological impacts. Among other applications, it has been utilized in France to evaluate the relative merits of green growth, social equity policies (similar to those of the Green New Deal), and degrowth, focusing on the evolution of key variables~\autocite{dalessandro_feasible_2020}. The economy is demand-driven, with factors of production not fully utilized. The investment function depends on the capacity utilization gap, profit rate, depreciation rate, and an autonomous component that does not enhance capacity, which has been identified in the literature as essential for addressing Harrodian instability. The model integrates financial and real sectors through a portfolio model that reflects the demand for financial assets among the population, segmented into 13 groups based on skill levels and occupational status to analyze the distributional impacts of various public policies. Additionally, the model employs input-output methodology using WIOD tables to disaggregate production across ten sectors, specifically modeling the two industries within the energy sector (fossil fuels; electricity and gas). It incorporates endogenous technical change that influences the technical coefficients of each industry.

The new module evaluates feedback loops and the effects of policy measures on both water and economic outcomes, providing a comprehensive view of their interdependencies. The model introduces an Extended Water Exploitation Index (EWEI), considering variations in water stress by fully accounting for grey water demand and supply constraints. We present initial results from a base scenario and several alternatives, analyzing the impact on agricultural productivity, industrial output, and regional water scarcity.
A sequential scenario strategy is employed in formulating the narratives, facilitating the isolation of impacts attributable to each distinct hypothesis and appraising their cumulative effects. Specifically, each successive scenario is presumed to encompass all preceding hypotheses in addition to introducing a novel singular condition. This methodological approach allows us to isolate the effects of introducing a single new assumption, thereby precluding spurious interpretations. We compare the business as usual, with a scenario with climate damage induced by the RCP 6.0 scenario and another in which the Government invests in adaptation strategies and water efficiency.

The base scenario suggests that endogenous growth and climate change could exacerbate water stress, underscoring the need for integrated water management strategies to ensure socioeconomic

stability. However, it appears that similar low EWEI may be induced by climate damage that affects agricultural activities or by a scenario in which damages are recovered by public investments paired with improvement in water efficiency.