

A theoretical model of virtual water trade under increasing water scarcity conditions

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This paper proposes a virtual water trade model to obtain a better understanding of how hydro-climatic change affects societies through changes in virtual water trade. In previous studies it has been shown that global trade patterns can be influenced by water scarcity and vice-versa. The extent to which this relationship holds is still a topic under discussion. With the model introduced in this paper, the dynamics behind these trade patterns are further explored.

First, a model is constructed of a society suffering from an increase in water scarcity. This model is shown to be capable of replicating patterns of technological, population, production and consumption per capita changes. In order to incorporate the effects of globalization and trade, the model has been extended to a toy model of virtual water trade between two societies. The two societies are represented by overlapping generations models. The individuals of each generation provide the labour needed for the production of the composite goods. In addition to this labour, water and technology are also incorporated as factors of production. There are two goods being produced; one is labour intensive and the other water intensive. Trade emerges from the principle of comparative advantage, with differences in labour-abundance and water resources availability between the two societies.

Using this model of two societies interconnected by trade, it is examined how trade of water-intensive commodities alters under changing scarcity conditions. In particular we explore the conditions under which trade emerges, and to what extent. Furthermore, we present the conditions for the sustainable development within these two societies.