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VIRTUAL WATER: HIDDEN FLOWS AND THE ILLUSION OF SELF-SUFFICIENCY

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Abstract

Water is consumed not only in drinking and washing but, in vastly greater quantity, in the production of food and goods, and when those goods are traded, the water used to make them is in effect traded too. This paper examines the concept of virtual water, the water embodied in traded commodities, and draws out its implications for how water scarcity should be understood and managed. It argues that virtual water reveals a hidden geography of water flows that the conventional, territorial view of water resources entirely misses, and that this hidden geography matters profoundly for water-scarce regions. By importing water-intensive goods, above all food, a water-scarce country can in effect import water, relieving the pressure on its own limited supplies, and the global trade in agricultural commodities accordingly constitutes a vast, unplanned redistribution of water from where it is abundant to where it is scarce. The paper argues that this insight undermines the ideal of national water self-sufficiency, reframes food policy as water policy, and complicates the measurement of water scarcity, since a country's water position cannot be read from its territorial resources alone. It concludes that virtual water is an indispensable concept for any serious reckoning with water scarcity in an interconnected world.

Keywords: *virtual water; water footprint; trade; water scarcity; food security*

1. Introduction

The water a person drinks is a trivial fraction of the water a person consumes. The overwhelming share is consumed indirectly, in the production of the food they eat and the goods they use, for it takes vast quantities of water to grow a crop or raise an animal. This simple fact has a profound consequence that the conventional view of water resources overlooks: when a commodity is traded, the water used to produce it is, in effect, traded along with it. This embodied water has come to be called virtual water, and the concept opens a hidden geography of water flows invisible to the territorial accounting that dominates water policy. This paper examines virtual water and its implications, and argues that it is indispensable to understanding water scarcity in a world knit together by trade.

The paper first introduces the concept of virtual water, then traces the hidden geography of water flows it reveals, then draws out the consequences for self-sufficiency and for the measurement of scarcity, and finally considers the concept's significance for water-scarce regions. The treatment is conceptual, drawing on the scholarship that introduced and developed the idea.

2. The concept of virtual water

The concept of virtual water arose from reflection on how water-scarce regions nonetheless meet their needs. Its originating insight is that the water required to produce a commodity, the water evaporated and transpired in growing a crop, for instance, is embodied in that commodity, so that trading the commodity amounts to a virtual transfer of the water used to make it (Allan, 1998). A tonne of wheat embodies the large quantity of water consumed in growing it; to import that tonne of wheat is, in water terms, to import that quantity of water, saving the importing region from having to supply it from its own resources. The water is virtual rather than literal, in that it does not physically move, but its effect on the water balance of the importing and exporting regions is real: the importer is spared the water it would have needed to produce the good, and the exporter has committed that water on the importer's behalf. The concept thus makes visible a transfer of water that the physical accounting of rivers and aquifers cannot see, because the water moves not as water but as the goods it produced (Allan, 1998).

3. A hidden geography of water

Pursued across the whole of international trade, the concept of virtual water reveals a hidden geography of water flows of enormous scale. The water embodied in the food and goods that nations trade, their water footprints, constitutes a vast movement of virtual water around the world, flowing, with the commodities that carry it, from regions that produce water-intensive goods to regions that consume them (Hoekstra & Chapagain, 2007). Because agriculture is overwhelmingly the largest consumer of water, and because food is heavily traded, the global food trade is the principal channel of this virtual-water flow, and it amounts to a continual, if unplanned and unrecognised, redistribution of water across the globe. This hidden geography does not always run from the water-rich to the water-poor in a tidy way, for trade is driven by economics and politics rather than by water, and water is sometimes exported, embodied in crops, from regions that can ill afford to lose it. But its existence transforms the picture of global water: no region's water situation can be understood in isolation, because every trading region is linked to others through the virtual water embodied in what it buys and sells (Hoekstra & Chapagain, 2007; Allan, 1998).

4. The illusion of self-sufficiency and the puzzle of scarcity

This hidden geography has two consequences that unsettle received ideas. The first concerns the ideal of water self-sufficiency. Many water-scarce regions have pursued the goal of producing their own food, treating dependence on food imports as a vulnerability to be avoided, and have strained their limited water to grow water-intensive crops at home. The concept of virtual water exposes the water cost of this ideal: to insist on growing one's own food in a water-scarce land is to commit scarce water to a purpose for which the world's water-rich regions are far better suited, and to forgo the water that importing food would save. For a water-scarce region, importing

water-intensive goods is, in water terms, often the rational course, and the pursuit of self-sufficiency an expensive illusion that squanders the resource it is meant to protect (Allan, 1998). The second consequence concerns the measurement of scarcity. If a region can relieve its water scarcity by importing virtual water, then its water position cannot be read from its territorial water resources alone, and the volumetric scarcity indicators that count only a region's own water give an incomplete, even misleading, account of how scarce its water effectively is (Rijsberman, 2006; Hoekstra & Chapagain, 2007). A water-scarce country well connected to global food markets may be far less constrained than its physical resources suggest, while a water-rich country exporting its water in crops may be depleting a resource its favourable indicators conceal.

5. Significance for water-scarce regions

For water-scarce regions, the practical significance of virtual water is considerable. It reframes food policy as, in large part, water policy: decisions about what to grow, what to import, and whether to pursue food self-sufficiency are, viewed through virtual water, decisions about how to allocate the region's scarce water, and they ought to be made with that water cost in view. It suggests that trade can be an instrument of water management, allowing a region to relieve its water scarcity by importing the water-intensive goods it cannot efficiently produce and reserving its own water for higher-value or essential uses. And it cautions against reading a region's water security from its territorial resources alone, directing attention instead to its whole water position, including the virtual water it imports and exports. None of this makes virtual water a panacea, for reliance on imported food carries its own risks, and the global redistribution of virtual water is shaped by an economics indifferent to water scarcity. But it makes virtual water an indispensable element of any serious reckoning with water scarcity, one that the territorial view, for all its familiarity, cannot supply (Allan, 1998; Hoekstra & Chapagain, 2007; Rijsberman, 2006).

6. Conclusion

Most of the water people consume is embodied in the food and goods they use, and when those are traded the water is virtually traded too. The concept of virtual water reveals a hidden geography of water flows, running with traded commodities from regions that produce water-intensive goods to those that consume them, that the territorial accounting of water resources cannot see. This hidden geography undermines the ideal of national water self-sufficiency, reframes food policy as water policy, and complicates the measurement of scarcity, since a region's effective water position depends on its trade as well as its territory. In a world knit together by the trade in water-intensive goods, no region's water can be understood in isolation, and virtual water is the concept that makes the connections visible. For the reckoning with scarcity that the coming century demands, it is indispensable.

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