

VIRTUAL WATER¹ AND OCCAM'S RAZOR

Until then I had thought each book spoke of the things, human or divine, that lie outside books. Now I realized that not infrequently books speak of books: it is as if they spoke among themselves.

Umberto Eco *The Name of the Rose*

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Introduction

In 2001 Professor Tony Allan of the University of London's School of Oriental and African Studies saw published his magnum opus entitled *The Middle East Water Question: Hydropolitics and the Global Economy*. The book marks the final step in his long march from geography to the politics of water resources. It also provides the most complete statement of his views on the rôle of virtual water in linking regions of water scarcity with regions rich in water. In fact, his main interest is the Middle East and North Africa (MENA). The concept of virtual water¹, virtually synonymous with Allan's name, has been taken up increasingly widely in recent years and the time is ripe for a critical review of its relevance to our understanding of the manner in which the water needs of semi-arid countries are met. Such a review is the object of this paper. Section two below provides a résumé of the main propositions of the virtual water thesis. Section three deploys the main critique. Section four introduces Occam's razor. Section five presents my conclusion.

Before getting under way it is worth noting that the disciplinary foundation of this paper is philosophy. So a useful philosophical convention will be used. Whenever I am discussing a concept, the word will be placed in single inverted commas. For example:

"Spinoza tells us that the concept *Ædog*¹ cannot bark".

Whenever I refer to the thing or activity to which a concept such as *Ædog*¹ refers, there are no inverted commas. For example:

"Hagrid's dog Fluffy barked without ceasing".

Two other features of a philosophical paper are worth noting. First, philosophers within the English tradition are primarily concerned with the relation between language and truth, so they commonly write in a dense and compact style where the text needs to be read at a measured pace to be understood. Second, non-philosophers may take the view that philosophy is merely rhetorical quibbling, nothing but words, words, words. My view is different. Water resources management has traditionally been founded on engineering and hydrology - with a history of immense achievements. But we now recognize that social and environmental scientists should ally themselves with the hydrologist and the engineer in the challenges that the future holds for us all. This requires that political scientists and economists, for example, develop an appropriate language for their work. They are now in the stage where such a language is still in the furnace. The role of philosophy is to assist in the forging of this new language, in which the objects of criticism may be water *Æefficiency*¹ in irrigation or water *Ædemand*¹ in urban planning or virtual water¹ in global trade or the

contingent value¹ of a buttercup. In a nutshell, the successful advance of science is critically dependent upon progress in its language.

A water deficit resolved

A brief, neutral statement of the virtual water thesis is set out in this section, beginning with Allan's concept of a region's water deficit¹.

CERegion¹ here refers to any relevant geographic area including a country, a province or a catchment.

For any region it is possible to estimate whether or not it suffers from a water deficit in the sense that there is not enough surface water, ground water and soil water to meet the domestic, industrial, municipal and food needs of its population¹ (T.Allan pers.comm.) In the specific case of what will be referred to as Region A, its surface water, groundwater and soil water are insufficient to meet the needs described above. This shortfall of supply with respect to need is Region A's water deficit (Allan 2001: 30).

In fact the needs of households and industry can and are comfortably met by regional supply. It is the crop water requirements of food self-sufficiency that are impossible to satisfy. As a consequence the water deficit is resolved by the import of virtual water from Region B. Virtual water¹ refers to the soil water sourced by precipitation and irrigation that meets the crop water requirements of the food grown in Region B that is subsequently exported to Region A. Region A's imports of such food are sufficient, alongside domestic production, to meet entirely the food needs of its population.

To indicate the scale of these virtual water imports, we can take the example of wheat. One tonne of exported wheat requires about one thousand tonnes of virtual water (Allan 2001: 106, 126). Less than 0.1 per cent of the virtual water is physically embedded in the food grains themselves. During cultivation in Region B, more than 99.9 per cent of the virtual water returns to the irrigation cycle as farmland drainage or is lost in evapotranspiration. As Allan writes (2001:106):

At the 1000 tonnes (cubic metres) of water per tonne of grain estimate of water content the [MENA] regional imports of virtual water by the mid-1980s were equivalent to the annual flow of the Nile into the Egyptian agricultural sector.

A critique of the virtual water thesis

Allan's thesis summarized in section two is, I suggest, flawed in a number of ways. The critique will be set out with respect to the use of the term virtual water¹, the import of virtual water and, finally, the farm sectors of Regions A and B.

Virtual water. In everyday English we use the word CEvirtual¹ (as in virtual reality¹) to mean something parallel to or imitative of a real-life entity or process. But Allan's virtual water¹ does not do this. This is because virtual water is real water; it is the soil water of Region B used in meeting the crop water requirements of that Region's food exports. This neglect of a well-established linguistic routine has the result that the central concept of the argument, virtual water¹, is not virtual in any

sense. It is not good science to build theory on terms that are inherently misleading.

The import of virtual water. In *The Middle East Water Question: Hydropolitics and the Global Economy* we repeatedly read that virtual water is imported into the MENA region. So one expects to see each single ship carrying a full cargo of wheat, maize or rice imported from the wide world and heading for the sunlit harbours of the Mediterranean and the Red Sea to be followed by one thousand additional ships each carrying in its hold a full cargo of the virtual water used for the imports' crop water requirements. A magnificent sight - but one we are unlikely to witness in our time. It is as if, having identified a water deficit in Region A, virtual water must be imported to eliminate it. It may be that Allan does not wish us to believe literally that this happens. Clearly propositions of the type "water security for the MENA region is achieved by virtual water imports" are false, and as misleading as the tabulation of 40 billion cubic metres of cost-free water transported into the region each year (Allan 2001: Table 2.1). But if such statements are, indeed, merely metaphorical, they cannot at the same time be read as part of a scientific argument on international trade in food and water.

Farming in Regions A and B. When one approaches agriculture from the perspective of water resources there is a danger that the experience of farming is seen largely with respect to its crop water and net irrigation requirements. As a result, a more rounded vision is lacking, one that understands that the water theme is only one amongst many, such as soil characteristics, land rights, labour skills, pest control, farm budgets and product markets. Consequently, if we use the term the import of food¹, this opens up major questions rendered invisible by the import of virtual water¹. Have food imports led to higher population birth rates in water deficit regions than would have occurred in their absence? Do food imports weaken the farm sector of the importing country? Do food imports open the importing country to political control from the exporting country? Will the importing country be able to maintain its foreign exchange expenditure on food imports in the long run? Finally, if food imports are subsidized when they are shipped from the European Union and North America, will these subsidies be maintained in the long term?

Occam's razor

So we come to William of Occam, a Franciscan scholar and Aristotelian philosopher who lived between circa 1295 and 1349, the year of the Black Death. He took part forcefully in the great debates of his time on the poverty of the clergy and on transubstantiation and was excommunicated by Pope John XXII in 1328. Bertrand Russell writes of him:

Occam is best known for a maxim which is not to be found in his works, but has acquired the name of Occam's razor¹. This maxim says: Entities are not to be multiplied without necessity.¹ Although he did not say this, he said something which has much the same effect, namely: It is vain to do with more what can be done with fewer.¹ That is to say, if everything in some science can be interpreted without assuming this or that hypothetical entity, there is no ground for assuming it. I have myself found this a most

fruitful principle in logical analysis.

(Russell 1996: 462-3)

I now wish to explore whether Occam's razor can properly be applied in excising two of Allan's core concepts: virtual water¹ and the import of virtual water¹.

Virtual water¹. This term can be replaced by the crop water requirements of food exports¹.

The import of virtual water¹ can be replaced by the import of food¹.

More generally, the huge economic, political and social processes that are addressed by Allan in the terminology already described can be reset in a world where semi-arid (and other) regions do not have the capacity to feed their populations and so import food. These imports mean that less production and therefore less water is required in these regions¹ irrigated agriculture. Regional politicians may deflect attention from such dependence; the availability of imported food allows them both to postpone new water supply initiatives and to delay difficult decisions about the demand management of their water resources.

Conclusion

In this paper it is argued that:

... Virtual water¹ refers to real water - there is nothing virtual about it.

It denotes the crop water requirements of food exports.

... The import of virtual water¹ is a metaphorical term, not a scientific one, and its use leads to statements that are plainly false. It denotes the import of food.

... In its policy applications, the import of virtual water¹ leads to a neglect of the current and future status of the agricultural sectors of the countries importing and exporting food.

My conclusion is that water resource researchers and policy-makers should apply Occam's razor to the virtual water thesis.

References

Allan, T. (2001) *The Middle East Water Question: Hydropolitics and the Global Economy*, London: Tauris.

Russell, B. (1996) *History of Western Philosophy and its Connection with Political and Social Circumstances from the Earliest Times to the Present Day*, London: Routledge.