Institution:
King's College London

Unit of Assessment:
UoA 17

Title of case study:

Virtual Water: the conceptual transformation of public and private sector water policy and metrics

1. Summary of the impact

The virtual water concept is used to identify and quantify water use which is hidden, or embedded within the production and supply of food and other commodities. Its primary application has been to demonstrate that the majority of water consumed globally is used within the production and trade of food. Introduced and developed by Allan, virtual water research has transformed public and private sector water policy and its metrics in the UK and internationally. Instantiated through conceptual work published in 1993 and 1994 and developed through empirical studies thereafter, virtual water was widely adopted by 2000. The idea is now accepted as an essential element in the framing of policy on water security and its economic systems. Virtual water has been increasingly deployed by advisers to governments, corporations and NGOs, below we provide evidence from the U.S. State department, Coca Cola, WWF and the World Economic Forum, this is by no means a complete list. In 2011 the UK House of Lords and UK government's official response urged the EU Commission to incorporate virtual water in EU Policy. In recognition of the global conceptual impact of virtual water, Tony Allan was awarded the Stockholm Water Prize, 2008. In 2013, in recognition of impact made in preceding years through his virtual water concept and research Allan was also awarded the Foundation Prince Albert II de Monaco Water Award and the International Environmentalist Award of the Florence-based Fondazione Parchi Monumentali Bardini e Peyron.

2. Underpinning research

The conceptual shift achieved by virtual water within the fields of water and food security, water management and international trade research has been the result of more than fifteen years of concerted research and strategic engagement effort. Virtual water was proposed by Allan as a theoretical concept to policy-facing and academic audiences in 1993 and 1994 respectively (Refs. a. and b.). Allan developed the concept further through long-term empirical engagement on water management, water politics and economics with a focus on Middle Eastern and North African countries. Allan's policy and water systems research discovered and articulated the fundamental observation that where the large majority of national water budgets accrue to the agricultural sector, countries effectively manage water insecurity through import water in the form of food, thereby reducing dependency on national water resources. Allan has since used the virtual water concept to explain the absence of politicization in the shift from water and food self-sufficiency and increasing dependence on global food trade systems as demographically driven water demand increases. The virtual water concept is now accepted globally by business, academics, NGOs, practitioners and governments.

Allan's research was developed alongside a committed engagement strategy of exchange with public authorities, private companies and water managers at local and national scales. This has been a long-term process and continues today: most recently in the publication of *Virtual Water* (Ref.c) which consolidates interdisciplinary work explored through more than 100 publications over the last two decades on the water resource security of water scarce economies around the globe (Ref. d). The quality of Allan's research is indicated further by the range of funding it has attracted, reflecting a consistent strategy to derive research funding that is close to policy influence so as to enable engagement within research planning. Funders include the World Bank, FAO, and the UK government including DFID and DEFRA. Awards from institutions to target specific research questions include grants from SOAS, University of London, King's College London and the University of Warwick.

The academic reach of Allan's concept is indicated by virtual water being attributed to Allan by the science community and the academy through the Stockholm Water Prize, as well as hundreds of publications and popular press articles. Most recently, the virtual water concept has underpinned research into developing metrics for water-footprints, as explained by the World Wild Life Fund:

> "The foundation of water footprint is the concept of virtual water, a term coined by Professor Tony Allan in early 1990s (Allan 1993; 1998) who recognised that importing wheat to the Middle East would be a way to relieve the pressure on scarcely available domestic water resources…" (Ref. e:9)

This has significantly contributed to the still growing influence of virtual water on both research and policy communities.

3. References to the research

Where a doi / url is not supplied, a hard copy is available if requested.

(a) Allan, J.A. (1993). 'Fortunately there are substitutes for water otherwise our hydro-political futures would be impossible' In: ODA, Priorities for water resources allocation and management, ODA, London, pp. 13-26.
(b) Allan, J.A. (1994). 'Overall perspectives on countries and regions' In: Rogers, P. and Lydon, P. Water in the Arab World: perspectives and prognoses, Harvard University Press, Cambridge, Massachusetts, pp. 65-100.
(c) Allan, J.A. (2001). The Middle East water question: Hydropolitics and the global economy I.B. Tauris, London.
(d) Allan, J.A. (2012). Virtual Water: Tackling the Threat to Our Planet's Most Precious Resource. I.B. Tauris, London.
(e) WWF UK (2009). *UK Water Footprint: the impact of the UK's food and fibre consumption on global water resources,* Leatherhead: WWF. Accessed from http://www.waterfootprint.org/Reports/Orr%20and%20Chapagain%202008%20UK%20waterfootprint-vol1.pdf

4. Details of the impact

Virtual water's conceptual impact has been both far-reaching and profound. The concept produced a paradigm shift in how water, the production of goods, trade and water security are understood and used by consumers, industry, governments and NGOs. This impact was acknowledged with the award of the prestigious Stockholm Water Prize, awarded by Stockholm International Water Institute, in 2008. The citation for Allan's award confirmed this global impact:

> "Virtual water has major impacts on global trade policy and research, especially in water-scarce regions, and has redefined discourse in water policy and management… Because of his work, policy makers, scientists, water professionals and the general public have greater awareness of the role of water in the production of different types of products and its impact on global trade and economy. Virtual water remains a central and active component of scientific research and policy formulation, and has empowered individual consumers to affect water management on a global scale". (Ref. i)

The virtual water concept has reshaped how governments, professional bodies and industry, and NGOs understand water usage, security and risk. The concept generated and underpins the related notions of embedded water and water footprint, used to measure virtual water consumption, as the Royal Academy of Engineers and the World Wild Life Fund recognise in reports (the latter acknowledging Allan's development of the concept):

> "The concept of 'virtual' water has become a key concept in the understanding and communication of water issues and how they are linked to international trade, agriculture,

> climate change, economics and politics and is the basis of water footprint assessments being carried out by businesses (such as SABMiller) both in their own direct use and through their value chain." (Ref. ii:28-29)
>
> "When there is a transfer of products or services from one place to another, there is little direct physical transfer of water (except the real water content in the product which is quite insignificant in terms of quantity). There is often, however, a significant transfer of virtual water." (see Reference to the Research above, Ref. v:9)

The U.S. State Department's Intelligence Community Assessment on Global Water Security (Ref. iii) contains 10 mentions of virtual water and concludes: "We judge that, from now through 2040, improved water management (e.g. pricing, allocations, and "virtual water" trade) and investments in water-related sectors (e.g. agriculture, power, and water treatment) will afford the best solutions for water problems."

The UK House of Lords Select Committee on the European Union Agriculture, Fisheries and Environment (Sub-Committee D) Inquiry on EU Freshwater Policy in a 2011 report offered extensive discussion of the concept with 21 references to it, concluding, that the 'virtual water issue requires an EU approach…' (Ref. vi: 24). The UK government's official response to the House of Lords Report reaffirmed the significance of virtual water, agreeing that 'greater recognition of the amount of water used in the products that we consume will be increasingly necessary' and urging the European Commission to 'consider the role of "virtual" water in EU policy, particularly in terms of achieving the objectives of the EU Resource Efficiency Roadmap.' (Ref vii: 1).

The virtual water concept has directly changed government and business policy. A 2012 Report from the Netherlands Environmental Assessment Agency states "On 12 April 2012, the Dutch House of Representatives approved a resolution about the large amount of 'virtual' water imported into the Netherlands. The resolution proposed that the Dutch Government, in its economic policy, will advocate that Dutch enterprises reveal their water footprint as well as reduce this footprint in countries with water scarcity." (Ref viii:4).

The UK House of Parliament Water in Production and Products Postnote (ref viiii:4) highlights the impact of the virtual water concept in businesses: Marks and Spencer are "working with WWF-UK to better manage the water consumed in products sourced from UK farms (such as meat and dairy products), the production of cotton and the import of flowers from Kenya."

Virtual water footprinting has had conceptual and instrumental impact, resulting in global businesses changing their practice and corporate strategy, as reports by Nestlé and Coca-Cola testify:

> "… world food trade indirectly moves considerable volumes of "virtual water" already; today, nearly one-quarter of food trade occurs from water-abundant to water-scarce areas… At a farm level, "virtual water" also offers a good opportunity to improve water use and management through an assessment of the total water footprint of a crop." (Ref. iv: p. 39)
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> "To understand the true extent of the water that is used to make our products we need to understand the water footprint of our whole supply chain. A product water footprint considers both direct (operational) and indirect (supply chain) freshwater use. This includes 'embedded' water – the water used to grow ingredients or produce packaging – in addition to the water used in production and in the drinks themselves." (Ref v: 13)

Virtual water's conceptual and instrumental impact of global reach and scope has changed the way the world thinks about water and its management. The virtual water concept and its measurements enables governments, business, engineers, NGOs and practitioners to better manage the water security of nation states, environmental protection, the sustainability of businesses and global agriculture.

5. Sources to corroborate the impact

(i) Stockholm International Water Institute. *2008 Water Prize statement*. Accessed from: http://www.siwi.org/prizes/stockholmwaterprize/laureates/professor-john-anthony-allan-great-britain/
(ii) Royal Academy of Engineering (2010). *Global Water Security – an engineering perspective*, Accessed from: http://www.ice.org.uk/getattachment/d51f8675-c126-4606-b6ec-165abf6b6dad/Global-Water-Security---an-engineering-perspective.aspx
(iii) Intelligence Community (2012). Global Water Security, and Intelligence Community Assessment for the US State Department, Washington DC: ICA. (ICA 2012-08, 2 February 2012) http://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf
(iv) Nestlé (2010). *Creating Shared Value and Rural Development Summary Report* 2010, Accessed from: http://www.nestle.com/asset-library/Documents/Library/Documents/Corporate_Social_Responsibility/Nestle-CSV-Summary-Report-2010-EN.pdf
(v) Coca-Cola (2011). *Corporate Responsibility & Sustainability Report* 2010/11. Accessed from: http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDIQFjAA&url=http%3A%2F%2Fwww.coca-cola.co.uk%2Fdownloads%2FCCGB_CCE_Corporate_Responsibility_Report_2010_11.pdf&ei=N3FAUZO7Hcqw0AXauIDYDg&usg=AFQjCNHeUSybUKxhWykUqVTEGaypXo4O_A&bvm=bv.43287494,d.d2k
(vi) House of Lords (2011). *Unreserved transcript of evidence taken before the Select Committee on the European Union, Agriculture, Fisheries and Environment* (Sub-Committee D), Inquiry on EU Freshwater Policy, Evidence Session 3, Questions 52-97, 16 November. Accessed from: http://www.parliament.uk/documents/lords-committees/eu-sub-com-d/EUFreshwaterPolicy/ucEUD161111ev3.pdf
(vii). UK Government (2011). *Government response to the House of Lords EU Agriculture, Fisheries and Environment Sub-Committee's conclusions and recommendations*. Accessed from: http://www.parliament.uk/documents/lords-committees/eu-sub-com-d/EUFreshwaterPolicy/freshwatergovresp.pdf
(viii) PBL Netherlands Environmental Assessment Agency (2012). Water Footprint: Useful for sustainability policies? Accessed from: http://www.pbl.nl/sites/default/files/cms/publicaties/pbl_2012_Waterfootprint_873.pdf
(viiii) UK House of Parliament (2011). Water in Production and Products. Number 385. Accessed from: www.parliament.uk/briefing-papers/POST-PN-385.pdf