FOOD ETHICS COUNCIL

sustain
the alliance for
better food and farming

Water labels on food

Issues and recommendations

Ruth Segal & Tom MacMillan (July 2009)

Contents

1. Introduction

In many regions of the world, including parts of Europe, water scarcity will be one of the most pressing environmental, social and economic challenges of the coming decades. Water is used in large quantities to produce the food we eat. The water used to produce an item is far greater than the water contained within it. For instance, one cup of coffee needs 140 litres of water, while the production of one kilogram of beef requires 16,000 litres of water[1]. In order to understand how to reduce our use of water, we need to measure this 'embedded' or 'virtual' water.

The term 'virtual water' is defined as the volume of water required to produce a commodity or service[2]. It was initially used at a national and global level to measure water flows through trade. The concept of a 'water footprint' (WF) developed from the notion of virtual water, and can be defined as the water required to sustain a population or to produce a commodity.[3]

The virtual water in a product can be broken down further by identifying the different types of water used:

- Green WF: the volume of water evaporated from green water resources (rainwater stored in the soil as soil moisture).

- Blue WF: the volume of freshwater that is evaporated from blue water resources (surface water and ground water)

- Grey WF: the volume of polluted water associated with the production of goods and services. (However, the technical definition of grey water is still being debated by academics, and is measured in different ways in different studies).

Although WF was developed to measure the water use of nations, it has thus developed into an indicator that can also convey the extent of both water use and pollution in more specific ways.[4] This enables water use to be considered in relation to water availability.

Using the WF methodology, it has been calculated that agriculture (including food, fuel, textiles) accounts for 86% of worldwide freshwater use.[5] However, there is wide variation across the globe: for instance, agriculture accounts for 24% of water use across the EU as a whole, but as much as 80% for some regions.[6] Other water-intensive sectors include energy production and mineral extraction. Total water use also varies hugely between countries: the USA has an average WF of 2,480 m^3/person/yr whereas China has an average WF of 700 m^3/person/yr.[7] A high WF can be explained by high levels of consumption overall (more likely in industrialised countries); water-intensive consumption (i.e. high levels of consumption of meat and industrial goods); inefficient agricultural practices; and climatic factors.[8] This last factor explains why the UK's WF is relatively low, at 1,245m^3/person/yr.[9]

Water use matters when water is taken out of an ecosystem faster than the system can be replenished by natural processes. This over-exploitation leads to a range of environmental problems, such as decreased river flows, shrinking lakes, and pollution of groundwater sources. This

---

[1] Hoekstra and Chapagain (2007)
[2] Garnett (2008)
[3] Gerbens-Leenes et al (2007)
[4] Gerbens-Leenes, Hoekstra (2008)
[5] Hoekstra and Chapagain (2007)
[6] Collins et al (2009)
[7] Hoekstra and Chapagain (2007)
[8] Hoekstra and Chapagain (2007)
[9] Defra (2008)

in turn means that the local population cannot rely on ecosystem 'services' such as water for basic human needs like drinking and washing, for food production, for maintaining flora and fauna, for controlling erosion and for all kinds of economic and cultural activities.

Therefore, it is not just the volume of water used to produce a product that matters, but how that volume relates to the amount of water available in the place the water was taken from. Once the water needed to maintain the ecosystem has been taken into account, water scarcity can be calculated by comparing the total water extracted from a system with the quantity of renewable water resources.[10] This gives an indication of how water-stressed a location or country is.

WWF has calculated that 62% of the UK's WF comes from other countries.[11] By examining where our imports come from, how much we import and how water-intensive the imported products are, WWF has been able to identify where in the world the UK has the highest impact, based on the volume of product consumed and the level of stress on the water system in question. They have identified a wide range of countries, including France, Spain, Germany, Pakistan, India and South Africa, and have highlighted some water-intensive products, including tomatoes, cotton and sugar cane.

Some generalisations can be made: for instance, higher value crops such as sugar and vegetables are often more water intensive than cereals, and meat and dairy is even more water-intensive.[12] For processed items, the agricultural production of raw ingredients accounts for the largest element of a WF.[13]

However, following the WF of a particular product is extremely complex. Water use varies by method of production, local soil types, variety of product, time of year, and more. Whilst it is possible to calculate the exact WF of a tomato produced in an irrigated Spanish field[14] compared to one produced in a UK greenhouse, the time, effort and cost involved makes it impractical on any large scale. It becomes even more difficult for processed products with several ingredients.

However, some businesses are taking the lead in measuring their WF, considering how to reduce it, and working with NGOs to understand the consequences of water use in their supply chains. Governments are also beginning to consider these issues. However, public awareness of water scarcity remains low. In the UK, citizens are rarely exposed to the direct effects of severe water shortage and cannot readily see the links between their purchases and water shortage in other countries. Water use is not reflected in the price of the final product.

The next three sections of this report consider relevant policy and industry initiatives, and the value of labels in promoting sustainable water use and communicating this to consumers. The report ends with recommendations.

---

[10] Chapagain and Orr (2008) Volume 2 appendix B
[11] Chapagain and Orr (2008) Vol 1
[12] Lundqvist et al (2008)
[13] Grant (2009)
[14] Chapagain and Orr (2008)

Food Ethics Council, 39-41 Surrey Street, Brighton BN1 3PB, United Kingdom t: +44 (0)1273 766 654 f: +44 (0)1273 766 653
The Food Ethics Council is a company limited by guarantee (03901671) and a registered charity (1101885).
info@foodethicscouncil.org www.foodethicscouncil.org

2. Policy context

In general, government policies have taken an area-based approach to water – seeking to regulate how water is used within particular water basins or regions – rather than considering the water 'embedded' in products that may be traded between territories. However, a number of policy commitments in the UK, the EU and internationally are particularly relevant to efforts at managing embedded water:

- The EU Water Framework Directive makes explicit the need to manage the demand for water.

- Defra has as a departmental objective to reduce the global impact of UK food production and consumption, and is beginning to explore how this objective can be met in relation to water. Defra is concerned by the high level of UK water dependency[15] both for future UK food security and because of the pressure caused by UK imports on the water resources of other countries.

- Defra's Food Industry Sustainability Strategy Champions' Group on water set targets to reduce water use, but this only relates to UK water use (internal WF).

- Other national governments are taking a wide range of approaches to water management, e.g. Brazil has a National Law of Hydraulic Resources, which includes watershed committees and agencies to ensure integrated water policies with public participation.[16] South Africa's water law establishes a water reserve for ecosystem maintenance and basic human needs, which needs to be satisfied before water can be used for economic development.[17]

- The United Nations and its Food and Agriculture Organisation have explored sustainable water management models, mostly in poorer countries.

- European Parliament has discussed – and rejected – including food products in an eco-labelling scheme.[18]

---

[15] Defra (2008)
[16] Gardiner (undated)
[17] Postel (2008)
[18] Byrne (2008)

3. Supply-chain initiatives

Many businesses, NGOs, international agencies and academics are working to address water scarcity. In the absence of strong explicit demands for responsible water use from their end customers, the impetus for businesses has been a concern that water scarcity poses a substantial risk both to their own operations and to their security of supply. In contrast to more 'diffuse' issues such as greenhouse gas emissions, where businesses have often been reluctant to take responsibility for the environmental footprint of their suppliers, the direct business risk attached to water scarcity has encouraged a supply chain approach. NGOs, agencies and academics have provided expertise and funds to help advance and coordinate these efforts, and try to ensure they promote wider environmental and social benefits.

Several different initiatives have been developed that use WF and other tools in a range of ways. These are tools both to measure water use, and to develop effective water management. They are summarised in Table 1, below. Most of these initiatives – and all of those which appear to offer potential to be used by businesses in labelling or accrediting their use of water – have been developed in partnership between industry and public interest organisations. While other organisations such as Food and Water Watch[19] independently seek to hold companies to account over their water use, they have not been involved in the efforts described here to measure and accredit more or less responsible water management practices. All the initiatives below bar the Waterwise Marque are international.

Table 1: initiatives to promote sustainable water use.[20]

Initiative	Details
Alliance for Water Stewardship (AWS)	The AWS is leading the process of developing global standards to improve the way water is managed around the world. It is developing a set of core standards to which local criteria can be added, by mid-2009. It will provide independent certification of responsible water management. The scheme will be applicable both to water 'users' (businesses) and water 'providers' (utilities). It is likely to contain levels (e.g. bronze, silver, gold) to encourage improvement. Originally conceived and initiated by The Nature Conservancy, Water Stewardship Initiative (see below), and the Pacific Institute, the Alliance now includes a range of stakeholders such as WWF and Water Witness International (see below). It does not take a product-specific or supply-chain approach. http://www.allianceforwaterstewardship.org/

---

[19] This is a US-based campaigning organisation - http://www.foodandwaterwatch.org/
[20] Table adapted from Garnett (2008) and Morrison et al (2009) unless otherwise referenced.

Fair Water Framework	The World Business Council for Sustainable Development is developing the Fair Water Framework which will map out existing initiatives on water stewardship and then define best practice, focusing on three dimensions: the process of stewardship; the methodology of measurement; concepts and principles. http://www.wbcsd.org/web/watertool.htm
Global Public Policy Network on Water Management	Working jointly with the Stockholm International Water Institute, an organization called the Stakeholder Forum has established the Global Public Policy Network on Water Management , which aims to identify key priorities for the international water and sanitation agenda and communicate those priorities to decision-makers. It supports multi-stakeholder processes and is developing an analytical framework. http://gppn.stakeholderforum.org/
Global Water Tool	The World Business Council for Sustainable Development has developed a Global Water Tool to enable businesses to map their current water use and assess future risks. http://www.wbcsd.org/web/projects/water/fairwater.zip
SAB Miller Water Footprint Toolkit	SAB Miller, the multinational brewing company, is one of the first businesses to seek to measure its water use and the consequences of that use, trying to develop ecologically sustainable approaches. They have developed their own water footprint toolkit with support from WWF. http://www.sabmiller.com/index.asp?pageid=915
System of Environmental-Economic Accounting for Water (SEEAW)	The SEEAW, developed by the UN Statistic Division is a conceptual framework for organising hydrological and economic information. The aim is to enable an analysis of the contribution of water to the economy and the impact of the economy on water resources.[21] http://unstats.un.org/unsd/envaccounting/SEEAWDraftManual.pdf
Water Accounting System	Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) has developed a Water Accounting System as a tool for strategic long term water management. The tool takes river basins as the spatial unit and uses stock and flow dynamics (e.g. how water moves from rainwater into groundwater and reservoirs). Variables such as population density can be changed to see how the system would respond to different scenarios, and different ways of addressing water use problems.[22] http://www.csiro.au/science/Water-Resources-Assessment-and-Water-Use-Accounting.html

---

[21] UN Statistics Division (2006)
[22] Turner et al. (2008)

Water Footprinting Network (WFN)	The WFN is developing standards for WF accounting, tools for WF implementation and WF impact assessments. It runs the WFWG (see below) as well as a working group trying to harmonise approaches to accounting for water and energy use. It has published a business water accounting tool.[23] http://www.waterfootprint.org
Water Footprinting Working Group (WFWG)	The WFWG aims to make WF an accounting and policy tool to promote good governance. It sees WF as a building block towards understanding the effects of water use, and as a tool to use in the context of developing sustainable water management systems. Its analysis includes a supply-chain approach to determining the impact of water use. It is working on tools for the practical use of the WF concept, taking into account the context in which water is used. http://weatherhead.case.edu/ungc-us/documents/WFWG_Overview_000.pdf
Water Mandate	A public-private partnership, established by the UN Global Compact, the Water Mandate aims to engage companies and other stakeholders in addressing water issues. Its signatories aim to improve their performance in six areas: direct operations, supply chain and watershed management, collective action, public policy, community engagement, and transparency. The initiative disseminates information, shares experience and promotes good practice. It has developed a business 'road map' to address water risk and urges businesses to move beyond their supply chains to engage in public policy.[24] http://www.unglobalcompact.org/docs/news_events/8.1/Ceo_water_mandate.pdf
Water Stewardship Initiative (WSI)	The WSI aims to establish standards and compliance systems for responsible water use, modelled on approaches such as the Marine Stewardship Council and Forestry Stewardship Council. The WSI mission includes creating positive partnerships between water authorities, landholders, industry and governments, and stresses the importance of stakeholder involvement in developing principles and criteria. http://www.waterstewardshipinitiative.com
Water Sustainability Planner	The Global Environmental Management Initiative has developed a Water Sustainability Planner, for managers of facilities such as factories. It has also built a Creative Water Strategies Tool to help businesses through the process of assessing their water impact and making a business case for doing something about it. http://www.gemi.org/waterplanner/

[23] Gerbens-Leenes, Hoekstra (2008)
[24] CEO Water Mandate (2009)

Waterwise Marque	The Waterwise Marque is an award scheme for water-efficient products. It has been developed by WaterWise, an NGO focussing on water use in the UK. http://www.waterwise.org.uk/
Water Witness International (WWI)	Working with LTS International and University of East Anglia, WWI is developing the WaterMark. It will research certifiable standards for sustainable water resource management, taking into account scientific evidence, corporate social responsibility and trends in ethical consumerism. The Mark will be awarded to goods and services meeting the standards. The approach is being piloted in Tanzania, and includes social concerns, governance issues and stakeholder engagement. The aim is to develop an accreditation scheme so that consumers know their purchase has been produced without causing social or environmental problems, and while adhering to good practice. WWI has now joined the Alliance for Water Stewardship. http://host.qsoftdns.net/~waterwit//index.php?option=com_content&task=view&id=1&Itemid=1
WWF Freshwater Programme	WWF has developed a methodology for measuring water use in specific river basins, including calculating embedded water through analysing local climatic conditions, assessing how much is needed for ecosystems and how to manage water use better. WWF has taken a lead in developing the WF concept and supporting businesses (e.g. SAB Miller) to use it and are active in the AWS, developing sustainable water use standards. http://assets.panda.org/downloads/agwaterusefinalreport.pdf

Water footprinting is becoming the most widely used tool for measuring water use, as it enables the location of water use to be considered, and its impact, as well as an analysis of water use along a supply chain. It makes explicit the link between water use and the final consumption of a product, thus enabling consumers to see how their purchasing choices may affect water use.

However, water footprinting has limitations:

- It does not tell you how efficiently a product is being produced (it may be a very water-intensive product, even if every stage of its production uses as little water as possible). This analysis can only be made by comparing similar products, or by establishing a set of water use standards for a particular product.

- Despite the growing consensus on WF as a measurement tool, at the moment there is still a lack of consistency between businesses in measuring and reporting water use, so even when it is disclosed it is hard to compare.[25]

---

[25] Morrison et al (2009)

- WF does not in itself enable consideration of social and ethical issues, policy considerations or governance and stewardship concerns.[26] These considerations must be incorporated through standards that move beyond measuring water use.

- WF does not enable consideration of opportunity costs, in other words what else water might be used for if it is 'saved' from one supply chain. This can only be done through effective governance of a water resource, examining the costs and benefits to different sectors of society of different options

So once businesses have measured their WF, they have to understand the effects of that water use and then choose how to address the risks they represent. While regulation and public concern around water scarcity remains weak in many countries, on top of physical water-related risks they must also consider regulatory and reputational risks that vary according to the laws and community concerns in the countries in which they and their suppliers operate.[27] They could manage these risks in a variety of ways, for example by reducing use, relocating to a less water-stressed region or engaging with local water management processes.

Businesses are becoming increasingly aware that, even if they reduce their own water use, others using the same resource may continue to over-exploit it, meaning that the problem of water scarcity persists. Engaging with regulators, competing water users and other stakeholders in a region enables a company to ensure that its own water savings can actually succeed in reducing scarcity and, therefore, the risks to its business.

So businesses have to engage beyond their own supply chain, with other stakeholders and with governments, to demonstrate good practice.[28] Several organisations are starting to develop approaches that build on water footprinting by considering the place-specific environmental consequences and encouraging dialogue with stakeholders in affected regions about how best to govern water use. The AWS and WaterMark approaches (Table 1) are the most advanced efforts to combine these considerations, but they are all still at an early stage and there is not yet a common approach.

---

[26] Hoekstra (2008)
[27] Morrison et al (2009)
[28] Pegram et al (2009)

4. Labels

Sustain is currently investigating the potential for a multi-criteria sustainability label, appropriate for food products, that provides a grading for each on a number of issues. The label might take the form of a flower, with each petal representing a different concern. Water has been identified as an important petal and a robust method for 'scoring' products is required.

Sustain is not alone in pursing multi-criteria labels or 'omnistandards'. The Institute for Environmental Research and Education[29] is launching an eco-label based on a life-cycle analysis of the environmental performance of a product. Similarly, the Confederation of the Food and Drink Industries of the EU (CIAA) has recently launched European Food Sustainable Consumption and Production (SCP) Round Table. Its objectives are "to establish, by 2011, scientifically reliable and uniform environmental assessment methodologies for food and drink products and to identify suitable means of voluntary communication to consumers. It will also promote and report on continuous improvement initiatives along the whole food chain." [30] Meanwhile, concern that a proliferation of sustainability standards and labels confuses consumers and leaves them vulnerable to misleading claims has led the UK government Environmental Audit Committee to call for government to police the use of environmental labels on products.[31]

None of the initiatives discussed in Section 3, above, offers a completed system that Sustain and other organisations could readily adopt in the short term to include water in an omnistandard. As these initiatives progress, however, they are likely to offer a variety of tools for measurement and systems of accreditation that could be used in label. Specifically, they are likely to provide increasingly robust and standardised approaches for assessing:

- The water footprint of a specific product.

- The environmental impact of using water to produce a specific product.

- The approach to water stewardship taken by the businesses that produced a product.

Any of these tools could be used singly or in combination as the basis of a water label. In considering which approach would be most appropriate it is important to consider the potential functions of a water label. These are principally to:

- Communicate water scarcity to consumers as citizens, giving governments and businesses a stronger mandate to address water problems in the public interest. Governments and businesses sometimes say they cannot act unless there is clear public demand for it.

- Encourage scrutiny of supply chain practices, both by businesses themselves and by third parties. For example, the assessment processes to underpin carbon labelling have identified opportunities for companies to identify greenhouse gas savings in their supply chains.

- Enable people when they buy food to choose products that cause less harm or greater benefit.

Table 2 summarises which approaches to assessing water use satisfy which goal of labelling. It suggests that a stewardship approach, to which the parallels include Fairtrade and Marine Stewardship Council certification, would be the most promising.

---

[29] Institute for Environmental Research and Education (2009)
[30] Confederation of the Food and Drink Industries of the EU (2009)
[31] Byrne (2009)

Table 2: which approaches to labelling satisfy which goals of labelling?

Approach\Goal	Communication	Scrutiny	Choice	*Compare with…*
Water footprint	Highlights a proxy issue potentially causing confusion	Partial scrutiny that stops short of the real issues	High risk of unintended consequences	*Distance travelled or airfreight labels*
Water impact	The main message may get lost in the detail	Enables detailed scrutiny, product-by-product	Difficult, costly and potentially misleading	*Carbon labels*
Water stewardship	Allows clarity without being reductionist	Demonstrates third-party scrutiny	Encourages brand but not category or product choices	*Fairtrade or MSC*

A water stewardship approach has the advantages of communicating a complex issue to the public without being reductionist and (to be credible) demanding rigorous third-party scrutiny. Where it appears to fall down is that it would not enable consumers to make product choices that would directly lower their water-related impact on the environment. It would not highlight, for example, that meat and dairy generally use more water than vegetables or cereals, or that rice is more water-intensive than wheat.[32]

This shortfall of water stewardship when it comes to enabling consumers to make sustainable product choices is not as serious as it seems. On the one hand, there are general problems with expecting measurement-based labels to encourage consumers to choose more sustainable products. Not least, it is often understood to shift the burden of responsibility for promoting sustainable supply chains away from businesses and towards individual consumers, even though the former usually have much greater power to fulfil that responsibility.

Yet, in addition, there are further challenges more specific to water measurement that make it difficult, costly and potentially misleading to develop a workable water impact label. These include how place-specific the environmental consequences of water use can be, and how dependent any assessment of the social consequences must be on local economic conditions and value judgements.

---

[32] Hoekstra and Chapagain (2007)

5. Recommendations

There are many factors to consider when assessing whether water has been used sustainably during a production process. These factors include not just the amount of water used, but where that water came from, how its use affects the ecosystem from which it came, what other uses water in that location is needed for, and how decisions are made about water use. Sustainable water use involves meeting the ecosystem and basic human needs for water, and then dividing the water available for other uses equitably among stakeholders. It involves implementing effective systems of governance which take into account the social, economic and cultural concerns of those reliant on the ecosystem.

We recommend that a water stewardship approach offers the best basis for addressing water issues within a multi-criteria sustainability label. This supports the thinking among many of the businesses, NGOs, academics and agencies described in Section 3, who have been resisting pressure to introduce water footprint or even water impact-based labels.

Water stewardship approaches are not yet sufficiently advanced that we can recommend which schemes would provide the most suitable basis for Sustain's label. It is also impossible to advise, as yet, whether it would be most appropriate to grade the label according to a business or product-line's involvement in one of a hierarchy of more or less challenging stewardship programmes, or whether any of those programmes will themselves accredit different standards of compliance or stewardship.

However, the Alliance for Water Stewardship (AWS) is playing an increasingly prominent co-ordinating role among the range of organisations developing stewardship approaches. The AWS shares an NGO member with Sustain in the form of WWF, which is increasingly active within the alliance. We therefore recommend that Sustain should and engage with the AWS to ensure that stewardship standards:

- Require stakeholder involvement in decision-making and governance processes.

- Cover issues of social justice (fairness) as well as environmental impact.

- Are sensitive to the environmental and social differences between production localities.

- Encourage clear and consistent communication of water issues to consumers.

- Are based on measurable criteria, agreed with civil society stakeholders.

- Are subject to independent third-party scrutiny.

- Are paid for by consumers and businesses in the UK and other rich countries, rather than representing an additional cost and barrier to entry for primary producers in poorer countries.

- Support a cross-sector approach, with standards for food being based on core standards shared with other sectors such as textile production, energy generation and mineral extraction.

- Invite independent external scrutiny from NGOs such as Food and Water Watch, which have a remit to address water issues but do not have a stake in specific stewardship schemes.

We also recommend that Sustain should encourage:

- Businesses to sign up to water standards. As pressure will not come from consumers at this stage, Sustain should seek to identify other carrots and sticks.

- DFID and Defra to work together to ensure that UK imports support sustainable development.

- The EU to press national governments to implement and enforce the water resource management systems demanded by the Water Framework Directive.

6. References

Byrne, J. 2009. *Standards urged for green labelling*. Food Production Daily. 23-Mar-2009.
http://www.foodproductiondaily.com/Supply-Chain/Standards-urged-for-green-labelling

CEO Water Mandate. 2009. Discussion Paper: *From Footprint to Public Policy – The business future for addressing water issues*.
http://www.pacinst.org/topics/globalization_and_environment/ceo_water_mandate/footprint_to_public_policy.pdf

Chapagain, A. and Orr, S. 2008. *UK Water Footprint: the impact of the UK's food and fibre consumption on global water*. Volumes 1 and 2. WWF
http://www.wwf.org.uk/filelibrary/pdf/water_footprint_uk.pdf

Chapagain, A. and Orr, S. 2008. *An improved water footprint methodology linking global consumption to local water resources: A case of Spanish tomatoes.* Journal of Environmental Management, 90 (2), 2009, pp. 1219-1228. http://dx.doi.org/10.1016/j.jenvman.2008.06.006

Collins, R., Kristensen, P., Thyssen, N. 2009. *Water resources across Europe — confronting water scarcity and drought.* European Environment Agency Report No 2.
http://www.eea.europa.eu/publications/water-resources-across-europe/at_download/file

Confederation of the Food and Drink Industries of the EU. 2009. *Food stakeholders and European Commission join forces to address food sustainability*. 11/05/09.
http://www.ciaa.be/asp/documents/detailed_doc.asp?doc_id=866

Defra. 2008. *Virtual water – A Discussion Paper for Defra*.

Gardiner, R. (undated) *Freshwater: A Global Crisis of Water Security and Basic Water Provision*, Towards Earth Summit 2002 Environment briefing no.1, Stakeholder Forum
http://www.earthsummit2002.org/es/issues/Freshwater/freshwater.pdf

Garnett, T. 2008. *Measuring Water: who's doing what – Briefing paper produced for Defra* Unpublished

Grant, D. 2009. *Water footprinting*. SABMiller. Slides available at
http://www.globalcompact.de/fileadmin/PDFs/DGCN_AT_20090603_Water_Management_SABMiller.pdf.

Gerbens-Leenes, P.W., Hoekstra, A. 2008. *Business Water Footprint Accounting: A tool to assess how the production of goods and services impacts on freshwater resources worldwide* Value of Water Research Report Series no 27, UNESCO-IHE Institute for Water Education http://purl.org/utwente/59999

Gerbens-Leenes, W., et al. 2007. *Water neutrality: a concept paper*, WWF NL
http://www.semide.net/thematicdirs/news/2007/11/PDF/20071120_Water-Neutrality

Hoekstra, A.Y. 2008. *Human appropriation of natural capital: A comparison of ecological footprint and water footprint analysis*, Ecological Economics.
http://www.waterfootprint.org/Reports/Hoekstra2008-Ecological-versus-WaterFootprint.pdf

Hoekstra, A.Y. and Chapagain, A.K. 2007. *Water footprints of nations: water use by people as a function of their consumption pattern*. Water Resources Management. 21(1): 35-48.
http://www.waterfootprint.org/Reports/Hoekstra_and_Chapagain_2007.pdf

Institute for Environmental Research and Education. 2009. *Acquiring and helping others acquire the knowledge and skills they need for fact-based decision making*. http://www.iere.org/programs.html

Lundqvist, J., de Fraiture, C., & Molden, D. 2008. *Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain* SIWI Policy Brief. SIWI.
http://www.siwi.org/documents/Resources/Policy_Briefs/PB_From_Filed_to_Fork_2008.pdf

Morrison, J., Morikawa, M., Murphy, M., & Schulte, P. 2009. *Water Scarcity and Climate Change: Growing Risks for Businesses and Investors*, CERES.
http://www.pacinst.org/reports/business_water_climate/full_report.pdf

Pegram, G., Orr, S. and Williams, C. 2009. *Investigating shared risk in water: Corporate Engagement with the Public Policy Process*. WWF.
http://assets.wwf.org.uk/downloads/investigating_shared_risk.pdf

Postel, S. 2008. *The Missing Piece: A Water Ethic*. The American Prospect. May 27, 2008
http://www.prospect.org/cs/articles?article=the_missing_piece_a_water_ethic

Turner, G.M., Baynes, T.M., & McInnis, B.C. 2008. *A Water Accounting System for Strategic Water Management*. Socio-Economics and the Environment in Discussion, CSIRO Working Paper Series 2008-14 http://www.springerlink.com/content/xw87076n1m784807/

United Nations Statistics Division. 2006. *System of Environmental-Economic Accounting for Water Final Draft* UN http://unstats.un.org/unsd/envaccounting/SEEAWDraftManual.pdf

Acknowledgements

About the Food Ethics Council

The Food Ethics Council provides independent advice on the ethics of food and farming. We:

- Help guide the way through difficult issues by analysing problems, challenging accepted opinion and creating a space for dialogue; and

- Build tools to put ethics at the heart of decisions about food in business, policy and civil society.

Our Council members include bioethicists and moral philosophers, farmers and food industry executives, scientists and sociologists, academics and authors. Our work has covered topics including the personalisation of public health, the control of food research, the use of veterinary drugs and the growing challenge of water scarcity.

Find out more about our work, including the members of the Council, our exclusive Business Forum, and our must-read magazine, Food Ethics, on our website at www.foodethicscouncil.org.

About Sustain: the alliance for better food and farming

Sustain advocates food and agriculture policies and practices that enhance the health and welfare of people and animals, improve the working and living environment, promote equity and enrich society and culture. Find out more at www.sustainweb.org.

Food Ethics Council, 39-41 Surrey Street, Brighton BN1 3PB, United Kingdom t: +44 (0)1273 766 654 f: +44 (0)1273 766 653
The Food Ethics Council is a company limited by guarantee (03901671) and a registered charity (1101885).
info@foodethicscouncil.org www.foodethicscouncil.org