

The water footprint: water in the supply chain

Worldwide, companies have started to explore the water footprint of their products. The creator of the water footprint concept, Arjen Hoekstra, provides some background

Environmental awareness and strategy is often part of what a business regards as its 'corporate social responsibility'.

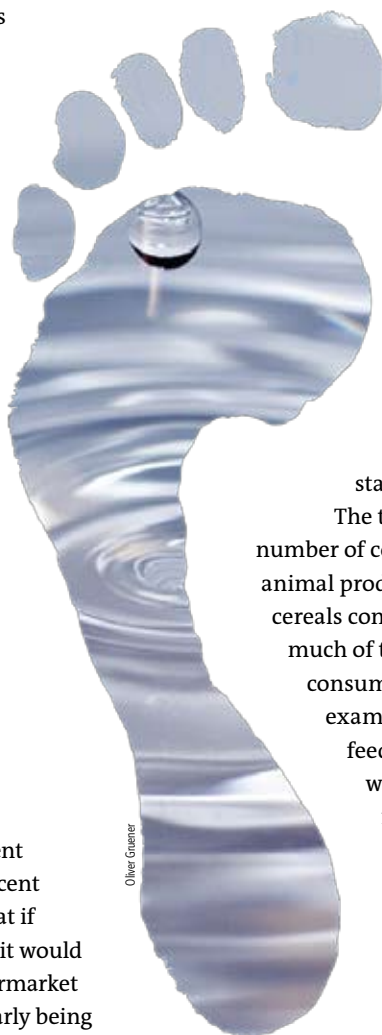
Fortunately, an increasing number of companies recognise that reducing the water footprint should be part of the corporate environmental strategy, just like reducing the carbon footprint. And many businesses actually face serious risks related to freshwater shortage in their operations or supply chain: what is a brewery without a secure water supply or how can a clothing company survive without a continued supply of water to the cotton fields? Another incentive is possible regulatory control of water and one can also observe that some businesses even see a corporate water footprint strategy as an instrument to reinforce the corporate image or to strengthen the brand name.

One single component in the total water footprint of humanity stands out: the water footprint related to food. About 85 per cent of humanity's water footprint is related to the consumption of agricultural products; 10 per cent relates to industrial products and only five per cent to domestic water consumption. This means that if people consider reducing their water footprint, it would be better to examine what they buy in the supermarket than their domestic water usage – although clearly being careful with water at home helps too.

So what are the options? One is to substitute a consumer product with a large water footprint with one carrying a smaller footprint. But this approach of substitution has limitations, and so it may be better to simply offer more information about a product's water footprint.

The concept

The water footprint concept is an analogue to the ecological and the carbon footprint. It is calculated by the volume of freshwater used to produce the product, measured over the various steps of the production chain. Water use is measured in terms of water volumes consumed (evaporated) or polluted. The water footprint shows volumes of water use and pollution, but also the locations,



which is relevant because the impact of water use depends on local conditions. A water footprint generally breaks down into three components: the blue, green and grey water footprint. The blue water footprint is the volume of freshwater that is evaporated from the global blue water resources (surface and ground water). The green water footprint is the volume of water evaporated from the global green water resources (rainwater stored in the soil). The grey water footprint is the volume of polluted water, which is quantified as the volume of water that is required to dilute pollutants to such an extent that the quality of the ambient water remains above agreed water quality standards.

The table shows the global average water footprint for a number of commodities. As a crude measure, one can say that animal products are more water-intensive than cereals and that cereals consume more water than vegetables and fruits. And much of the grain cultivated in the world are not for human consumption but for animals. In the United States, for example, 68 per cent of grains consumed are used for animal feed; thus animal products do not have a relatively large water footprint because of the water volumes required for drinking, but because of the water needed to grow the feed. From a water saving point of view then, it is obviously more efficient to eat the crops directly than having them first processed into meat.

Biofuels have a higher water footprint per litre than any other type of fuel. Bio-based products such as coffee, tea, chocolate and cotton have high water footprints as well. And the global averages shown in the table hide the fact that there is a very large variation of the water footprint for each type of product, depending on production circumstances. Knowing these differences is essential if one has already chosen to buy a certain product but not yet chosen which of the various options that still remain. One piece of beef is simply not equal to the other one, even though the taste and all other measurable characteristics are the same. The history and underlying resource use may be very different.

Globalisation

Protecting freshwater resources can no longer be regarded as an issue for individual countries. Let us take Europe as an example. The water footprint of Europe – the total volume of water used for

producing all commodities consumed by European citizens – has been significantly externalised to other parts of the world due to imports. Europe is a large importer of crops like sugar and cotton – two of the most thirsty crops – and also imports large volumes of feed, like soybean from Brazil. European consumption also strongly relies on water resources available outside Europe.

Indeed, although in many countries most of the food is still domestically produced, substantial volumes of food and feed are internationally traded. There is a growing demand for biofuels as well. As a result, all countries import and export water in virtual form, i.e. in the form of agricultural commodities. Worldwide trade in agricultural products results in international virtual water flows that add up to 1,250 billion cubic metres per year, which is equivalent to more than two times the annual runoff of the Mississippi. And because Europe is a net importer of virtual water its water security thus strongly depends on external water resources. Related to this, a substantial proportion of existing problems of water depletion and pollution in the world relates to export to Europe.

Product transparency

So in order to know what we consume we are going to need a form of product transparency that is currently completely lacking. It is, after all, quite reasonable that consumers have access to information about the history of a product. Indeed, many consumers do not even realise that the water footprint of beef, for example, varies greatly across production systems and countries and strongly depends on feed composition. The same holds for other commodities.

The question is: how water-intensive is a particular product that is for sale and to what extent does it relate to water depletion and/or pollution? Establishing a mechanism that makes sure that such information is available is not an easy task. It requires a form of accounting along production and supply chains that accumulates relevant information all the way to the end point of a chain.

Governments that show interest in ‘sustainable consumption’ may translate this interest into their trade policy. Given the fact that about 70 per cent of the UK water footprint lies outside its own territory, the British Government could strive towards more transparency regarding the water impacts of imported products. National governments can tune their trade and development cooperation policies towards their wish to promote consumption of and trade in sustainable products. They can also put regulations in place that urge businesses along the supply chain of water-intensive products to cooperate in creating product transparency.

Business can also have a key role, particularly the large food processors and retailers. Since they form an intermediary between farmers and consumers, they are the ones that have to pass on key information about the products that they are trading. As big customers, they can help and demand that farmers actually reduce their water footprint and provide proper environmental accounts. In addition, businesses can cooperate in water labelling, certification and benchmarking schemes and produce annual water accounts that include a report of the supply-chain water footprints and associated impacts of their products. ■

Arjen Hoekstra
 Professor in Multidisciplinary Water Management
 University of Twente, the Netherlands
 Scientific Director of the Water Footprint Network
a.y.hoekstra@utwente.nl

The water footprint of different commodities

Commodity	Unit	Global average water footprint (litres)
Apple or pear	1 kg	700
Banana	1 kg	860
Beef	1 kg	15,500
Beer (from barley)	1 glass of 250 ml	75
Bio-diesel from soybean	1 litre	14,000
Bio-ethanol from maize	1 litre	2,600
Bio-ethanol from sugar beet	1 litre	1,400
Bio-ethanol from sugar cane	1 litre	2,500
Bread (from wheat)	1 kg	1,300
Cabbage	1 kg	200
Cheese	1 kg	5,000
Chicken	1 kg	3,900
Chocolate	1 kg	24,000
Coffee	1 cup of 125 ml	140
Cotton	1 shirt of 250 gram	2,700
Cucumber or pumpkin	1 kg	240
Dates	1 kg	3,000
Eggs	one 60-gram egg	200
Goat meat	1 kg	4,000
Groundnuts (in shell)	1 kg	3,100
Leather (bovine)	1 kg	17,000
Lettuce	1 kg	130
Maize	1 kg	900
Mango	1 kg	1,600
Milk	1 glass of 250 ml	250
Milk powder	1 kg	4,600
Olives	1 kg	4,400
Orange	1 kg	460
Paper	1 A4 (80 gram/m ²)	10
Pasta (dry)	1 kg	1,900
Peach or nectarine	1 kg	1,200
Pizza margherita	0.725 kg	1,200
Pork	1 kg	4,800
Potato	1 kg	250
Rice	1 kg	3,400
Lamb	1 kg	6,000
Sugar (from sugar cane)	1 kg	1,500
Sugar (from sugar beet)	1 kg	935
Tea	1 cup of 250 ml	30
Tomato	1 kg	180
Wine	1 glass of 125 ml	120

Source: Water Footprint Network (www.waterfootprint.org)