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The water footprint: water in the supply chain

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Environmental awareness and strategy is often part of what a business regards as its 'corporate social responsibility'. 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. Many businesses actually face serious risks related to freshwater shortage in their operations or supply chain. What is a brewery without secure water supply or how can a company in jeans survive without continued supply of water to the cotton fields? Another reason for companies to dive into water footprint accounting and explore measures to reduce the corporate water footprint is to anticipate regulatory control by governments. One can also observe that some businesses see a corporate water footprint strategy even 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% of humanity's water footprint is related to the consumption of agricultural products; 10% relates to industrial products and only 5% to domestic water consumption. This means that if people consider reducing their water footprint, they better critically look at what they buy in the supermarket than at their water use in the kitchen, bathroom and garden. Wasting water never makes sense, so saving water at home when possible is certainly advisable, but when we would limit our actions to water reductions at home, many of the most severe water problems in the world would hardly be lessened. The water in the Murray-Darling basin in Australia is so scarce mostly because of water use for the production of various types of fruits, vegetables, cereals and cotton. The Ogallala Aquifer in the American Midwest is gradually being depleted because of water abstractions for the irrigation of crops like maize and wheat.

Consumers can reduce their direct water footprint – i.e. their home water use – by installing water saving toilets, applying a water-saving showerhead, etc. For reducing their indirect water footprint – that is the water consumption behind the production of food and other consumer products – they have basically two options. One option is to substitute a consumer product that has a large water footprint by a different type of product that has a smaller water footprint. Eating less meat or becoming vegetarian is one example, but

one can also think of drinking tea instead of coffee, or even better plain water. Not wearing cotton but artificial fibre clothes also saves a lot of water. But this approach of substitution has limitations, because many people do not easily shift from meat to vegetarian and people like their coffee and cotton. A second option is that people stick to the same consumption pattern but select the beef, coffee or cotton that has a relatively low water footprint or that has its footprint in an area that does not have high water scarcity. This requires, however, that consumers have proper information to make that choice. Since this sort of information is generally not available, this in turn asks for an effort from businesses to create product transparency and an effort from governments to install the necessary regulations. Currently we are far removed from a situation in which we have relevant information about the environmental impact of one piece of beef compared to another piece. The water footprint of beef, however, greatly varies across production systems and countries and strongly depends on feed composition. The same holds for other commodities.

The water footprint concept is an analogue to the ecological and the carbon footprint, but indicates water use instead of land or fossil energy use. The water footprint of a product is 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. Much of the grains cultivated in the world are not for human consumption but for animals. In the United States, for example, 68% of the grains consumed are used for animal feed. 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 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. 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.

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
Sheep meat	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

Sources: Water Footprint Network (www.waterfootprint.org); Hoekstra, A.Y. and Chapagain, A.K. (2008) Globalization of water: Sharing the planet's freshwater resources, Blackwell Publishing, Oxford, UK.

Globalization of water

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. Europe is a large importer of crops like sugar and cotton, two of the most thirsty crops. Europe also imports large volumes of feed, like soybean from Brazil. European consumption strongly relies on water resources available outside Europe. How is Europe going to secure its future water supply? China and India are still largely water self-sufficient,

but with rising food demand and growing water scarcity within these two major developing countries, one will have to expect a larger demand for food imports and thus external water demand.

Although in many countries most of the food still originates from the country itself, 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 1250 billion cubic metres per year, which is equivalent to more than two times the annual runoff of the Mississippi. Europe is a net importer of virtual water. Europe's 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

In order to know what we consume we will need a form of product transparency that is currently completely lacking. It is reasonable that consumers have access to information about the history of a product. The question is: How water-intensive is a particular product that is for sale and to which 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 put interest in 'sustainable consumption' may translate this interest into their trade policy. Given the fact that about 70% of the UK water footprint lies outside its own territory, the British government could strive towards more transparency about 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 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 from farmers to 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.

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