DATA TABLE 19

Water Content of Things

Description

There is a growing interest in the resource implications of the goods and services that we all use, buy, and consume. How much energy, or how many greenhouse gases, or what amount of water is used to satisfy our demands for things? This table shows some estimates of the water implications, or "footprint," of a range of basic and manufactured goods, from a number of different sources. For a range of beverages, the data shown are the number of liters of freshwater required to produce a liter of beverage. For the other goods, the data are shown in liters of water per kilogram of product (or, since a liter of water weighs one kilogram, in kilograms of water per kilogram of product). There are very important uncertainties and limitations to these data, and we expect that improvements in measurement and reporting will continue over the next several years.

Limitations

These kinds of data are fraught with problems and uncertainties, and users should be extremely careful about using them for other than the most simple comparisons. When we can, we like to use ranges to try to bracket many of the uncertainties, but other sources rarely mention uncertainties or provide ranges of estimates. For example, the Water Footprint reports that 15,500 kg of water are required to produce beef, but work from the Pacific Institute reports a range of 15,000 to over 70,000 depending on diet, climate, the amount of product from each cow, and other variables. Similarly, the Water Footprint reports single estimates for the production of a range of vegetable and feed crops, but actual water requirements will vary dramatically with climate, soils, irrigation methods, and crop genetics.

Equally, if not more complicated, is evaluating the water required to produce manufactured items. For example, the water required to produce a liter of a soft drink may be as low as 2 to 4 liters per liter of product. But vast quantities of water are also consumed to produce the feedstocks, such as sugar or corn syrup, used in the same product. There are no consistent rules for where to draw the "supply chain" boundaries in such estimates, making it critical that users understand the assumptions that go into these values. This table, for example, lists 125 liters of water to make a kilogram of sheet paper, but it seems likely that this is the value for producing paper alone, and excludes the water required to grow the tree itself. Similarly, fewer than ten liters of water are required to process milk, but as many as 1,000 liters may be required if the water to produce the cow itself is included.

SOURCES

Gleick, P.H. Water in Crisis, Table H.17. New York: Oxford University Press.
Gleick, P.H. 2000. Water for Food: How Much Will Be Needed? In: Gleick, P.H. *The World's Water 2000–2001*. Washington DC: Island Press, pp. 63–91.
Pacific Institute, 2007. Bottled Water and Energy.
http://www.pacinst.org/topics/integrity_of_science/case_studies/bottled_water_energy.html
Water Footprint.
http://www.waterfootprint.org/

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	Liters water	Comments/Notes/Sources
Beverages (per liter)		
Glass of beer	300	http://www.waterfootprint.org/; includes growing barley
Malt beverages (processing)	50	http://www.waterfootprint.org/; processing only
Glass of water	~1	http://www.waterfootprint.org/
Bottled Water	3 to 4	Pacific Institute estimate 2007; processing and water to make the plastic bottle
Milk	1,000	http://www.waterfootprint.org/; for the cow and processing
Milk (processing)	7	http://www.waterfootprint.org/; processing only
Cup of coffee	1,120	http://www.waterfootprint.org/
Cup of tea	120	http://www.waterfootprint.org/
Glass of wine	960	http://www.waterfootprint.org/; includes producing the grapes
Glass of apple juice	950	http://www.waterfootprint.org/; includes growing the apples
Glass of orange juice	850	http://www.waterfootprint.org/; includes growing the oranges
Assorted Produced Goods (per kilogram)		
Roasted coffee	21,000	to grow; http://www.waterfootprint.org/
Tea	9,200	to grow; http://www.waterfootprint.org/
Bread	1,300	http://www.waterfootprint.org/
Cheese	5,000	http://www.waterfootprint.org/
Cotton textile finished	11,000	http://www.waterfootprint.org/; assumes 45% crop use; 41% unproductive evaporation; 14% processing and wastewater
Sheet paper	125	http://www.waterfootprint.org/; Not including the water to grow tree
Potato chips	925	http://www.waterfootprint.org/
Hamburger	16,000	http://www.waterfootprint.org/
Leather shoes	16,600	http://www.waterfootprint.org/
Microchip	16,000	http://www.waterfootprint.org/
Assorted Crops (per kilogram)		To grow; depends on climate; depends on weight of finished crop versus total yield
Barley	1,300	http://www.waterfootprint.org/
Coconut	2,500	http://www.waterfootprint.org/
Corn	900	http://www.waterfootprint.org/
Sugar	1,500	http://www.waterfootprint.org/
Apple	700	http://www.waterfootprint.org/

continues

DATA TABLE 19 *continued*

	Liters water	Comments/Notes/Sources
Assorted Crops (per kilogram) *(continued)*		
Potato	500 to 1,500	Gleick 2000
Wheat	900 to 2,000	Gleick 2000
Alfalfa	900 to 2,000	Gleick 2000
Sorghum	1,100 to 1,800	Gleick 2000
Corn/Maize	1,000 to 1,800	Gleick 2000
Rice	1,900 to 5,000	Gleick 2000
Soybeans	1,100 to 2,000	Gleick 2000
Assorted Animals (per kilogram of meat)		Includes water for all feed
Sheep	6,100	http://www.waterfootprint.org/
Goat	4,000	http://www.waterfootprint.org/
Beef	15,000 to 70,000	Gleick 2000
Chicken	3,500 to 5,700	Gleick 2000
Eggs	3,300	http://www.waterfootprint.org/
Assorted Industrial Products (per kilogram)		Processing water; there is great variation depending on process
Steel	260	Gleick 1993
Primary Copper	440	Gleick 1993
Primary Aluminum	410	Gleick 1993
Phosphatic fertilizer	150	Gleick 1993
Nitrogenous fertilizer	120	Gleick 1993
Synthetic rubber	460	Gleick 1993
Inorganic pigments	410	Gleick 1993