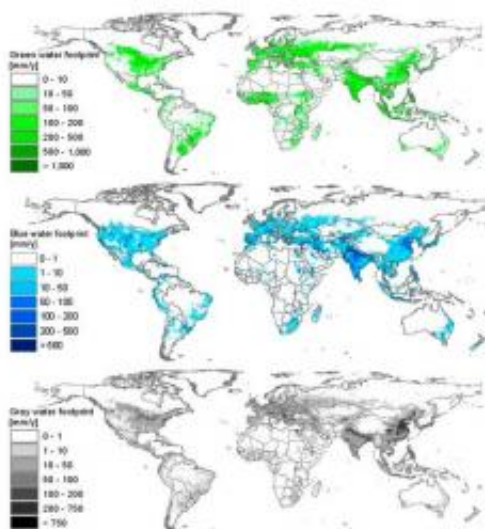


# Research duo maps worldwide water footprint with high spatial resolution

February 14 2012, by Bob Yirka



The green, blue, and gray water footprints within nations in the period 1996-2005. (c)PNAS, doi:10.1073/pnas.1109936109

(PhysOrg.com) -- Arjen Hoekstra and Mesfin Mekonnen from the University of Twente in the Netherlands have created a worldwide water footprint map at a higher spatial resolution than has been seen before; and as they describe in their paper published in the *Proceedings of the National Academy of Sciences*, most (92%) of the water used by people the world over, goes to growing food. They also find that about a fifth of all water used goes towards products that are exported, creating, what they describe as a “virtual” water export business.

A virtual [water](#) footprint is one where the entire amount of water that goes into producing a product is taken into account. For example, when electronics products are made, water is used in the production of electricity used by the factories to run their machines. Water is also used to make the plastics that are used in casings and wire. It's also used in the sense that quite often manufacturing results in polluting water making it no longer be useable for another purpose. All of these things add up to a virtual footprint for every product made which the researchers then combined to construct a map of the world showing how water is really used.

One interesting finding that comes up is the sad reality that more advanced countries are importing [virtual water](#) from those that are less advanced as water resources are used to create those products that are made locally and used somewhere else; a situation that if continued, could lead to depletion of water resources in those countries if that water is withdrawn from nonrenewable sources such as underground aquifers.

To come up with their [water footprint](#) map, the researchers examined water usages patterns for the years 1996 through 2005, as blocks of the land surface of the Earth made up of 85 square kilometers. Then each block was examined (using data from the country to which it belonged) to discern its water usage. Once all the blocks were filled in the researchers had their map. As part of the process, the water footprint of individual countries was calculated and the findings aren't likely to surprise anyone. Those people that live in highly developed countries tend to consume more water per capita than do those from less highly developed countries. The United States for example, was calculated as having a footprint of 2,842 m<sup>3</sup>/y, compared to a worldwide average of just 1,385 m<sup>3</sup>/y.

Another point the [map](#) makes clear is that water has become a true commodity, though its ownership is still constantly in debate, and as

such, soon it will have to be bought, sold or traded just as other precious commodities currently are or conflicts will likely arise.

**More information:** The water footprint of humanity, *PNAS*, Published online before print February 13, 2012, [doi: 10.1073/pnas.1109936109](https://doi.org/10.1073/pnas.1109936109)

## Abstract

This study quantifies and maps the water footprint (WF) of humanity at a high spatial resolution. It reports on consumptive use of rainwater (green WF) and ground and surface water (blue WF) and volumes of water polluted (gray WF). Water footprints are estimated per nation from both a production and consumption perspective. International virtual water flows are estimated based on trade in agricultural and industrial commodities. The global annual average WF in the period 1996–2005 was 9,087 Gm<sup>3</sup>/y (74% green, 11% blue, 15% gray). Agricultural production contributes 92%. About one-fifth of the global WF relates to production for export. The total volume of international virtual water flows related to trade in agricultural and industrial products was 2,320 Gm<sup>3</sup>/y (68% green, 13% blue, 19% gray). The WF of the global average consumer was 1,385 m<sup>3</sup>/y. The average consumer in the United States has a WF of 2,842 m<sup>3</sup>/y, whereas the average citizens in China and India have WFs of 1,071 and 1,089 m<sup>3</sup>/y, respectively. Consumption of cereal products gives the largest contribution to the WF of the average consumer (27%), followed by meat (22%) and milk products (7%). The volume and pattern of consumption and the WF per ton of product of the products consumed are the main factors determining the WF of a consumer. The study illustrates the global dimension of water consumption and pollution by showing that several countries heavily rely on foreign water resources and that many countries have significant impacts on water consumption and pollution elsewhere.

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