Blue and Green Virtual Water Flows

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WHAT ARE THESE MAPS TELLING US?

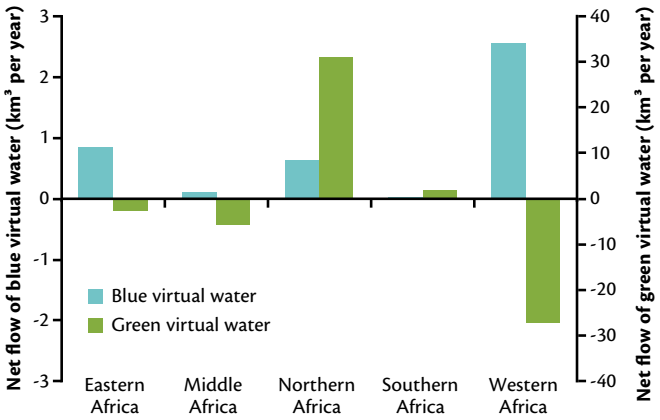
The term virtual water content refers to the volume of water used by a crop per unit of crop harvest. Virtual water flows are then determined by commodity flows between the locations where crops are produced and consumed. Virtual water flows are further distinguished as flows of blue (irrigation) and green (precipitation stored in the soil) water. The maps show blue and green net virtual water flows caused by the production and consumption of 19 major crops (wheat, barley, rye, maize, rice, sorghum, millet, pulses, soybeans, groundnuts, sunflower, rapeseed, potatoes, cassava, grapes, citrus, dates, cocoa, coffee). Negative values in the maps indicate a net outflow of virtual water and show major production areas where the amount of water used locally to produce crops consumed elsewhere is greater than the amount contained in crops consumed locally. Positive values indicate a net inflow of virtual water to major consumption areas.

The major irrigation regions are the source regions of blue virtual water flows (blue in Map 1) while concentrations of rainfed crop production are the source of green virtual water flows (green in Map 2). Cities and other densely populated regions represent the sinks of virtual water flows (red in Maps 1 and 2). In total, northern and southern Africa see a net inflow of both blue and green virtual water while eastern, middle, and western Africa have a net inflow of blue water but a net outflow of green water, indicating that crop imports from irrigated production compensate for exported rainfed crops (Figure 1).

WHY IS THIS IMPORTANT?

Production and consumption of agricultural commodities used to be local. Now, with the rapid growth in trade and urban areas, food may be produced in one place and consumed far away. With globalization, new links and dependencies between producers and consumers have formed. Demand from faraway markets for agricultural commodities may elevate local resource use. On the other hand, resource shortages in major production regions may result in reduced crop yields and send price signals to commodity markets worldwide. Mapping virtual water flows helps policymakers to better understand the importance of links between resource use and trade and of dependencies between producers and consumers of commodities.

FIGURE 1 Net virtual water flows, 2000



Data source: Hoff et al. 2014 and FAO 2012.

Note: Blue virtual water=irrigation water drawn from groundwater bodies (aquifers) or surface water bodies (rivers, lakes, wetlands, or canals). Green virtual water=precipitation stored in the soil and used by rainfed and irrigated crops. Positive values represent net flows into each region.

WHAT ABOUT THE UNDERLYING DATA?

Crop production, crop water use, and corresponding blue and green virtual water content were computed by applying the Global Crop Water Model (Siebert and Döll 2010). Crop consumption within each country was computed by adding imports of the respective crop commodity to domestic crop production and then subtracting the corresponding commodity exports derived from the Comtrade database for the period 1998–2002 (UN 2009). It was assumed that per capita commodity consumption is similar for all people belonging to the same country. Production surpluses and deficits within each country were leveled out by commodity flows (and linked virtual water flows) across increasingly larger distances and finally the whole country, if required (Hoff et al. 2014). The dataset refers to 1998–2002 and has a spatial resolution of 5 arc-minutes.[1]

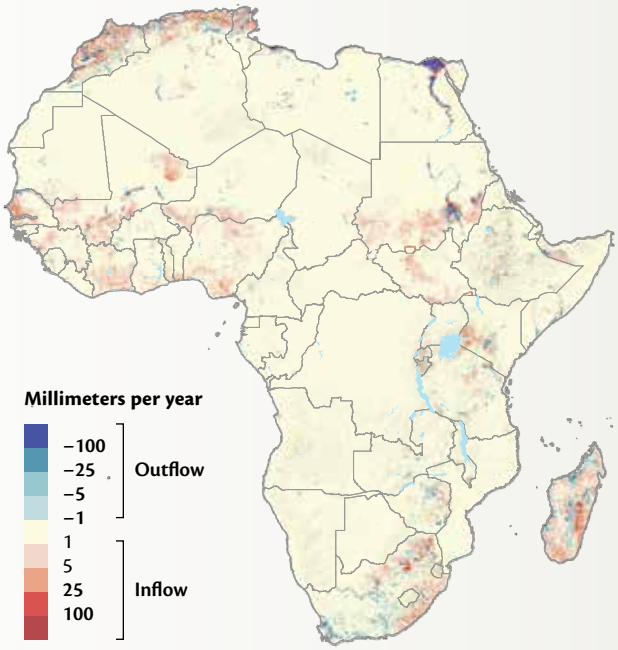
WHERE CAN I LEARN MORE?

Water Footprint Network: www.waterfootprint.org/

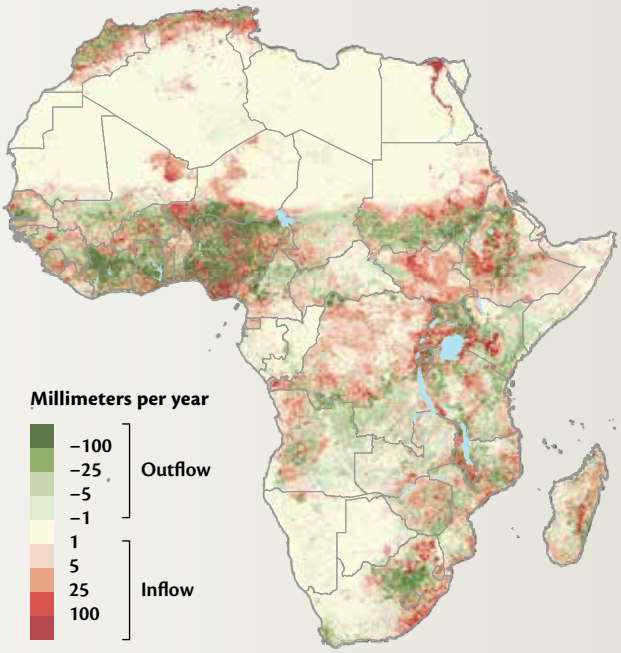
"Water Footprints of Cities: Indicators for Sustainable Consumption and Production." Hoff et al. 2014: http://bit.ly/1ogjdK1

1 Each cell measures approximately 100km² or 10,000 hectares at the equator.

MAP 1 Net virtual water flow of blue water (irrigation), 2000



MAP 2 Net virtual water flow of green water (precipitation stored in the soil), 2000



Data source (all maps): Hoff et al. 2014.

Note: Virtual water content refers to the volume of water used by the crop per unit of crop harvest. Virtual water flows are then established by commodity flows between the locations of crop production and crop consumption.

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