



## Water-controlled wealth of nations: Using Water Footprints to Estimate Nations Carrying Capacities and Demographic Sustainability

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Population growth is in general constrained by food production, which in turn depends on the access to water resources. At a country level, some populations use more water than they control because of their ability to import food and the virtual water required for its production. Here, we investigate the dependence of demographic growth on available water resources for exporting and importing nations. By quantifying the carrying capacity of nations based on calculations of the virtual water available through the food trade network, we point to the existence of a global water unbalance. We suggest that current export rates will not be maintained and consequently we question the long-run sustainability of the food trade system as a whole. Water rich regions are likely to soon reduce the amount of virtual water they export, thus leaving import-dependent regions without enough water to sustain their populations. We also investigate the potential impact of possible scenarios that might mitigate these effects through (1) cooperative interactions among nations whereby water rich countries maintain a tiny fraction of their food production available for export; (2) changes in consumption patterns; and (3) a positive feedback between demographic growth and technological innovations. We find that these strategies may indeed reduce the vulnerability of water-controlled societies.