The global water model WaterGAP 2: Water use model

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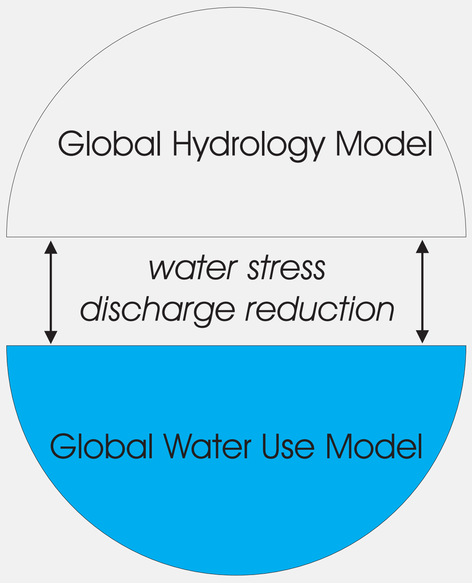
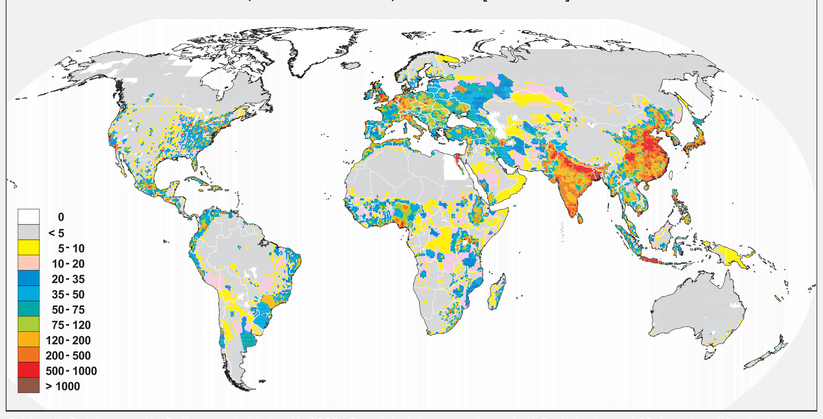
WaterGAP, a global model of water availability and water use, has been developed to assess the current water resources situation and to estimate the impact of global change on water scarcity. With a spatial resolution of 0.5°, the raster-based model is designed to simulate the characteristic macro-scale behavior of the terrestrial water cycle, including the human impact, and to take advantage of all pertinent information that is globally available.



The Global Water Use Model computes withdrawal and consumptive water use in four sectors:
- domestic
- industry
- irrigation
- livestock

Sectoral water use (right column below) is computed as a function of driving forces (left and center column below) and model parameters.

Population density in 1995 [inh./km²]



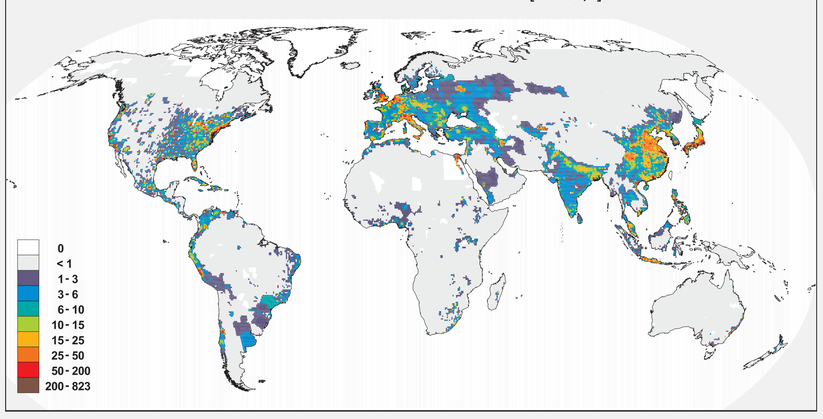
Tobler, W., Deichmann, U., Gottsegen, J., Malloy, K. (1995): The global demography project. Technical report 95-6. National Center for Geographic Information and Analysis, University of California, Santa Barbara.

Domestic

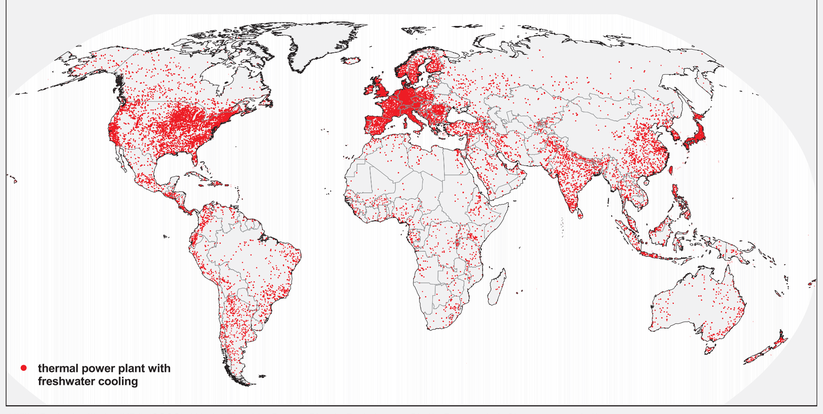
country data: domestic water withdrawal and consumption, urban and rural population, access to safe drinking water

for scenarios: changes in population, GDP

Domestic withdrawal water use 1995 [mm/yr]



Thermal power plants with freshwater cooling around 1995



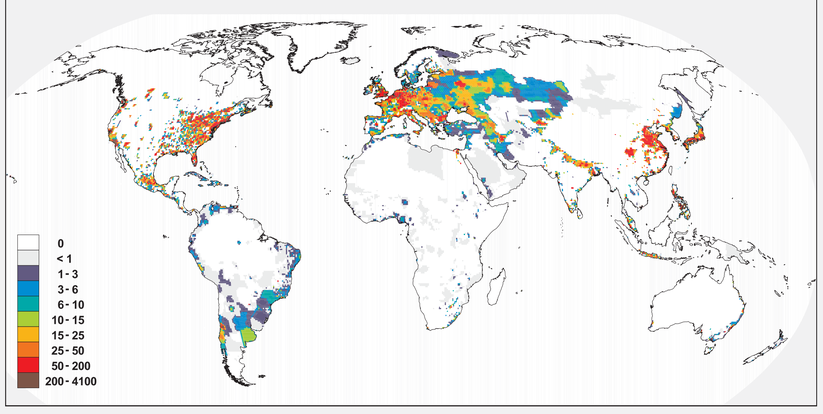
Utility Data Institute (UDI) (2000): World Electric Power Plants Database. Platts Energy InfoStore, www.platts.com.

Industry

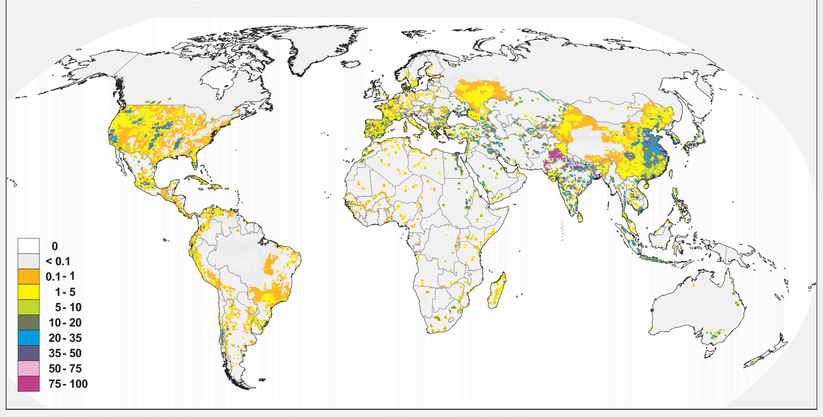
0.5° population density map
country data: electricity production, industrial water withdrawals and consumption, urban and rural population

for scenarios: changes in electricity production, (industrial) GDP, population

Industrial withdrawal water use 1995 [mm/yr]



Percentage of cell area equipped for irrigation around 1995



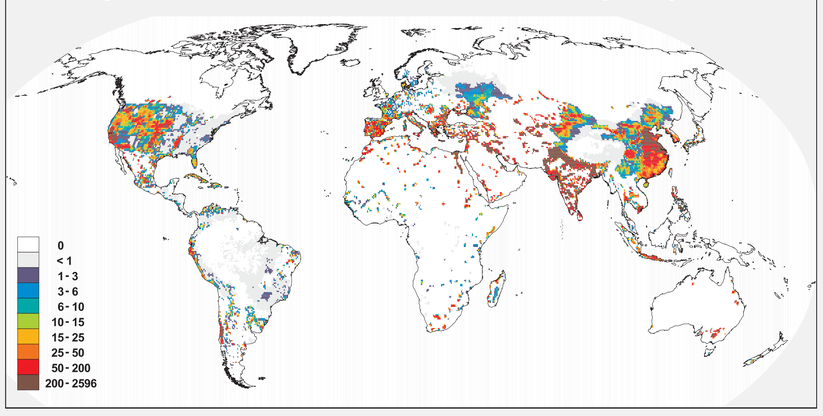
Döll, P., Siebert, S. (2000): A digital global map of irrigated areas. ICID journal, 49(2), 55-66.
Siebert, S., Döll, P. (2001): A digital global map of irrigated areas - An update for Latin America and Europe. World Water Series 4, Center for Environmental Systems Research, University of Kassel, Germany.

Irrigation

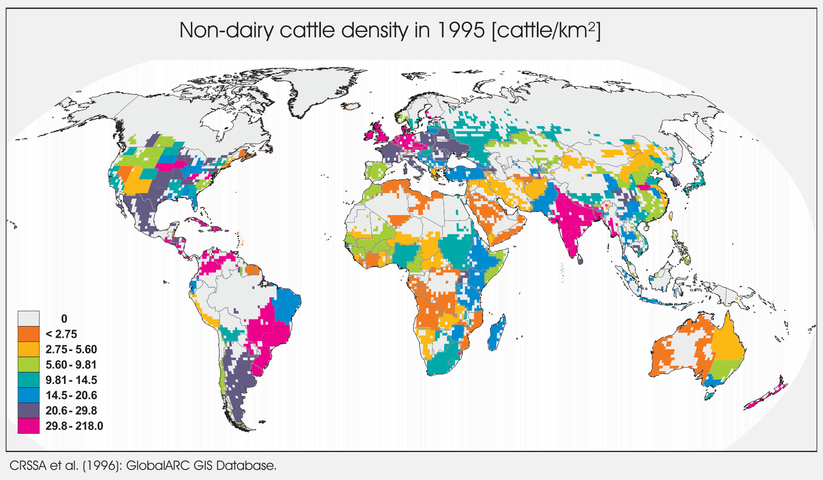
0.5° climate data (1901-1995 monthly values of precipitation, temperature, number of wet days, sunshine) and soil suitability
country data: irrigated rice growing area

for scenarios: changes in irrigated area, climate

Irrigation withdrawal water use 1995 (1961-90 climate)[mm/yr]



Non-dairy cattle density in 1995 [cattle/km²]



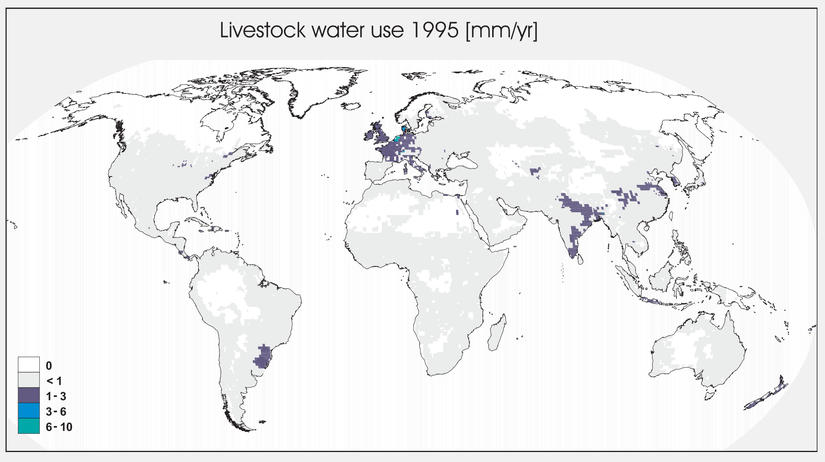
CRSSA et al. (1996): GlobalARC GIS Database.

Livestock

density maps for nine other livestock types

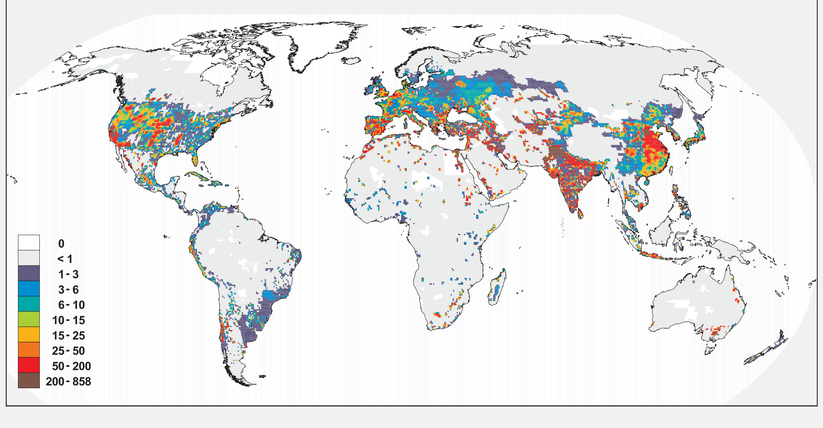
for scenarios: changes in number of livestock

Livestock water use 1995 [mm/yr]

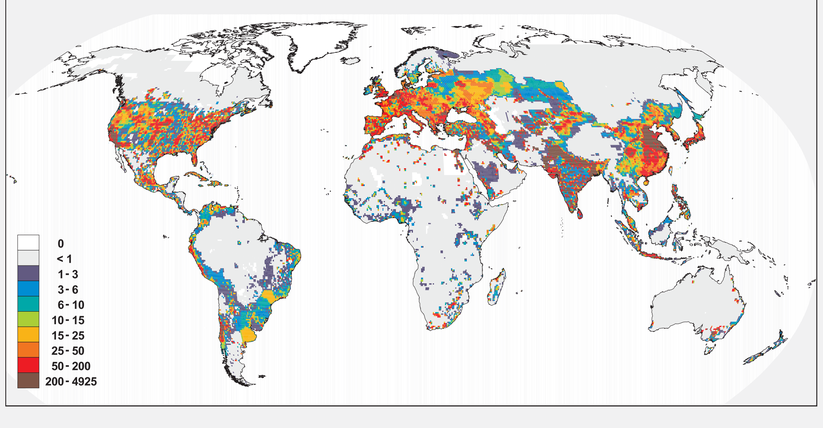


Total consumptive water use 1995

Consumptive water use 1995 [mm/yr]



Withdrawal water use 1995 [mm/yr]



Total withdrawal water use 1995