Module 28: Humans and water in the future

Water footprint: the amount of water used per capita (per head) in a country, including irrigation, industry and residential use.

Check out these two images:

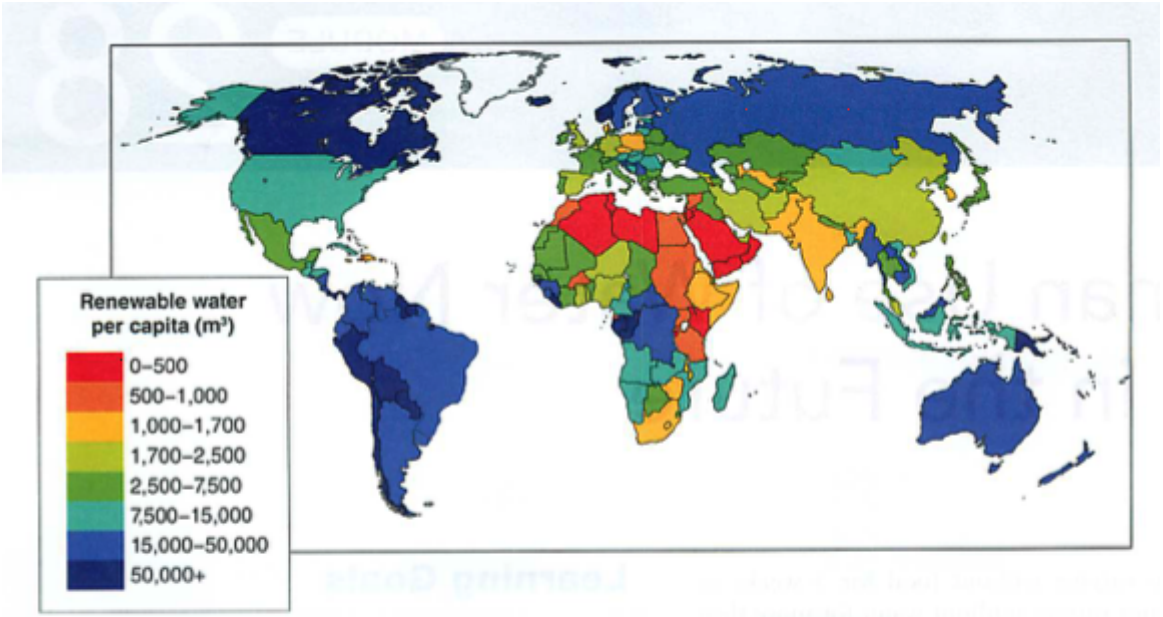


FIGURE 27.8 Water availability per capita. The amount of water available per person varies tremendously around the world. North Africa and the Middle East are the regions with the lowest amounts of available fresh water. (*Data from: United Nations World Water Development Report 2015 http://www.unesco.org /fileadmin/MULTIMEDIA/HQ/SC/images/WWDR2015_03.pdf)*

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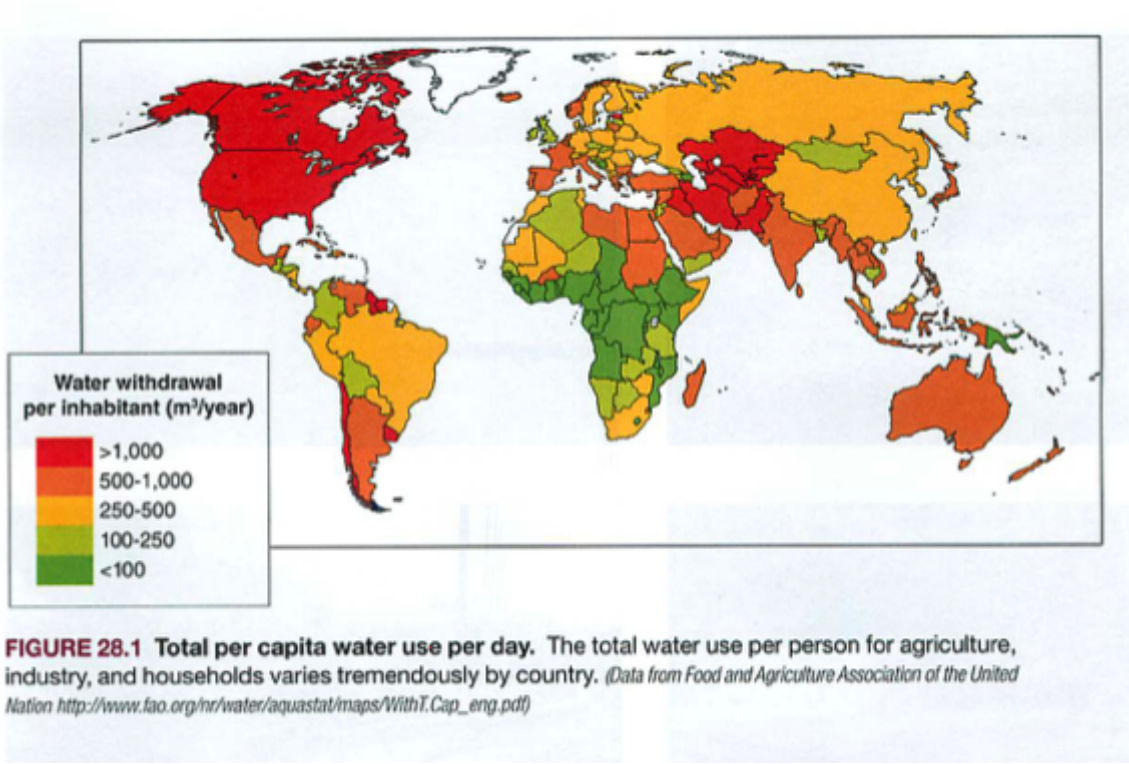


FIGURE 28.1 Total per capita water use per day. The total water use per person for agriculture, industry, and households varies tremendously by country. *(Data from Food and Agriculture Association of the United Nation http://www.fao.org/nr/water/aquastat/maps/WithT.Cap_eng.pdf)*

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What do you notice about use and availability?
Often, humans waste what they have available (water, timber, food)
As the need for food increases (population just passed 8 billion), creative methods will be needed to conserve water:
Irrigation:

- Furrow irrigation: 65% of water goes to plants
- Flood irrigation: 70% goes to plants
- Spray irrigation: 75% goes to plants (if not windy)
- Drip irrigation: 95% goes to plants

So...why not use the last two? Expensive (materials and labor)
But: as food prices rise along with water needs, these will become more widespread

Hydroponics: takes soil out of the equation, how?
Closed system with water, aeration and nutrients, everything a plant needs
Issues: small scale but very high productivity, often enclosed in greenhouses which prevent pests, can be organic (no pesticides) and can be grown where weather prevents normal crops

Industrial water use (huge):
Copper: 440 l (116 gallons) per kg of Cu for wiring
Aluminum: 410 l per kg
Steel: 260 l per kg
Paper: 125 L per kg

Most folks don't see these water uses, and they show up as pollution sources as well as water users

Household water use:
White water: pure water, can be used for drinking
Grey water: soapy wash water, can be used for irrigation or flushing, but not clean enough for drinking
Black water: raw sewage, can be treated to become usable for irrigation or flushing, even drinking (see rivers next semester)

Japan has created washing machines and sinks ABOVE toilets, so grey water use used for flushing. Cool!


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Water ownership:
Water wars will be fought more and more, current conflicts:

TABLE 15.2 International Water Disputes

River/Lakes	Countries Involved	Issues
	Asia	
Brahmaputra, Ganges, Farakka	Bangladesh, India, Nepal	Alluvial deposits, dams, floods, irrigation, international quotas
Mekong	Cambodia, Laos, Thailand, Vietnam	Floods, international quotas
Salween	Tibet, China (Yunan), Burma	Alluvial deposits, floods
	Middle East	
Euphrates, Tigris	Iraq, Syria, Turkey	International quotas, salinity levels
West Bank Aquifer, Jordan, Litani, Yarmuk	Israel, Jordan, Lebanon, Syria	Water diversion, international quotas
	Africa	
Nile	Mainly Egypt, Ethiopia, Sudan	Alluvial deposits, water diversion, floods, irrigation, international quotas
Lake Chad	Nigeria, Chad	Dam
Okavango	Namibia, Angola, Botswana	Water diversion
	Europe	
Danube	Hungary, Slovak Republic	Industrial pollution
Elbe	Germany, Czech Republic	Industrial pollution, salinity levels
Meuse, Escaut	Belgium, Netherlands	Industrial pollution
Szamos (Somes)	Hungary, Romania	Water allocation
Tagus	Spain, Portugal	Water allocation
	Americas	
Colorado, Rio Grande	United States, Mexico	Chemical pollution, international quotas, salinity levels
Great Lakes	Canada, United States	Pollution
Lauca	Bolivia, Chile	Dams, salinity
Paran	Argentina, Brazil	Dams, flooding of land
Cenepa	Ecuador, Peru	Water allocation

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Deep wells and horizontal drilling are two sneaky ways to steal water from your neighbors. Outright warfare is another, more obvious method.

Climate change will impact many of the rivers in the world as glaciers retreat, so water diversion will become a global issue:



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