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Innovations in Water Technology

# Facts on Water Worldwide

Water is our lifeblood – it makes up 60% of our body, 70% of our brain, and 80% of our blood. Without food, one can live for weeks, but without water, one can expect to live only for a few days. As the world population continues to grow, the demand for water increases even more rapidly. More and more water is needed for drinking, agriculture, industrial development, and even the production of energy. While demand for water is exploding, availability is declining.

Conservation efforts and scientific advancements are helping us learn how to use water more efficiently. Projects like dams and water canals transport water from places of abundance to places of greatest need. Technologies like desalination are converting non-usable water to fresh water. Various humanitarian agencies are building wells and pumping water to villages without access, while other products and inventions help people in developing nations treat water affordably.

Continued innovation and smarter use of resources will help our world meet the growing demand for water. Much progress has been made on improving access to water sources and sanitation in developing nations, while wealthier nations are using technology to improve efficiencies and expand water availability. For example, *The Economist*'s May 2010 article stated that "Desalination is the great hope" in response to the pending water crisis.

The following statistics define our use of water.

**Water Consumption**[i]

- In 1950, the world's population was about 2.5 billion. By 2010, population rose to 7 billion, and is predicted to be 9 billion in 2050. The area under irrigation has doubled and the amount of water drawn for farming has tripled.
- Farming accounts for 70% of water withdrawals worldwide, industry accounts for 22%, and domestic activities account for 8%.
- Industry generates 70 times as much value from a liter of water than does agriculture.
- It is no surprise that rich countries use around 60% of water for industry, versus only 10% in poor countries. The difference in domestic water use is much smaller, at 11% for rich countries and 8% for poor countries.

**Typical Water Use**

- All humans need a basic minimum of 2 liters (1/2 gal) of water each day for consumption.[i]
- When factoring in sanitation, bathing, and cooking needs, as well as basic survival, water demand rises to about 50 liters (13.2 gals) per person.[ii]
- ¼ of most household water use goes towards flushing toilets. A toilet flush uses 11 liters (3 gals) of water. A load of laundry uses 150 liters (40 gals) of water. A ten-minute shower uses 190 liters (50 gals) of water.[iii]

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- An American taking a five-minute shower uses more water than the typical person living in a developing country slum uses in a whole day. [ii]
- Millions of people live on less than 11 liters (3 gals) per day of water, while the average American uses 600 liters (160 gals) per day.[iii]
- The average Malian draws 4 cubic meters (1000 gals) a year for domestic use, the average American 215 cubic meters (57,000 gals).[i]
- The average Ugandan draws 20 cubic meters (5,300 gals) for total water use versus 5,000 cubic meters (1.3 million gals) for the average Turkmenistani. [i]
- In Florida, 11,300 liters (3000 gals) are used to water the grass for each golf game played.[iv]
- 7.6 million cubic meters (2 billion GPD) is used for golf course irrigation in the U.S.[iv]
- U.S. swimming pools lose 568 million cubic meters (150 billion gals) to evaporation every year.[iv]
- The longest water tunnel, supplying New York City, is 137 km (85 miles) and leaks up to 132,000 cubic meters (35 million gals) a day.[iv]
- Agriculture accounts for 70% of water use worldwide.[i]
- Agricultural production is projected to double by 2050 to feed the growing world population. Increased agricultural production will increase water withdrawals as well.[v]
- On average, 70 liters (18 gals) of water are required to produce an apple, 1,000 (260 gals) to produce a liter of milk, and 11,000 (2,900 gals)to produce a kilo of cotton.[i]
- Water use varies according to region -- SABMiller uses 45 liters (12 gals) of water to produce a liter of beer in the Czech Republic, but 155 liters (41 gals) in South Africa.[i]

**Water Scarcity**

- 97.5% of the Earth's water is salty, meaning that only 2.5% of water is fresh. About 2/3 of fresh water is frozen, leaving < 1% available for consumption.[iv]
- Most of the available fresh water is in aquifers that we're draining much more quickly than the natural recharge rate.[iv]
- In the past 5 years, the Jordan River has lost over 90% of its normal flow, due to dams and diversion of water to cities and farmlands.[iv]
- The Dead Sea, which is fed by the Jordan, has dropped 21 meters (70 feet) since 1978.[iv]
- By 2025, 1.8 billion people will live in regions of severe water scarcity.[iv]
- The proportion of people living in countries chronically short of water stood at 8% at the turn of the 21st century, and is set to rise to 45%, or 4 billion people, by 2050.[i]
- Just nine countries account for 60% of all available fresh water supplies.[i]
- China and India, with over a third of the world's population between them, have less than 10% of the world's water.[i]
- In China, the water available to each person is only a quarter of the world average. In the rain-starved north of China, the availability per person is only a quarter of that in the south.[i]

**Access to Water**

- About 1 billion people are without access to a decent water supply. Around the same number of people go to bed hungry each night, often because there is no water to grow food.[i]
- Malnutrition in the womb and during the first two years of life causes irreversible changes that lead to lifelong poor health, which in turn translates into poor economic output. A study was

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done in which children from two villages were given a more nutritious supplement during their first seven years than were children from two other villages. After adulthood, the boys who had had the more nutritious diet in their first two years were found to have larger bodies, a greater capacity for physical work, more schooling and better cognitive skills. They also grew up to earn average wages 46% higher than the other groups.[i]

- On average, 46% of people on earth do not have water piped to their homes.[iv]
- In rural areas, 69% of people do not have water piped to their homes. [vi]
- 18% of the world's population defecates in the open.[iv]
- About 2.5 billion people have no safe way to dispose of human waste.[iv]
- The water and sanitation situation in Sub-Saharan Africa is the most dire, with 40% of the population with no access to improved water sources in 2010, and 69% with no access to improved sanitation.
- In Sub-Saharan Africa, only 35% of urban dwellers have water piped to their home, with only 5% of rural dwellers using piped water.[vi]
- 40% of households in sub-Saharan Africa are more than a half an hour from the nearest water source.[iv]
- Women and girls represent 72% of those typically responsible for collecting water.[vi]
- Many people in poor and arid countries – usually women or children – need 5 or 6 hours per day to collect water.[i]
- Women in developing countries walk an average of 3.7 miles to get water, and then often carry 50 lbs or more of water on their backs.[iv]
- More than two-thirds of people without an improved water source live on less than $2 a day.[ii]
- Poor people living in the slums often pay 5-10 times more per liter of water than wealthy people living in the same city.[ii]

**Health Issues Related to Water**

- Without piped water to wash their hands with, let alone to drink, around 2 billion people are inevitably carriers of disease.[i]
- Patients with water-related diseases fill half the hospital beds in the poorest countries.[i]
- 3.3 million die from water-related health problems each year, most of them children under 5 years old.[iv]
- Dirty water and poor sanitation kill 5,000 children a day, which equates to a child dying from a water-related disease every 15 seconds.[i]
- 84% of water-related deaths are in children ages 0 – 14.[ii]
- 98% of water-related deaths occur in the developing world.[ii]
- The water and sanitation crisis claims more lives through disease than any war claims through guns.[ii]
- 43% of water-related deaths are due to diarrhea.[ii]

**Benefits of Improved Water and Sanitation**

- Proper hand-washing can reduce diarrheal disease by 45%.[iv]
- Studies show that on-site electrolytic generators used internationally result in nearly 50% reductions in diarrheal disease.[vii]

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- An eradication campaign that includes a simple water filter has cut the number of guinea worm cases by 99.9% since 1986.[iv]
- Improved water and sanitation have been demonstrated to lead to significant reductions in morbidity and mortality, with an almost immediate impact. The estimated return on every dollar invested in improved water and sanitation is US$4-34.[viii]
- The United Nations' Millennium Development Goals call for halving, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.[viii]
- The estimated economic benefits of halving the number of people without access to safe drinking water and sanitation are significant:[viii]
    - Annual health care savings of $7 billion for health agencies and $340 million for individuals
    - 320 million productive days in the 15-59 year age group, an extra 272 million school attendance days a year, and an added 1.5 billion healthy days for children under 5 years, together representing productivity gains of $9.9 billion a year
    - Time savings resulting from more convenient drinking water and sanitation services totals 20 billion working days a year, giving a productivity payback of some $63 billion

**Bottled Water**

- Bottled water consumption is forecast to be 174 billion liters (46 billion gals) in 2011, an increase of 51% since 2006.[ix]
- The global consumption of bottled water more than quadrupled between 1990 and 2005.[ix]
- If placed end to end, enough plastic bottles are produced each year to circle the planet 190 times.[x]
- U.S. consumers paid between 240 and 10,000 times more per unit volume for bottled water than for tap water.[xi]
- Every year over $100 billion dollars is spent on bottled water worldwide.[xii]
- It is estimated that $11.3 billion would be required to halve the number of people without sustainable access to safe drinking water and basic sanitation. If just 12% of the money spent annually on bottled water were redirected, this goal could be achieved.[xiii]

**Water Projects**[iv]

- The weight of China's three gorges reservoir will tilt the earth's axis by nearly an inch.
- Dam projects have displaced up to 80 million people worldwide.
- The Itaipú Dam in South America cost $18 billion and took 17 years to build.
- Irrigation allows California farmers to grow half of all U.S. vegetables, fruits, and nuts, despite the bulk of the state being desert.
- Orange County Water District in California recycles 265,000 cubic meters (70 million GPD) of sewage into water so clean it's almost distilled.

**Desalination**

- 60.5 million cubic meters (16 billion GPD) of water are produced by the world's 14,450 desalination plants.[iv]

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- Desalination currently only provides 0.4% of the world's fresh water, but continuing technology improvements are reducing cost.[i]

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[v] "Water - The right price can encourage efficiency and investment," *Organisation for Economic Co-operation and Development (OECD).* http://www.oecd.org/document/47/0,3343,en_2649_37425_36146415_1_1_1_1,00.html, accessed June 16, 2010.

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[x] "Beyond the Barrel – A Race to Fuel the Planet," *CNBC*, and http://earth911.com/recycling/plastic/plastic-bottles/facts-about-plastic-bottles/

[xi] "Bottled Water: Pure Drink of Pure Hype?," Natural Resources Defense Council, March 1999. http://www.nrdc.org/water/drinking/bw/bwinx.asp, accessed June 17, 2010.

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[xiii] "Factsheet on Water and Sanitation," International Decade for Action – Water for Life, 2005-2015. *United Nations.* http://www.un.org/waterforlifedecade/factsheet.html, accessed June 17, 2010.