

# WATER SCARCITY

www.obedwatershed.org Obed Watershed Community Assn.  
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## Freshwater Use

**Human Needs:** Researchers estimate that, on average, each person on earth needs a minimum of 264,000 gallons of water per year - equivalent to two-fifths of the volume of an Olympic-size swimming pool - for drinking, hygiene, and growing food for sustenance.

**Increased Rate of Consumption:** Over the last century water usage increased sixfold, twice the rate of population growth. Fifty years ago people did not perceive water as a globally scarce resource. But today, competition for clean water has become the norm in many regions. This is in large part because the world's population is rising and many people are getting richer and want to use more water. By 2025, forecasters predict that over three-quarters of the world's people will face some degree of water scarcity, already the situation for 40% of the global population. Nearly half the world's river systems are degraded, and in some rivers, the flows never reach the ocean.

## Scarcity

**Physical Scarcity** occurs when water use approaches or exceeds sustainable limits - that is where more than 75% of flows are withdrawn for agricultural, industry, or domestic purposes. Indicators of water scarcity include rivers running dry, wells going dry, and lakes disappearing.

Among the rivers that run dry for part of the year are the Colorado in the United States, the Amu Darya in Central Asia, and the Yellow in China. China's Hai and Huai rivers have the same problem from time to time, and the flow of the Indus River—Pakistan's lifeline—is sometimes reduced to a trickle when it enters the Arabian Sea. However, global climate change is worsening aridity and reducing supply in many regions. Severe droughts in the US have left large swaths of the Southwest scrambling for water. Here in the Southeast, our experience with the drought has made us painfully aware of water supply limits

The drilling of millions of wells has pushed water withdrawals beyond the recharge of many aquifers. The failure of governments to limit pumping to the sustainable yield of aquifers means that water tables are now falling in scores of countries.

**Quality Scarcity:** Many water sources are threatened by faulty waste disposal, releases of industrial pollutants, fertilizer runoff, and coastal influxes of saltwater into aquifers as groundwater is depleted.

**Economic Water Scarcity** occurs when human, institutional, infrastructural, or financial limitations prevent people from gaining access to water even though sufficient supplies are available. People in the American West have an old saying: "Water usually runs downhill, but it always runs uphill to money." When supplies are deficient, the elite diverts water supplies to higher-revenue generating activities at the expense of those with lower-revenue potential. Because the lack of access to water can lead to starvation, disease, political instability, and even armed conflict, failure to take action can have broad and grave consequences.

## Water in Today's Economy

**Agriculture:** 80% of the world's poor depend upon agriculture for their livelihood. 70% of world water use, including all the water diverted from rivers and pumped from underground, is used for irrigation, 20% is used by industry, and 10% goes to residences. Thus if the world faces a water shortage, it also faces a food shortage.

While the average person requires two quarts of water daily for drinking, the planet's average daily

food intake embodies some 800 gallons of water. The diets of the wealthier embody more water. A single hamburger requires over 2,640 gallons of water, taking into account what is used to produce corn to feed the cows. The rush to produce biofuels will put a further strain on water supplies.

**Industry** consumes another 20% of the freshwater withdrawn from streams. Industrial economies withdraw twice the global average (more than 40%), while those in developing countries account for roughly 10% of national water usage.

**Domestic Water Use:** Less than 10% of withdrawn freshwater is used for drinking and sanitation. Even though a modest amount, safe drinking water is an urgent global priority. Worldwide, more than 1.1 billion people lack access to improved water supplies, and over 2.7 billion lack sanitation. Two-thirds of those without access to water earns less than \$2 a day.

**Ecological Flow:** People are not the only creatures needing freshwater. Ecosystems depend upon fresh clean water to survive. This ecosystem demand is often not considered when water is taken from a stream or when the stream is used as a sewer. Maintaining or restoring environmental flows is often in stiff competition with economic growth and development. To maintain functional ecosystems, societies need to keep natural river flows and leave water of sufficient quality in the river. When the natural ecosystem is denied necessary water, it will collapse.

**Water Management and Equity:** Not having water access forecloses opportunities or makes them unprofitable. For poor people, water scarcity is not only about droughts or rivers running dry. Above all, it is about guaranteeing the fair and safe access they need to sustain their lives and secure their livelihoods. For the poor, scarcity is about how institutions function and how transparency and equity are guaranteed in decisions affecting their lives. It is about choices on infrastructure development and the way they are managed. In many places throughout the world, organizations struggle to distribute resources equitably.

### **Valuing Water for Sustainability**

**Flawed Market Signals:** Water as a resource underpins economic activities, but prices virtually never reflect water's full economic value. Within the Gross Domestic Product, the value of water appears as the price actually paid for it. This price is generally far less than water's real economic value and often even less than the cost of supplying it. Without true cost accounting, we cannot make reasonable decisions on water use and supply.

**Ecosystem Services Not Monetized:** The national account system (GDP) does not calculate the costs of degradation of water resources and related ecosystem services. The system accounts for the construction of water treatment plants and dams, but does not include investments in natural infrastructure such as protection of wetlands, groundwater, and watersheds even when they serve the same purpose as a water treat facility or dam. The inflated income coming from overexploitation or degradation of natural assets is considered strong economic growth. Here in Cumberland County, the carving up of farmland and tearing down of forests to build second homes examples that economic growth. Decision makers and consumers receive perverse signals regarding the sustainability of their development strategies and choices.

**Undervalued and Overexploited:** Water is not an inexhaustible resource. The historic view was that water was abundant relative to demand and not an important focus for economists. Water could always be dammed or pumped from the ground. Little thought was given to the possibility that the world might reach a scale of resource exploitation at which the capacity of both the use of water as a supply and as a place to put our wastes could become a binding constraint on well-being and economic growth. Water prices are

typically related to the capital outlays required to deliver water without any component of value given to the resource itself. Undervalued water resources tend to be overused. Distorted price signals provide poor information about whether economic activities are actually creating value or destroying a stressed resource. The constraint is no longer capital or labor, but the natural resource itself.

**Total Economic Value** captures both the market and nonmarket values of a natural resource. Use values include:

- Direct Use Value - derived from goods that can be extracted, consumed, or enjoyed directly: drinking water, fish, hydropower, recreational activities.
- Indirect Use Value - derived from the services derived from the natural resource: regulation of river flows, water purification, and other ecosystem services.
- Option Value - derived from future benefits derived from ecosystem services.
- Bequest Value - derived from the benefits provided future generations.
- Existence Value - derived from knowing that something simply exists, whether or not useful to people.

**Demand Management of Limited Resource:** Today, calls for new water supplies are questioned and water conservation is increasingly seen as a method to meet future water demands. Questions need to be asked of any project to develop a new water supply:

- Is it really necessary to tap “untapped” resources and for what purpose?
- What will these supply projects cost and how will they affect ecosystems and current water users?
- Do benefits justify economic, environmental, and social costs?

### **Sustainable Water Management**

**Sustainable Water Management** depends upon more inclusive and transparent decision making, investments in new technologies to enhance water use efficiency and water productivity, and careful alignment of economic signals and incentives.

**Managing Water Across Scales:** Because water is bulky and expensive to store and move, it is generally managed and allocated at a fairly local level. Effective water management focuses on the watershed basin level and works to reconcile various water users and demands to achieve a sustainable system. Working at a watershed level, however, is difficult as it does not correspond with political and administrative boundaries.

**Integrated Water Resources Management:** River basin organizations, like the Obed Watershed Community Association, are being established to manage water holistically at the basin level. The challenge remains to engage all stakeholders active within a watershed to help them understand the consequences of their actions. Consulting people who will be affected by disturbances within a watershed is essential to enhancing sustainability.

### **Technology**

- Industries are using and developing new technologies and processes to reduce water use and discharges. Crossville Ceramics and Stone Peak in Crossville treat their own water for reuse.
- Households can now purchase low-flush toilets, low-flow showers and faucets.
- Agricultural producers, the largest water consumers, have moved to drip irrigation, fixing leaks, and soil conservation practices.
- Municipal systems can enhance their water supply through innovative wastewater treatment and water reuse techniques.

- Decoupling water supplies from sanitation systems saves significant amounts of freshwater. Moreover, recycled wastes cut the use of fertilizer derived from fossil fuels.

**Watershed Services:** Decision-makers are increasingly investing in the natural water infrastructure such as watersheds, wetlands, and flood plains to provide the same services as weirs, dams, and wastewater treatment facilities. At the same time, biodiversity, aesthetics, and recreational benefits are preserved. In Costa Rica, the Heredia water utility pays landholders to protect forest on hill slopes which provide the region's water.

**Market-Based Tools:** In the past the cost of freshwater in the US has been too low to encourage users to save water. As often happens when people exploit a natural resource, few worry about waste if a commodity is so cheap that it seems almost free. Setting higher prices for water is a priority strategy to conserve water. Higher water prices can spur the adoption of measures such as the systematic reuse of grey water for nonpotable applications.

**Fixing Leaking Infrastructure:** Raising prices encourage municipalities and others to reduce water losses by improving maintenance of water-delivery systems. A major consequence of cheap waste is that insufficient funds are generated for future development and preventive upkeep. The City of Crossville has a 25% loss of water.

### **Water Footprint**

**Footprint:** A person's water footprint is the volume of freshwater the individual uses directly and in the production of the goods and services consumed. You can find your water footprint at [www.h2oconserve.org](http://www.h2oconserve.org).

**Beef:** In the U.S. it takes about 60 gallons of water to produce 1 pound of corn. When the corn is then fed to cattle, which also require water for drinking, cleaning and processing, it ends up taking over 1,500 gallons of water to produce a single pound of beef. The average American eats about 54 pounds of meat a year,

**Chicken:** Producing a single pound of corn-fed chicken takes about 287 gallons of water - that's enough water to fill a barrel 4 feet across and 6 feet high.

**Consumer Products:** It takes about 32,000 gallons of water to produce the steel that goes into the average automobile. In addition, every gallon of gas that a car burns takes 1.75 gallons of water for refining. Water is also used to produce most of the materials we commonly use at home. For instance, it takes 24 gallons of water to make 1 pound of plastic, meaning about 1.5 gallons of water are used to produce the average plastic water bottle.

**Resources:** Worldwatch Institute, *State of the World 2008*; *Scientific American*: Facing the Freshwater Crisis, July 2008; [www.h2oconserve.org](http://www.h2oconserve.org).

The Obed Community Association's purposes are community watershed education and volunteer involvement in ongoing appreciation and protection of the natural heritage of the Obed River watershed within Cumberland County. Louise Gorenflo, OWCA community educator, produced this fact sheet. Those wanting to join this membership organization or more information may contact OWCA at 484-9033 or at 185 Hood Drive, Crossville, TN 38555.