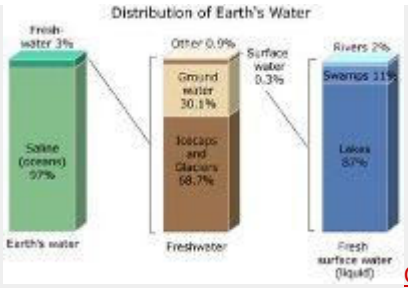
Enough water to go around?

***Nature* checks out the state of usable water on our planet.**

Rachel Courtland



Click to see graphic: Distribution of Earth's water.*USGS*

How much water is there on the planet?

If our planet were perfectly flat and its water covered all the surface, it would create a layer 2.7 kilometers deep. While this seems like a lot, less than 3% of that is freshwater. Of that, nearly 70% is in ice caps, glaciers, and permanent snow, and 30% sits in ground water. Rivers, lakes, and clouds carry less than 1% of the world's freshwater.

Is there enough water to go around?

It depends on where you live. Every individual requires an estimated minimum of 1,000 cubic metres of water per year, to grow food and meet drinking and hygiene needs (See Water facts). Global water sources vary widely; some areas, such as sub-Saharan Africa, regularly suffer from water scarcity and are unable to meet this requirement.

Why is it an issue?

More than 1 billion people lack access to potable water and 2.6 billion do not have access to adequate sanitation, according to the World Health Organization. A lack of clean water forces people to use unsafe water, which affects health and increases the incidence of diseases like cholera and dysentery. The food supply is also limited by water shortages; a litre of water is required to produce every calorie of food[1].

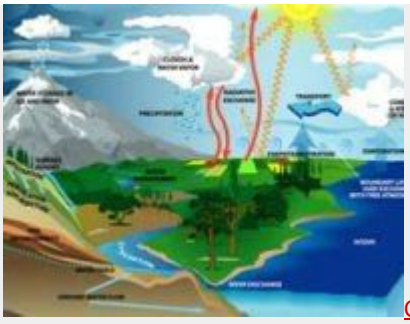
Will there be enough water to go around in the future?

Click to see image: Water scarcity in 2025.*World Resources Institute*

Many expect a dramatic rise in areas experiencing water scarcity in coming decades. Population and development pressures are creating competing demands for water for basic human needs, agriculture and power (water is used not only in hydroelectric plants and steam turbines, but also to cool fossil fuel and nuclear power plants). In 2000, for example, electricity production and agriculture each accounted for roughly 40% of freshwater withdrawals in the United States. US energy consumption alone is expected to rise by 50% by 2030, putting further pressure on resources (see 'The energy challenge').

How will climate change contribute?

The rise in global temperatures is expected to change the rates of flow of various parts of the water cycle. It will greatly reduce mountain snowpack, for example, a large source of water in many regions including India and the western United States. A recent United Nations report warned that ice loss from glaciers reached record levels in 2006, and many mountain glaciers could disappear completely within decades.



Click to see graphic: Water cycle.*US Global Change Research Program*

Getting rain instead of snow will also change the variation in water availability at different times of year, and dams set up to capture snowmelt may no longer be optimally placed to capture rainfall. As global temperatures rise, climate scientists generally expect more rain to fall, but less often. Longer dry spells could impact the food supply in a number of areas (see 'A long dry summer').

We can't drink less water. How do we make sure there's enough to go around?

For inland areas, one obvious but often controversial idea is to divert water from rivers with heavy flow to areas that are water-deprived. Some countries are planning to do this on a massive scale (see 'Muddy waters').

Making water fit to drink poses other challenges. Advances are being made developing materials that can trap viruses and bacteria, and de-activate them using catalysts triggered by light. The construction of desalination plants is on the rise in coastal areas, but this process has been criticized for being energy-intensive (see 'Purification with a pinch of salt').

It's a good idea too to re-use water whenever possible. Captured water from industry or municiple waste can be lightly treated and re-used on the spot for irrigation or industry, saving the energy needed to fully clean or re-pump water around (see 'Science and technology for water purification in the coming decades').

And agricultural systems can be designed so that crops need less water and are more tolerant to drought, for example. There is some tension, however, on whether to move forward with genetically modified crops for this purpose (see 'More crop per drop').

wOne target of the United Nations Millennium Declaration is to see the proportion of people without safe drinking water and basic sanitation halved by 2015. Will we meet that goal?

Perhaps. "There's a chance that we could meet the Millenium goals for safe water, but almost no chance we could meet it for sanitation, and in fact, we're falling behind," says Peter Gleick of the Pacific Institute, a non-profit based in Oakland, California. Gleick says investment in sanitation facilities has been a relatively low priority. But some question the utility of the current indicators (see 'Improving on the haves and have-nots').

MORE WATER FACTS

This story is part of a news special on water.

- ***References***

1. *Comprehensive Assessment of Water Management in Agriculture* (International Water Management Institute, 2006).

Web address: http://www.nature.com/news/2008/080318/full/news.2008.678.html