

Facts on Water Resources

A summary of the United Nations World Water Development Report 2



A summary by:



WATER is essential for human survival and well-being and important to many sectors of the economy. However, resources are irregularly distributed in space and time, and they are under pressure due to human activity.

How can water resources be managed sustainably while meeting an ever increasing demand?

Introduction: pressures on water resources

Around the world, human activity and natural forces are reducing available water resources. Although public awareness of the need to better manage and protect water has grown over the last decade, economic criteria and political considerations still tend to drive water policy at all levels. Science and best practice are rarely given adequate consideration.

Pressures on water resources are increasing mainly as a result of human activity – namely urbanisation, population growth, increased living standards, growing competition for water, and pollution. These are aggravated by climate change and variations in natural conditions.

Still, some progress is being made. More and more, officials are evaluating water quantity and quality together, and coordinating management efforts across borders.

Where and in what forms is water available on Earth?

The world's water exists naturally in different forms and locations: in the air, on the surface, below the ground, and in the oceans.

Freshwater accounts for only 2.5% of the Earth's water, and most of it is frozen in glaciers and icecaps. The remaining unfrozen freshwater is mainly found as groundwater, with only a small fraction present above ground or in the air.

Looking at how water moves through the Earth's water cycle helps us understand how it interacts with the environment and how much is available for human use.

Precipitation – rain, snow, dew etc. – plays the key role in renewing water resources and in defining local climatic conditions and biodiversity. Depending on the local conditions, precipitation may feed rivers and lakes, replenish groundwater, or return to the air by evaporation.

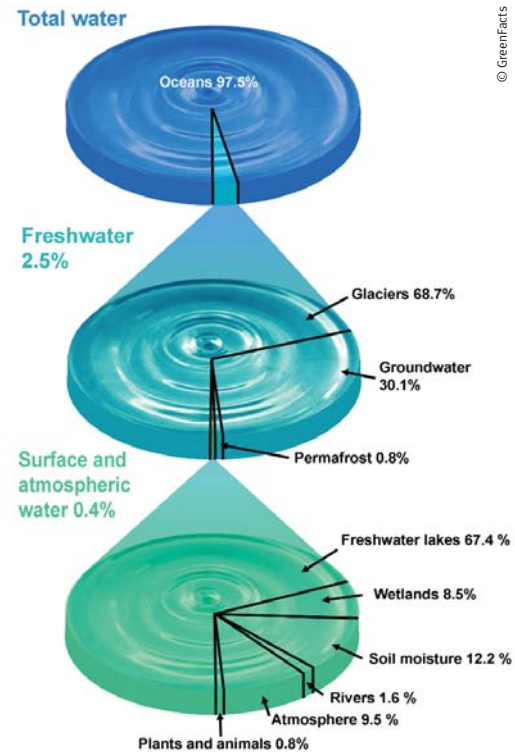
Glaciers store water as snow and ice, releasing varying amounts of water into local streams depending on the season. But many are shrinking as a result of climate change.

River basins are a useful “natural unit” for the management of water resources and many of them are shared by more than one country. The largest river basins include the Amazon and Congo Zaire basins. River flows can vary greatly from one season to the next and from one climatic region to another. Because lakes store large amounts of water, they can reduce seasonal differences in how much water flows in rivers and streams.

Wetlands – including swamps, bogs, marshes, and lagoons – cover 6% of the world's land surface and play a key role in local ecosystems and water resources. Many of them have been destroyed, but the remaining wetlands can still play an important role in preventing floods and promoting river flows.

Of the freshwater which is not frozen, almost all is found below the surface as **groundwater**. Generally of high quality, groundwater is being withdrawn mostly to supply drinking water and support farming in dry climates. The resource is considered renewable as long as groundwater is not withdrawn faster than nature can replenish it, but in many dry regions the

groundwater does not renew itself or only very slowly. Few countries measure the quality of groundwater or the rate at which it is being exploited. This makes it difficult to manage.



Global distribution of the world's water



Schematic of the hydrologic cycle components in present-day setting



More than two thirds of the world's freshwater is in frozen form in glaciers and Ice Caps but many are shrinking as a result of climate change.

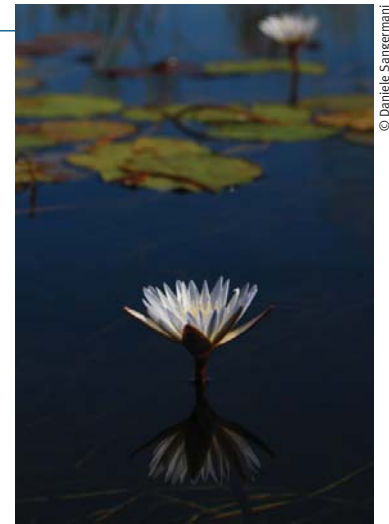
How much freshwater is available in different countries?

The quantity of freshwater that is available for use by a given country in a given year, without exceeding the rate at which it is renewed, can be estimated taking into account the amount of precipitation, water flows entering and leaving the country, and water shared with other countries.

The average amount available per person varies from less than 50 m³ per year in parts of the Middle East to over 100 000 m³ per year in humid and sparsely populated areas.

The United Nations has kept a country by country database of such estimates for several decades. This database can be consulted at: www.fao.org/hr/aquastat/.

Though the database has become a common reference tool, it has some drawbacks. Figures only indicate the maximum theoretical amount available for a country and may be an overestimation. Moreover, annual and national averages tend to mask local and seasonal differences.



© Daniele Sangermani

In what ways can human actions affect water resources?

Water resources face a host of serious threats, all caused primarily by human activity. They include pollution, climate change, urban growth, and landscape changes such as deforestation. Each of them has its own specific impact, usually directly on ecosystems and in turn on water resources.

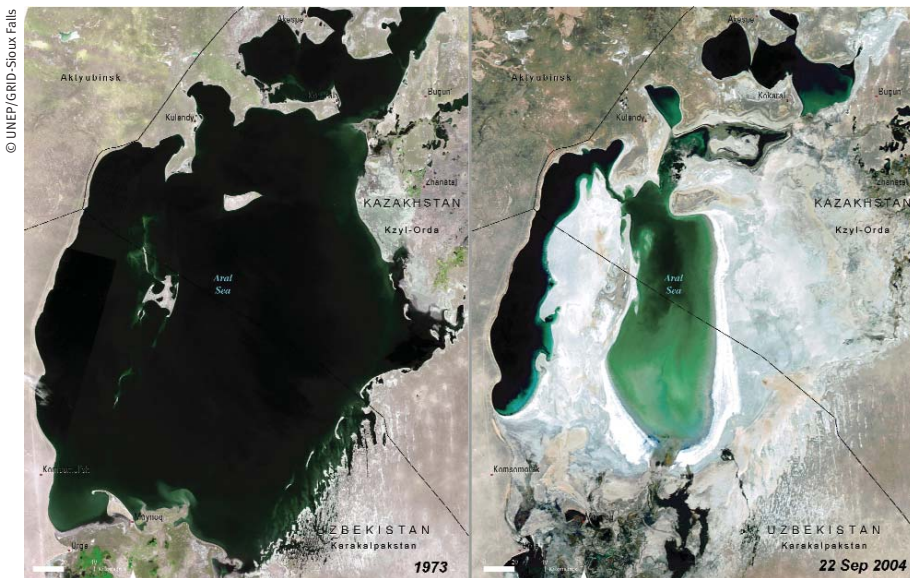
If inadequately managed, activities like farming, forest-clearing, road-building, and mining can lead to too much soil and suspended particles ending up in rivers (sedimentation). This damages aquatic ecosystems, impairs water quality and hinders inland shipping.

Pollution can harm water resources and aquatic ecosystems. Major pollutants include for instance organic matter and disease causing organisms from waste water discharges, fertilisers and pesticides running off from agricultural lands, acid rain resulting from air pollution, and heavy metals released by mining and industrial activities.

The effects of extracting too much water, both from surface waters and groundwater, have been dramatic. A striking example is the drastic reduction in size of the Aral Sea and Lake Chad. Little is being done to address the causes, which include poor water management practices and

deforestation. In recent decades, much more water has been extracted from underground sources. The benefits of withdrawing groundwater are often short-lived, while the negative consequences – lower water levels and depleted resources, for example – can last a long time.

Climate change appears to increase existing pressures, for example in areas already suffering from water shortages. Land and mountain glaciers have been shrinking more rapidly in recent years. Extreme weather events stemming from global warming, such as storms and floods, are likely to become more frequent and severe. However, based on current knowledge, scientists can only make general predictions about the impact of climate change on water resources.



Aral Sea: Diversion of rivers for irrigation has reduced drastically its size.

This text is a faithful summary, by GreenFacts, of the United Nation Water Development Report 2, more specifically of chapter 4: *The State of the Resource*. A web version of this summary, along with a longer, more detailed one, can be found on www.greenfacts.org/en/water-resources/.

How can the growing demand for water be met?

Meeting a continuous and ever increasing demand for water requires efforts to compensate for natural variability, and to improve the quality and quantity available.

Rainwater has been collected for thousands of years in many parts of the world. Today, this technique is used in Asia to replenish underground supplies. It is relatively inexpensive and has the advantage of allowing local communities to develop and maintain the required structures themselves.

Diverting surface water into the ground can help reduce losses from evaporation, compensate for variations in flow, and improve quality. Middle East and Mediterranean regions are applying this strategy.

Dams and reservoirs have been built to store water for irrigation and drinking. Moreover dams can provide power and help control floods, but they can also bring about undesirable social and environmental impacts.

Transferring water between river basins can also help alleviate shortages. China, for instance, already has major interbasin links, and is planning more. The impact of these projects on people and the environment must be monitored closely.

Wastewater is now **reused** for different purposes in many countries, especially in the Middle East, and this practice is expected to grow. Worldwide, non-potable water is used for irrigation and industrial



© Daniele Sangermani

cooling. Cities are also turning to water re-use to supplement drinking water supplies, taking advantage of progress in water treatment.

Desalinated water – seawater and other salty water that has been turned into freshwater – is used by cities and by industries, especially in the Middle East. The cost of this technique has dropped sharply, but it relies heavily on energy from fossil fuels and raises waste management and climate change issues.

How could water resources be developed sustainably?

Using water resources sustainably is challenging because of the many factors involved, including changes in climate, the natural variability of the resource, as well as pressures due to human activity.

At present, most water policy is still driven by short-term economic and political concerns that do not take into account science and good stewardship. State-of-the-art solutions and more funding, along with more data on water resources, are needed especially in developing nations.

To assess the state of our water resources, we must fully appreciate the roles of different parts of the water cycle – such as rain, meltwater from glaciers, and so on. Otherwise, it remains difficult to develop adequate protection and mitigation strategies.

Poor water quality and unsustainable use of water resources can limit the economic development of a country, harm health and affect livelihoods. More sustainable practices are starting to be adopted.

When managing water resources, more attention should be paid to increasing existing natural resources and reducing demand and losses.

The traditional response to rising demand for water was to store surface water in reservoirs, divert flow to dry regions and withdraw groundwater. Now these methods are increasingly supplemented by water reuse, desalination and rainfall harvesting. Certain regions are even going to the extreme of exploiting non-renewable groundwater resources.

Some countries have programs to reduce demand and losses from urban water distribution systems but more efforts are necessary. However, this will involve changes in behaviour requiring education and political commitment. Such efforts to conserve water and reduce demand are not only useful in regions where water is in short supply, they can also bring economic benefits in wetter regions.

Decentralised approaches to water resource management that focus on river basins are increasingly pursued even across borders. Exchanging information between countries that share river basins will yield both economic and environmental benefits.

Conclusions on water resources

Our water resources are under pressure. More reliable information is still needed regarding the quality and quantity of available water, and how this availability varies in time and from place to place. Human activities affect the water cycle in many ways, which need to be understood and quantified to manage water resources responsibly and sustainably.

It has become evident that:

- Changes in climate are affecting water availability.
- Pollution, water diversions and uncertainties about the abundance of water are threatening economic growth, environment, and health.
- Underground water is often overexploited and polluted.
- To augment water supply, traditional techniques – such as rainwater collection – are now being supplemented by newer technologies like desalination and water reuse.
- Political support is needed to improve information collection that can in turn enable better decision making about the management and use of water.

GLOSSARY GLOSSARY GLOSSARY GLOSSARY GLOSSARY GLOSSARY GLOSSARY GLOSSARY

Biodiversity — A contraction of biological diversity. Biodiversity reflects the number, variety and variability of living organisms. It includes diversity within species (genetic diversity), between species (species diversity), and between ecosystems (ecosystem diversity).

Climate change — Defined by the United Nations Convention on Climate Change as “change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”.

Ecosystem — An ecological unit made up of a complex system of interactions between living communities (plants, animals, fungi, and microorganisms) and the environment they live in. Ecosystems have no fixed

boundaries; a single lake, a watershed, or an entire region could be considered an ecosystem.

Freshwater — Water that is not salty, for instance water found in lakes, streams, and rivers, but not the ocean. All freshwater ultimately comes from precipitation of atmospheric water vapor, reaching inland lakes, rivers, and groundwater bodies directly, or after melting of snow or ice.

Glacier — A moving body of ice that forms on land from the accumulation and compaction of snow, and that flows downslope or outward due to gravity and the pressure of its own weight.

Groundwater — Water beneath the Earth's surface in the spaces between soil particles and between rock surfaces.

Sustainability — A characteristic or state whereby the needs of the present and local population can be met without compromising the ability of future generations or populations in other locations to meet their needs and aspirations.

Water cycle — The process by which water travels in a sequence from the air (condensation) to the Earth (precipitation) and returns to the atmosphere (evaporation). It is also referred to as the hydrologic cycle. Human use of water can transform the water cycle through irrigation or the construction of dams, for example.

Facts on this publication

This leaflet presents a faithful summary by GreenFacts of the second United Nations World Water Development report “Water, a shared resource” (2006). More specifically, it covers chapter 4 of the report which addresses “The State of the Resource”.

The World Water Development Report (WWDR) is a comprehensive review carried out every three years, providing an authoritative picture of the state of the world’s freshwater resources. It is a joint undertaking of 24 UN agencies in partnership with governments and other stakeholders, coordinated by the World Water Assessment Program of UN-Water.

It presents a comprehensive picture of freshwater resources in all regions and most countries of the world and examines a range of key issues including population growth and increasing urbanization, changing ecosystems, food production, health, industry and energy, as well as risk management, valuing and paying for water and increasing knowledge and capacity.

*This summary, along with a more detailed one, can be found on
www.greenfacts.org/en/water-resources/*

This publication was produced by:



GreenFacts is an independent non-profit organization that publishes faithful online summaries of scientific consensus documents produced by international bodies such as the Intergovernmental Panel on Climate Change, the Millennium Ecosystem Assessment or the World Health Organization. All GreenFacts summaries are peer reviewed by independent experts.

www.greenfacts.org | 2009@greenfacts.org | Tel: +32 (0)2 211 34 88

Published with the support of:



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC

Printed with the support of:



Avec le soutien du Ministre de la Recherche
scientifique de la Région de Bruxelles-Capitale
Met de steun van de Minister van Wetenschappelijk Onderzoek
van het Brussels Hoofdstedelijk Gewest
With the support of the Minister of Scientific Research of the
Brussels Capital Region



Distributed with the support of:

