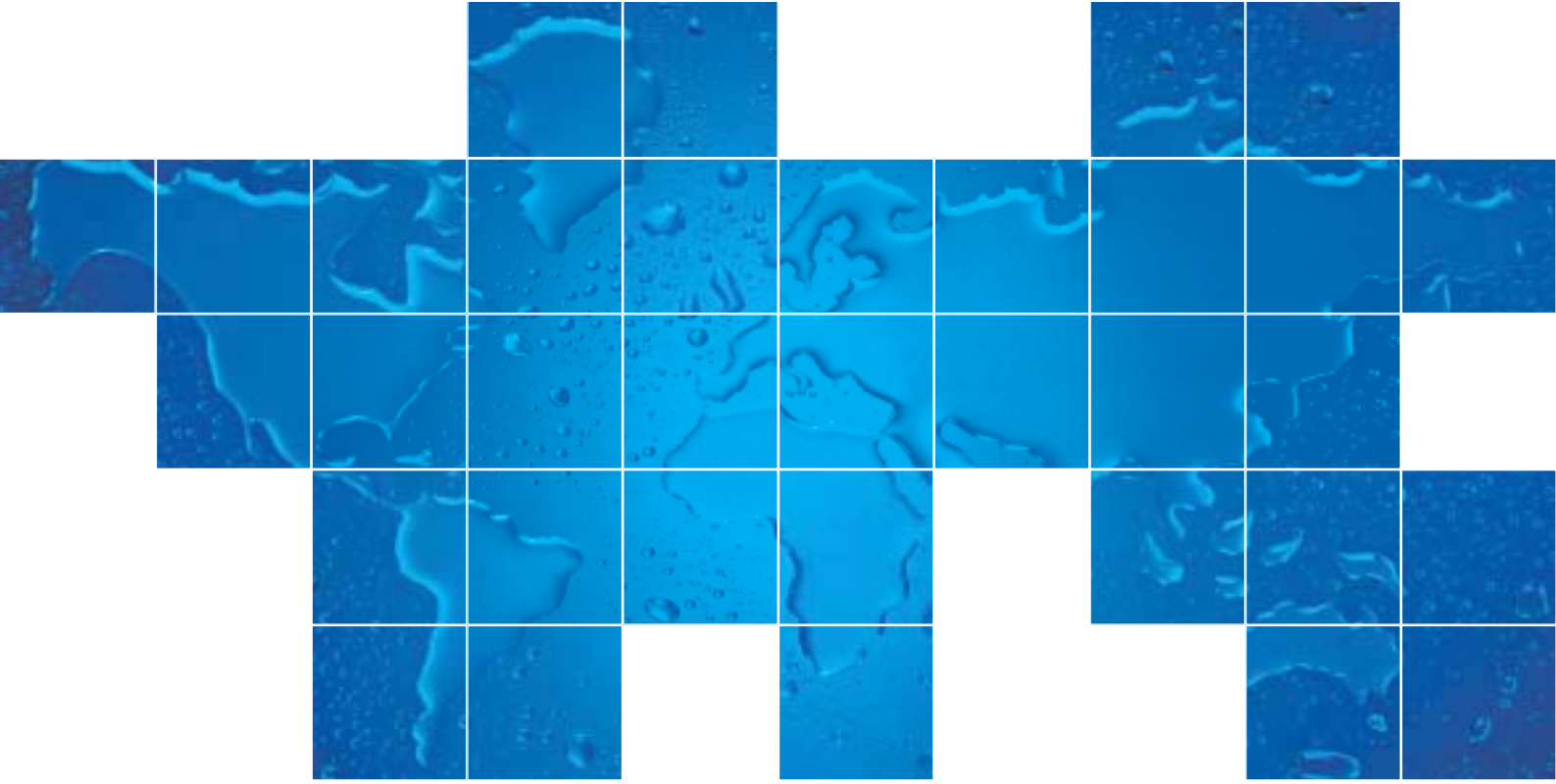
DEDICATED TO MAKING A DIFFERENCE

Facts and trends

water

World Business Council for
Sustainable Development



Introduction

The WBCSD Water and Sustainable Development Program aims to enhance awareness in the business community of critical water issues while actively promoting mutual understanding between business and non-business stakeholders. Engaging leading companies representing a broad spectrum of activity, the current program is focused on the role of business in sustainable water management and on strengthening the foundation for effective business action.

Member companies of the WBCSD believe that dialogue with other stakeholders is one of the keys to successfully navigating the future. Their Water Working Group has therefore launched a scenario planning process, with the participation of non-business stakeholders, to develop alternative narratives on how water issues might evolve over the next 20 to 25 years. The project is examining the influence of water-related issues on social, economic and environmental development and exploring the roles business can play in shaping appropriate actions and outcomes.

This working document provides an overview of some basic facts and societal challenges related to water. It has been developed by the WBCSD secretariat and is intended to support the ongoing dialogue within the WBCSD membership and with other stakeholders in civil society and government. The emphasis in this initial document is on water availability and people's use of water for agricultural, industrial and domestic purposes. The scenario planning process will provide opportunities to supplement this work with consideration of other key issues.

We have used existing data from many United Nation organizations, documents prepared for the 2nd and 3rd World Water Forums, the OECD, the World Resources Institute and other research organizations. We present it here in a simplified and condensed format to promote understanding of the world water situation and to stimulate forward thinking on business as part of the solution to issues in water and sanitation.

Project director	Robert Martin
Lead author	Al Fry
Research	Eva Haden
Design	Michael Martin
Copyright	© WBCSD, August 2005. Reprint March 2006.
ISBN	2-940240-70-1

Other WBCSD publications on water:

Industry, Fresh Water and Sustainable Development	1998
Partnerships in Practice	2000
Water for the Poor	2002

Ordering publications

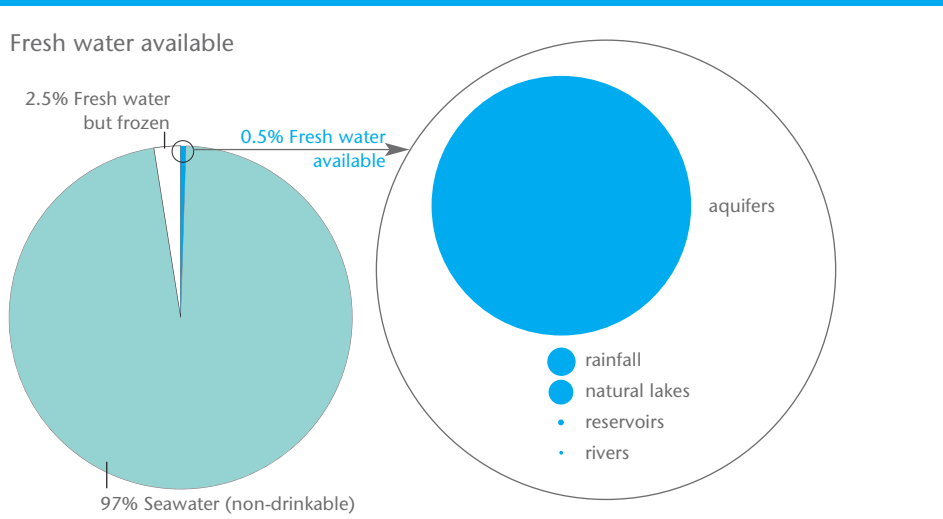
WBCSD, c/o Earthprint Limited
Tel: (44 1438) 748111
Fax: (44 1438) 748844
wbcsd@earthprint.com

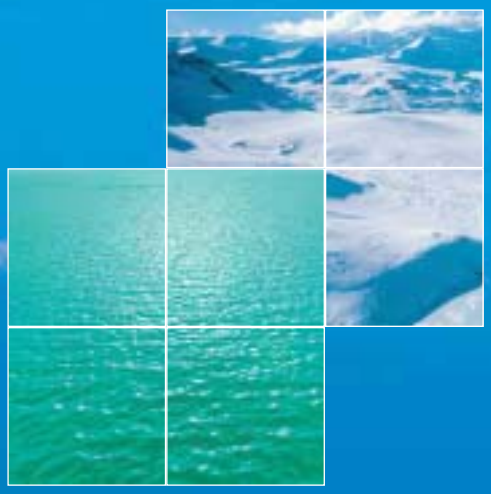
Publications are available at:

www.wbcsd.org
www.earthprint.com

The global situation

- Less than 3% of the world's water is fresh – the rest is seawater and undrinkable.
- Of this 3% over 2.5% is frozen, locked up in Antarctica, the Arctic and glaciers, and not available to man.
- Thus humanity must rely on this 0.5% for all of man's and ecosystem's fresh water needs.



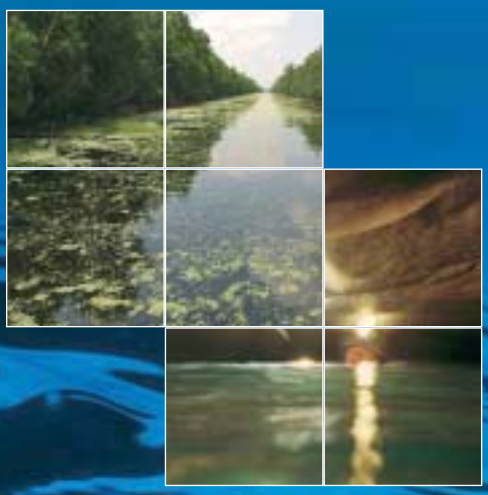


Where is this 0.5 % of fresh water?[1,2]

How many Olympic-sized swimming pools is that?

- 10,000,000 km³ stored in underground **aquifers**. **4,000,000,000,000**
  Since 1950 there has been a rapid expansion of groundwater exploitation providing:
  50% of all drinking water
  40% of industrial water
  20% of irrigation water.[3]
- 119,000 km³ net of **rainfall falling on land** after accounting for evaporation. **47,600,000,000**
- 91,000 km³ in **natural lakes**. **36,400,000,000**
- Over 5,000 km³ in **man made storage facilities** – reservoirs. *There has been a 7 fold increase in global storage capacity since 1950.* **2,000,000,000**
- 2,120 km³ in **rivers** – constantly replaced from rainfall and melting snow and ice. **848,000,000**

The world is not "running out of water," but it is not always available when and where people need it. Climate, normal seasonal variations, droughts and floods can all contribute to local extreme conditions.



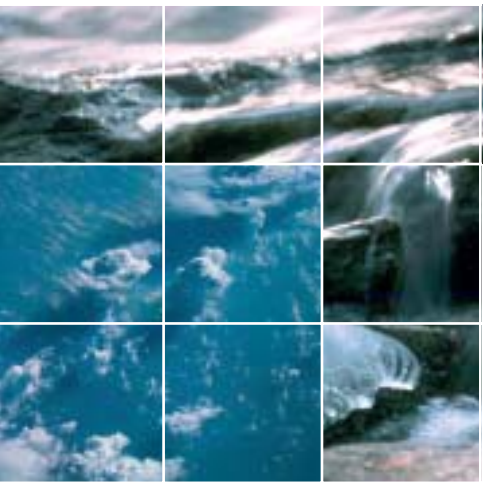
Ref. 1: "Water for People, Water for Life" United Nations World Water Development Report, Part II: A look at the world's freshwater resources. UNESCO, 2003, www.unesco.org

Ref. 2: "The Storage and Aging of Continental Runoff in Large Reservoir Systems of the World" Vörösmarty, C. J., *et al.* Ambio, Vol. 26 n°4, June 1997, pp. 210-219.

Ref. 3: "Groundwater – the processes and global significance of aquifer degradation" Foster and Chilton, Royal Society of London, 2003.

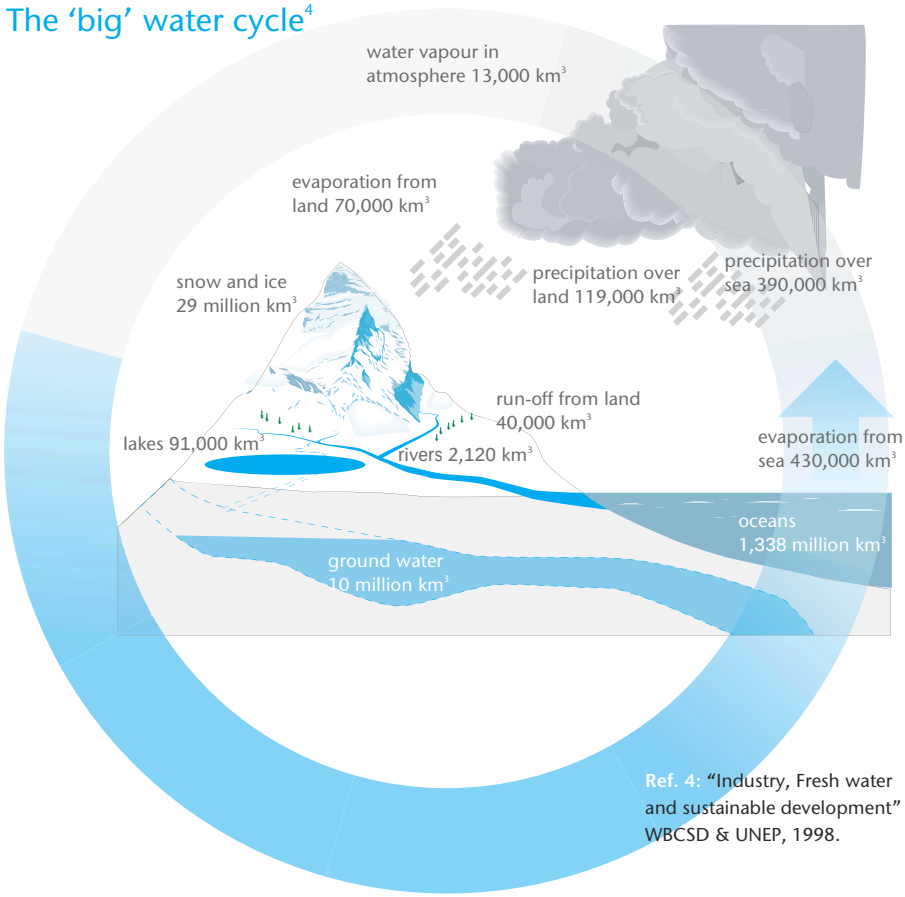
N.B.: 1 cubic kilometer (km³) = 1,000,000,000 cubic meters (m³) = 1,000,000,000,000 litres = 264,000,000,000 U.S gallons
1 m³ weighs 1 ton
1 Olympic-sized swimming pool = 50 m X 25 m X 2 m = 2,500 m³ (estimate)

How is fresh water distributed?



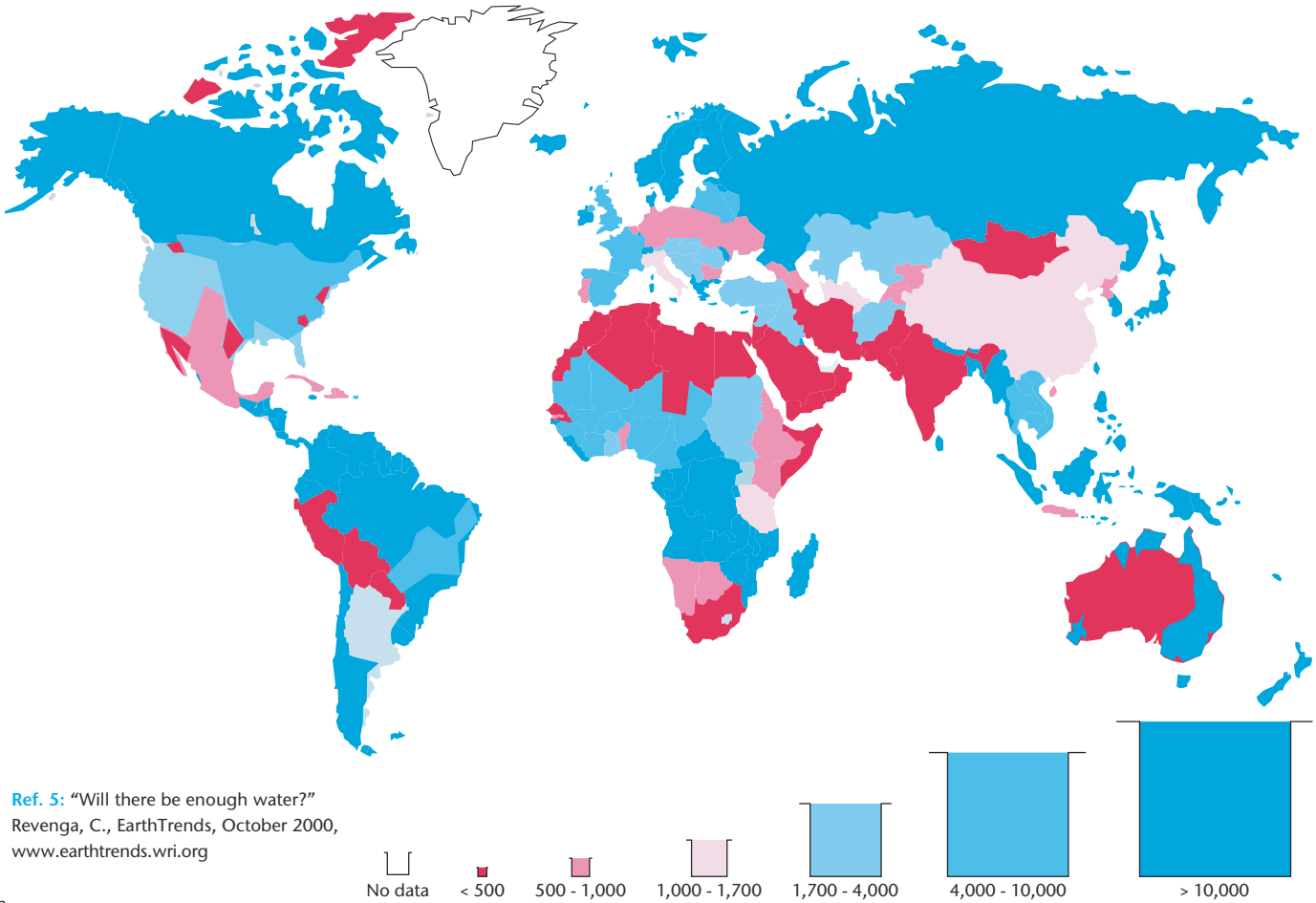
Water is not distributed evenly over the globe. Fewer than 10 countries possess 60% of the world's available fresh water supply: Brazil, Russia, China, Canada, Indonesia, U.S., India, Columbia and the Democratic Republic of Congo. However, local variations within countries can be highly significant.

The 'big' water cycle[4]



Ref. 4: "Industry, Fresh water and sustainable development" WBCSD & UNEP, 1998.

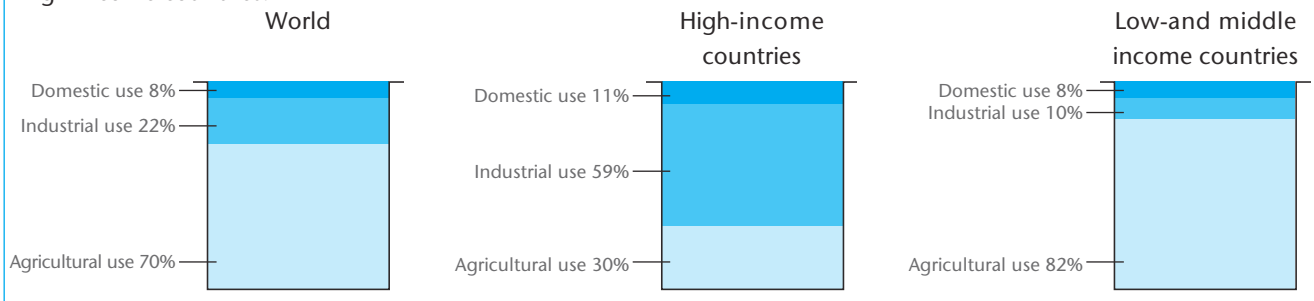
Annual renewable water (m³/person/year)[5]



Ref. 5: "Will there be enough water?" Revenga, C., EarthTrends, October 2000, www.earthtrends.wri.org

Competing water uses for main income groups of countries[6]

Industrial use of water increases with country income, going from 10% for low- and middle- income countries to 59% for high-income countries.

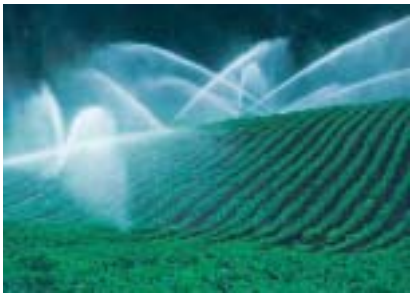


Ref. 6: "Water for People, Water for Life" United Nations World Water Development Report, UNESCO, 2003
www.unesdoc.unesco.org

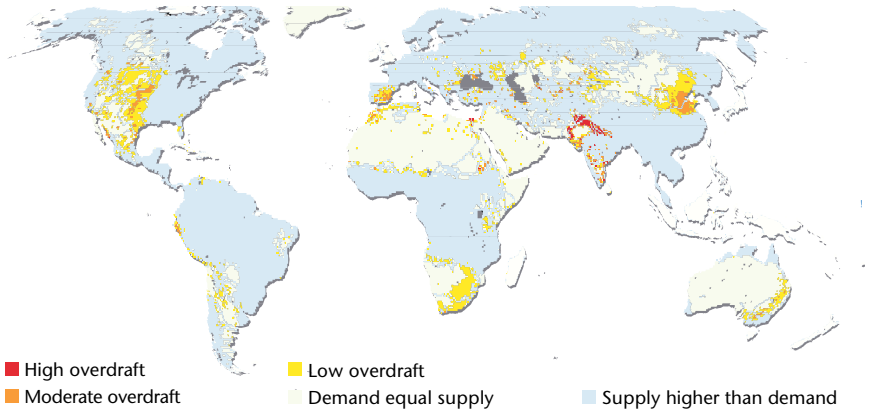
Agriculture

In many developing nations, irrigation accounts for over 90% of water withdrawn from available sources for use. In England where rain is abundant year round, water used for agriculture accounts for less than 1% of human usage. Yet even on the same continent, water used for irrigation in Spain, Portugal and Greece exceeds 70% of total usage.

Irrigation has been a key component of the green revolution that has enabled many developing countries to produce enough food to feed everyone. More water will be needed to produce more food for 3 billion more people. But increasing competition for water and inefficient irrigation practices could constrain future food production.



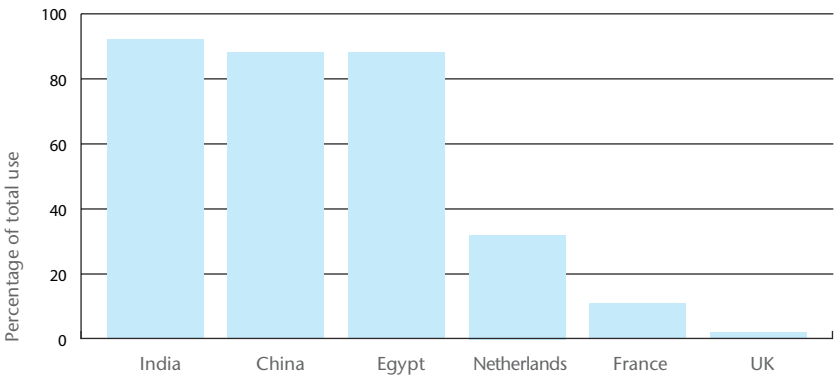
Unsustainable water withdrawals for irrigation[7]



Globally, roughly 15-35% of irrigation withdrawals are estimated to be unsustainable. The map indicates where there is insufficient freshwater to fully satisfy irrigated crop demands.

Ref. 7: "Ecosystems and Human Well-being: Synthesis" Millennium Ecosystem Assessment, 2005.

Percentage of total water used for irrigation[8]



Ref. 8: "Global Water Crisis, the Major Issue of the 21st Century", Saeijs, H.F.L. & Van Berkel, M.J., European Water Pollution Control, 1995. Vol. 5.4 pp. 26-40; cited by Corporate Water Policies, Dec. 2003.

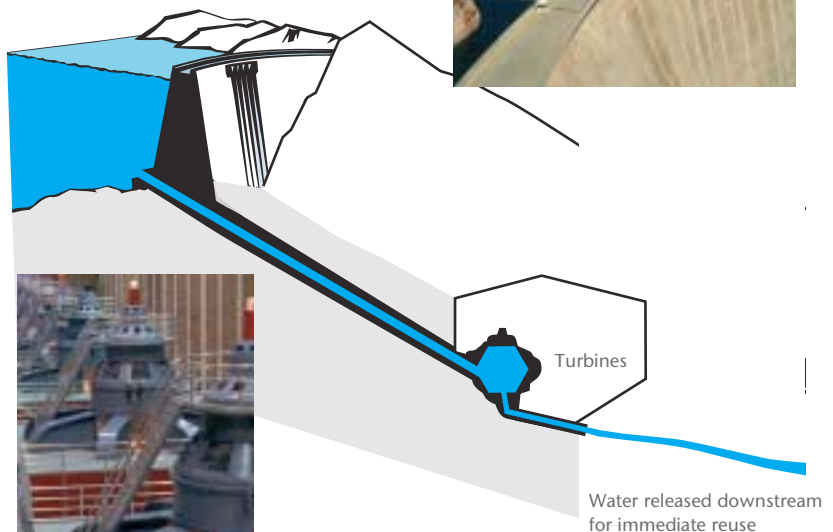
Industry

After agriculture, industry is the second largest user of water. However the amount of water used varies widely from one type of industry to another.

[No water, no business]

Water for energy

Multi purpose hydro projects manage water for many interests: flood control, irrigation, recreation and drinking water, as well as energy.



Cooling water

The largest single use of water by industry is for cooling in thermal power generation.

Process water

Industry uses water to make steam for direct drive power and for use in various production processes or chemical reactions.

A modern paper mill in Finland has reduced the amount of water used per unit of output by over 90% over the last 20 years: thanks to change from chemical to thermo-mechanical pulp, and installation of a biological wastewater treatment facility that permitted recycling of water.

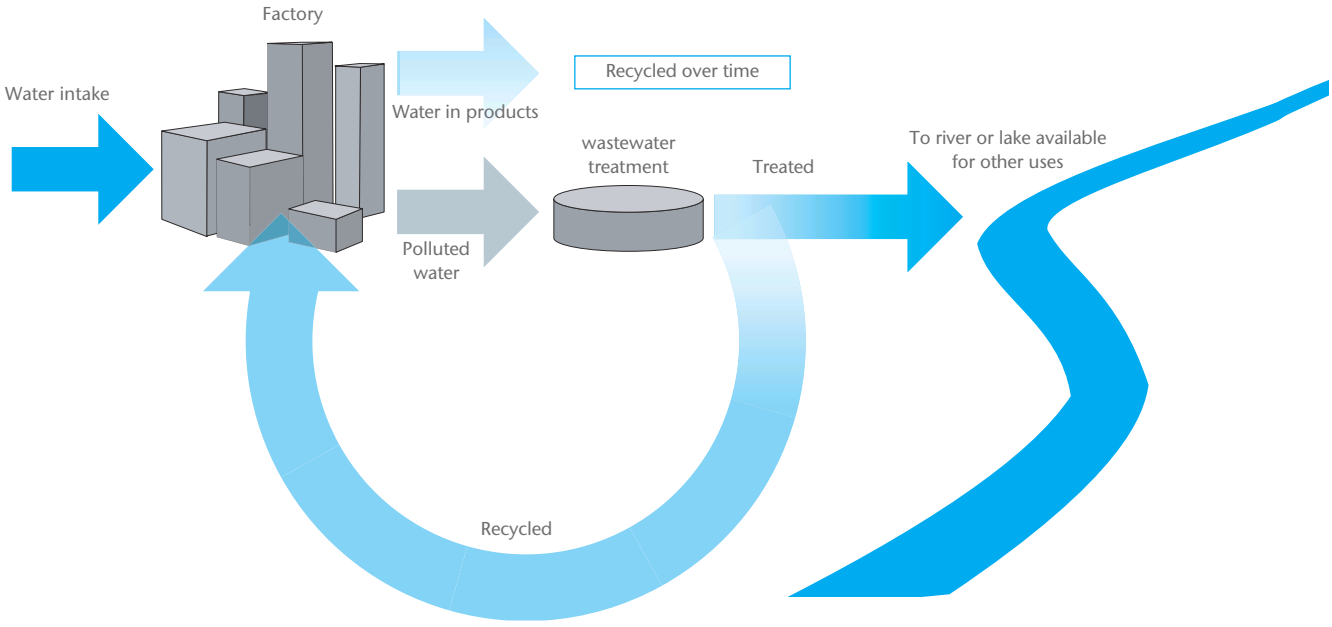
A modern microchip manufacturing plant in Malta was able to reduce its water consumption by over 70% in the late 1990s.

A textile firm in India reduced its water consumption by over 80%, by replacing zinc with aluminum in its synthetic fiber production, by reducing trace metals in wastewater thereby enabling reuse and by using treated water for irrigation by local farmers.

A plant converting sugar cane into sugar in Mexico reduced its consumption of water by over 90% by improving housekeeping and segregating sewage from process wastewater.

Water for products

Many businesses, notably the food, beverage and pharmaceutical sectors consume water by using it as an ingredient in finished products for human consumption. Think of dairy products, soups, beverages and medicines that are delivered in liquid form. Some water experts are using the term “virtual water” to describe the water that is embedded both in agricultural and manufactured products, as well as the water used in the growing or manufacturing process. When a country exports goods, it is exporting “virtual water”.



Water as a medium for waste disposal

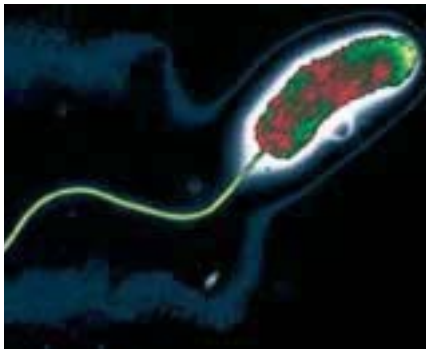
Many businesses dispose of wastewater or cleaning water into natural fresh water systems. Rivers and lakes can “process” small quantities of waste that can be broken down by nature. However, when these limits are exceeded, water quality declines and the downstream water is no longer useable without expensive treatment.

People

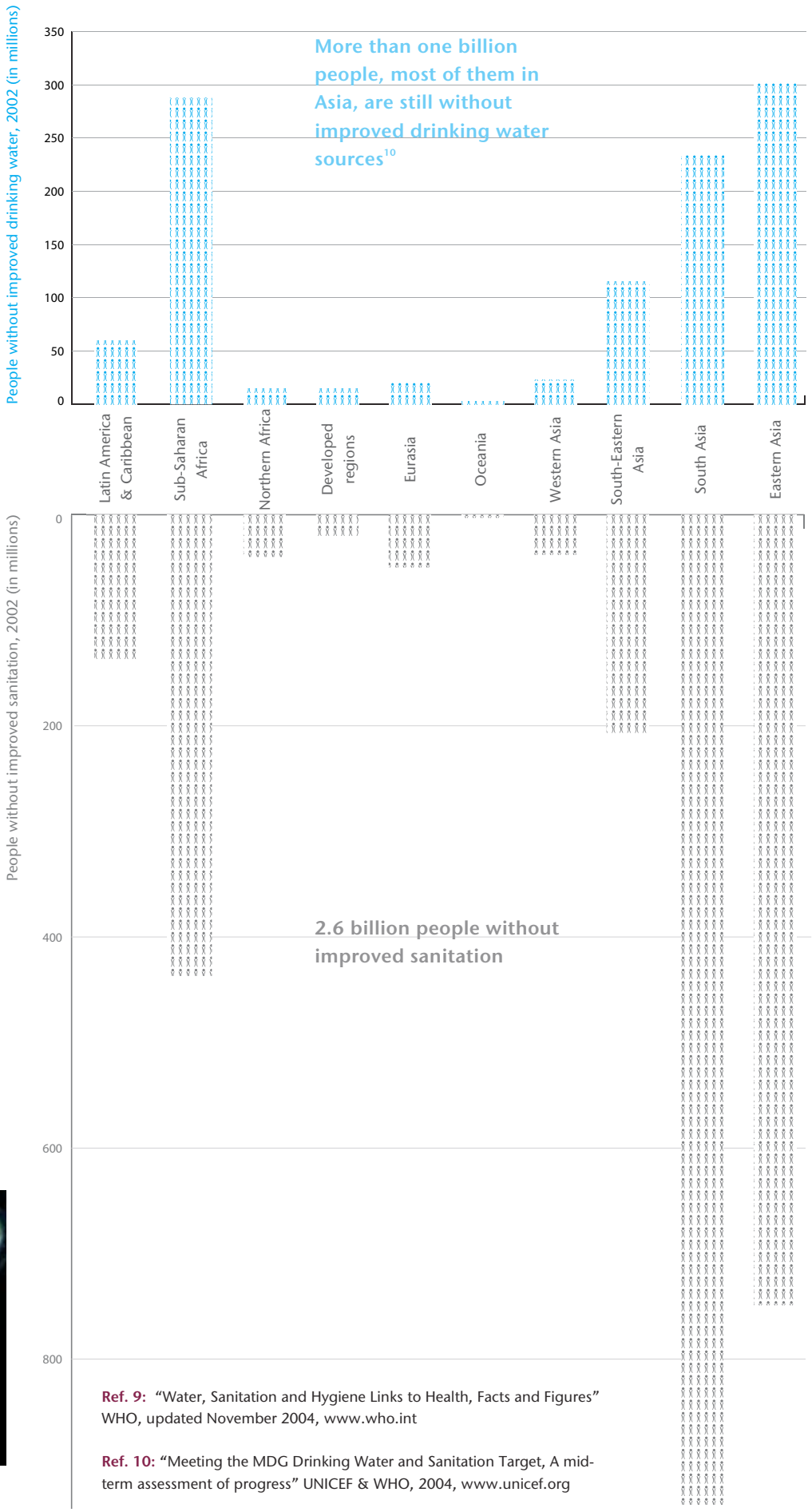
Individuals must have clean water for drinking or they fall ill and die. People also need fresh water for cooking, washing, and sanitation.

Water: Essential to health
3,900 children die each day due to dirty water or poor hygiene[9]

1.8 million people die every year from diarrhoeal diseases *(including cholera)* – the equivalent of 15 killer tsunamis each year or 12 Boeing 747 crashes every day.



Cholera, *Vibrio cholerae*

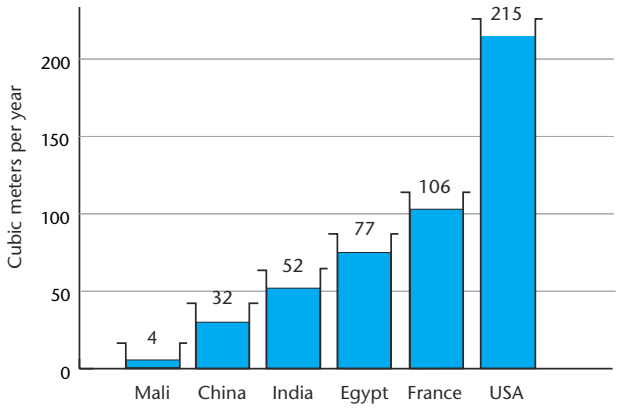


Ref. 9: "Water, Sanitation and Hygiene Links to Health, Facts and Figures" WHO, updated November 2004, www.who.int

Ref. 10: "Meeting the MDG Drinking Water and Sanitation Target, A mid-term assessment of progress" UNICEF & WHO, 2004, www.unicef.org

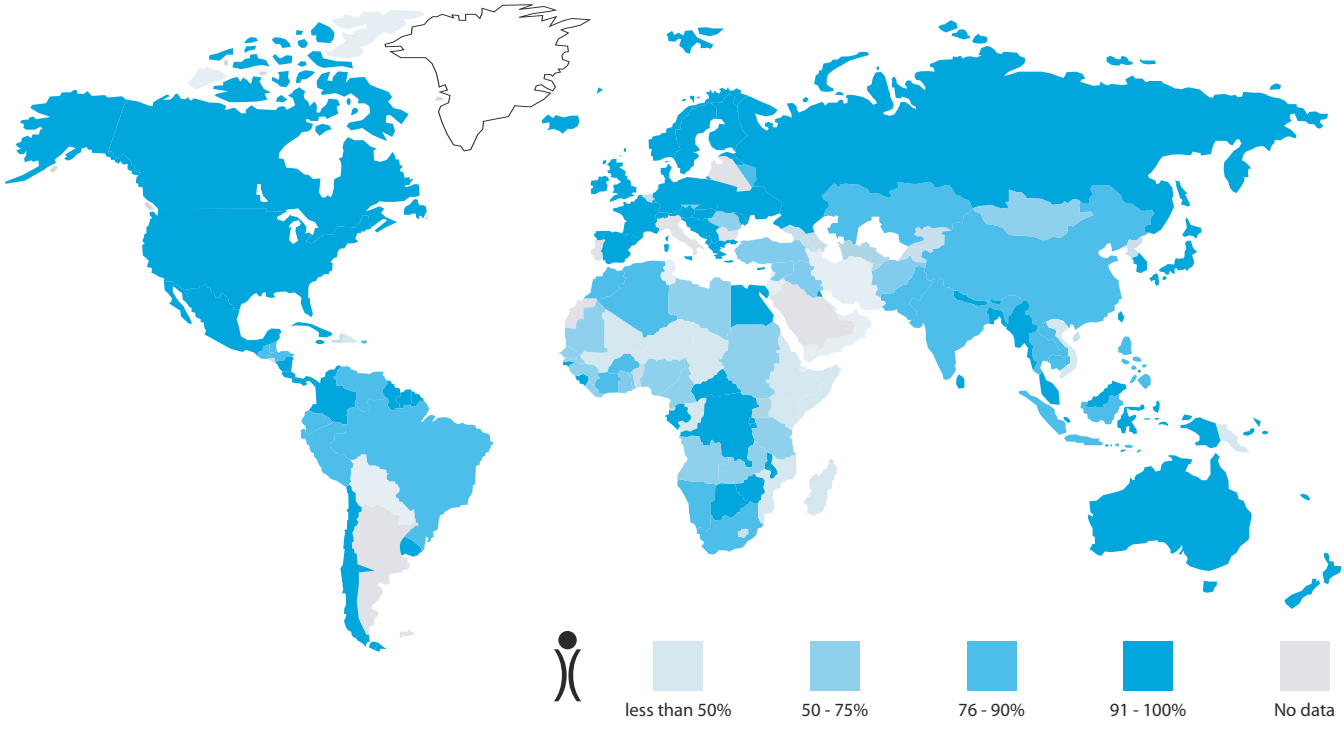
Per capita use of water

The adjacent chart derived from Aquastats data shows the wide variation in average per capita water withdrawals for domestic use from different nations. Humans need a minimum of two liters of drinking water per day to survive, which is less than one cubic meter per year.



Source: AQUASTAT - FAO's information system on water and agriculture (10-2-2003)

Good water coverage attained in most regions[11]



Percentage of population using improved drinking water sources

Global coverage figures from 2002 indicate that, of every 10 people:

- roughly 5 have a connection to a piped water supply at home (in their dwelling, plot or yard);
- 3 make use of some other sort of improved water supply, such as a protected well or public standpipe;
- 2 are unserved;[12]
- In addition, 4 out of every 10 people live without improved sanitation.

At Johannesburg in 2002 governments approved a Plan of Action to:

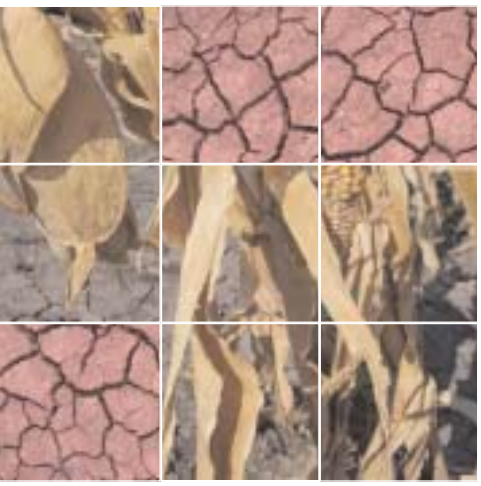
- Halve by 2015 the proportion of people unable to reach or afford safe drinking water. The Global Water Supply and Sanitation Assessment 2000 Report (GWSSAR) defines "Reasonable access" to water as at least 20 liters per person per day from a source within one kilometer of the user's home.
- Halve the proportion of people without access to basic sanitation. The GWSSR defines "Basic sanitation" as private or shared but not public disposal systems that separate waste from human contact.

The WHO/UNICEF Joint Monitoring Programme (2004) reports that the world is on track to meet the drinking water target but that sub-Sahara Africa lags behind. However, the same report indicates that progress towards the sanitation target is too slow to meet the goal.

Access to water is above all a local distribution issue. The people in urban slums are often as close to water resources as are the more fortunate urban rich, but they often do not have access to the infrastructure in place.

Ref. 11, 12: "Meeting the MDG Drinking Water and Sanitation Target, A mid-term assessment of progress" UNICEF & WHO, 2004, www.unicef.org

Water stress



As farmers, industry and people take too much water there is nothing left for nature:

Increases in water use have resulted in high environmental costs, including loss of biodiversity as well as affecting natural water systems such as rivers and aquifers. Half of the world's wetlands have disappeared over the last century, with some rivers now no longer reaching the sea, and over 20% of the estimated 10,000 freshwater fish species are now endangered or extinct.[13]

The concept of water stress is relatively simple: it applies to situations where there is not enough water for all uses, whether agricultural, industrial or domestic. Defining thresholds for stress in terms of available water per capita is more complex, however, entailing assumptions about water use and its efficiency. Nevertheless, it has been proposed that when annual per capita renewable freshwater availability is less than 1,700 cubic meters, countries begin to experience periodic or regular water stress. Below 1,000 cubic meters, water scarcity begins to hamper economic development and human health and well-being.

In 60% of European cities with more than 100,000 people, groundwater is being used at a faster rate than it can be replenished.[14] Even if some water remains available, it costs more and more to capture it.

Cities that have experienced aquifer drops between 10 to 50 metres include Mexico City, Bangkok, Manila, Beijing, Madras and Shanghai.[15]

In 2000, the world population was 6.2 billion. The UN estimates that by 2050 there will be an additional 3 billion people with most of the growth in developing countries that already suffer water stress.[16] Thus water demand will increase unless everyone finds ways to conserve and recycle the precious resource.[17]

Ref. 13: "Environment Matters 2003" World Bank Group, 2003, www.worldbank.org

Ref. 14: "Europe's Environment: The Dobris Assessment" European Environment Agency, 1995.

Ref. 15: "Groundwater in Urban Development" Foster, S. A. Lawrence and B. Morris, World Bank Technical Paper no.390, The World Bank, 1998.

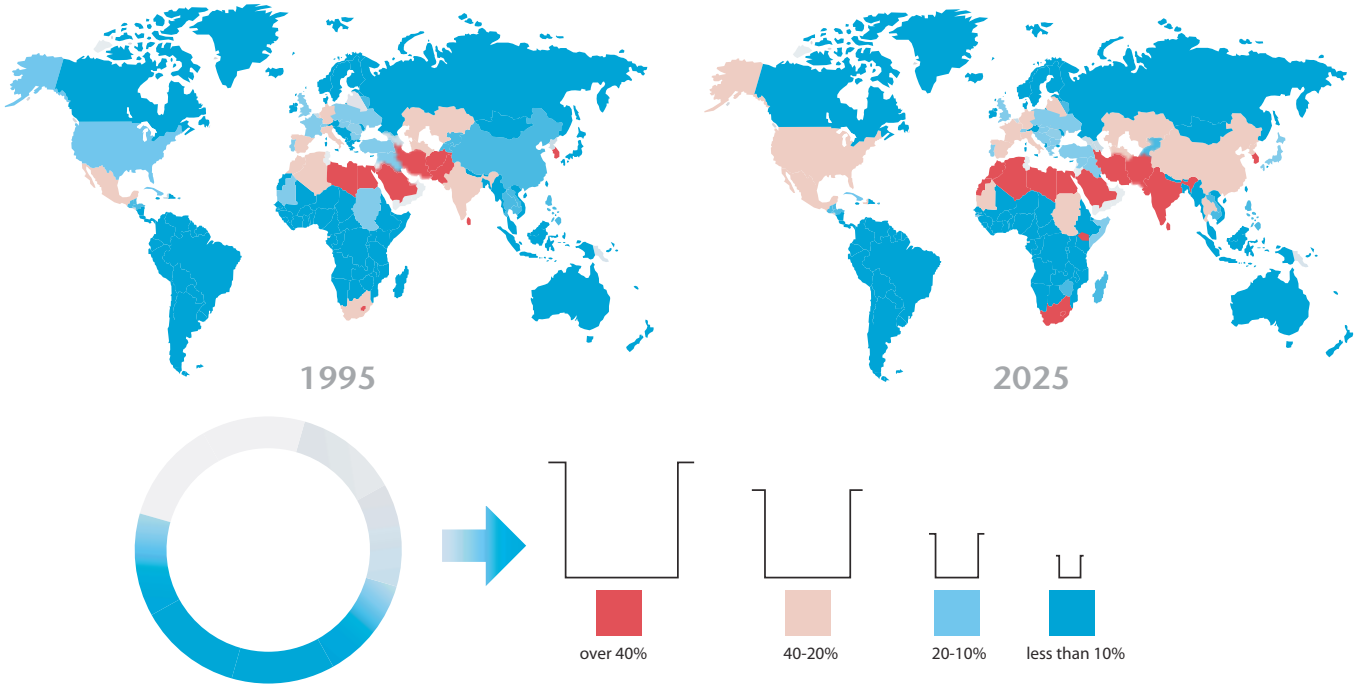
Ref. 16: "World population to reach 9.1 billion in 2050, UN projects" UN News service, 24 February 2005

Ref. 17: "Groundwater – the processes and global significance of aquifer degradation" Foster and Chilton, Royal Society of London, 2003.

Ref. 18: Vital Water Graphics, UNEP, www.unep.org

Fresh water stress

The following map projects how much water will be withdrawn with respect to the amount that is naturally available.[18]



Four ways people contribute to water stress

1. Excessive withdrawal from surface waters

Over the past 30 years, the Aral Sea in the former Soviet Union has shrunk to less than half of its original size. The demise of the Aral Sea was caused primarily by the diversion of the inflowing Amu Dar'ya and Syr Dar'ya rivers to irrigate water-intensive cotton and rice crops. This graphic shows the disappearance of the Aral Sea from 1957 to 2001. By 1987, about 60% of the Aral Sea's volume had been lost, its depth had declined by 14 meters, and its salt concentration had doubled.[19]

Between 1989-1990 the Aral Sea separated into two parts

Between November 2000 and June 2001 Vozrojdeniya Island joined the mainland (south)

2. Excessive withdrawal of water from underground aquifers

Along much of the west coast of India excessive fresh water abstraction has allowed sea water to enter aquifers thereby making the water so saline that it is unfit for human use. These consequences have been compounded due to excess irrigation water containing fertilizers and pesticides leaching into these aquifers.

3. Pollution of fresh water resources

Pollution can be so severe that the fresh water is no longer useable without incurring unacceptably high clean up costs.

Pollution from many small paper mills using outdated technology has depleted the oxygen from the several river stretches in China, making them unfit for consumption by any form of life. China entered into a joint venture with a Finnish company to build a state of the art paper mill. China then closed the polluting firms and these rivers are making a remarkable recovery.[20]

4. Inefficient use of freshwater

Poor irrigation practices, leakage in water delivery systems, inefficient use by industry and excessive consumption by individuals can all contribute to water stress.

Ref. 19: Vital Water Graphics, UNEP, www.unep.org

Ref. 20: "The River Runs Black: The Environmental Challenge to China's Future" Economy, E. C., 2004

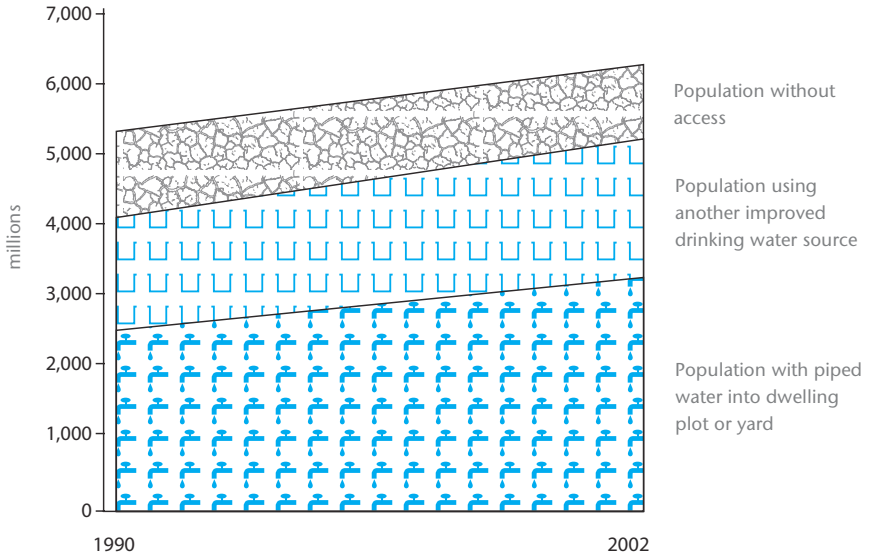
Signs of hope

In 2002, 83% of the world's population – around 5.2 billion people – had improved drinking water sources.[22]

Some African countries have been making rapid progress in drinking water coverage. For example, Tanzania was only 38% covered in 1990, and in 2002 was 73% covered; Namibia was 58% covered in 1990, and in 2002 was 80% covered.[23]

Trends in service levels for drinking water[21]

In 2002, more than half the world's population used water from a pipe connection at home



There is international consensus that improved water supply and sanitation are integral components of the United Nations Millennium Development Goals (MDGs).

The water supply target of the MDGs is a challenging, but achievable goal.

Ref. 21,22,23: "Meeting the MDG Drinking Water and Sanitation Target, A mid-term assessment of progress" UNICEF & WHO, 2004, www.unicef.org

Examples of "best management practices" and use of improved technology

- Drip irrigation uses plastic pipes that release water directly onto the roots of the plants without flooding the entire field, and recapture any excess water for reuse.
- Ashkelon, Israel – a new desalination plant on the Mediterranean Sea, just north of Gaza is delivering fresh water at USD 0.50 per cubic meter down from USD 2.50 in the early 1990's: This was achieved by an improved reverse osmosis system requiring less energy to drive seawater through the desalination unit.
- Singapore is recycling "gray water" to drinking quality standards by using a new filtration technology.
- An auto/truck manufacturer operating in an arid region of Mexico reduced its water consumption per unit of output by 90% (Stockholm Industry Water Award winner in 2001).

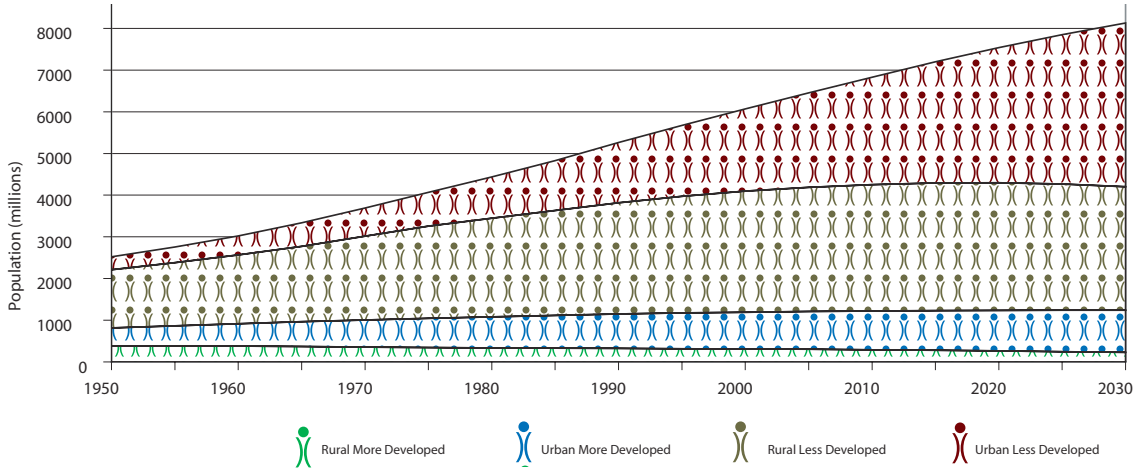
Warning signs

Trends that will affect fresh water use

These five trends are increasing pressure to better manage water:

Population Growth Projected to reach over 8 billion in 2030 and to level off at 9 billion by 2050.

Population trends 1950 - 2030



Source: UN DESA, World Urbanization Prospects: 2003 Revision

Increasing affluence

The rate of poverty alleviation is increasing especially within the two population giants of China and India. However, increasing affluence inevitably means more water consumption: from needing clean fresh water 24 hours a day, 7 days a week and basic sanitation service, to demanding water for gardens and car washing, to wanting jacuzzis or private swimming pools.

Expansion of business activity

Business activity ranging from industrialization to services such as tourism and entertainment continues to expand rapidly. This expansion requires increased water services including both supply and sanitation, which can lead to more pressure on water resources and natural ecosystems.

Rapid urbanization

The trend towards urbanization is accelerating. Small private wells and septic tanks that work well in low-density communities are not feasible within high-density urban areas. Urbanization requires significant investment in water infrastructure in order to deliver water to individuals and to process the concentrations of wastewater – both from individuals and from business. These polluted and contaminated waters must be treated or they pose unacceptable public health risks.

Climate change

Climate change could increase annual precipitation and make more fresh water available in some places. Rising temperatures, however, could increase the rate of evaporation from surface waters and reservoirs and lead to the loss of freshwater held in glaciers. Furthermore, increased rainfall might come in the form of storms that lead to flooding and damage thereby doing more harm than good. Climate change poses a series of risks to water availability and water management systems, although much uncertainty remains.

Good news & Bad news

There is a lot of fresh water in the world	...	It is not always where man needs it
Water is free from nature	...	Infrastructure needed to deliver water is expensive
In many areas, water is easily accessible at a low cost	...	People assume it will always be available & take it for granted
Nature is constantly recycling & purifying water in rivers & lakes	...	Man is polluting water faster than nature can recycle it
There is a huge amount of water underground	...	Man is using this water faster than nature can replace it
5 billion people have reasonable access to fresh water	...	Over 1 billion do not
3.8 billion people have at least basic sanitation	...	2.4 billion do not
Millions are working their way out of poverty	...	Affluent people use more water
The pace of industrialization is increasing	...	Industry will require more fresh water
Industry is becoming more efficient in its water use	...	Many industries are still using water unsustainably/inefficiently
Awareness of water issues is increasing	...	Translating awareness into action can be slow

Economic considerations

Water supply and sanitation require a huge amount of capital investment in infrastructure such as pipe networks, pumping stations and water treatment works. It is estimated that OECD nations need to invest at least USD 200 billion per year to replace aging water infrastructure to guarantee supply, reduce leakage rates and protect water quality[24]

International attention has focused upon the needs of the developing countries. To meet the MDG targets of halving the proportion of the population lacking access to safe drinking water and basic sanitation by 2015, current annual investment on the order of USD 10 to USD 15 billion would need to be roughly doubled. This does not include investments required for the maintenance of existing infrastructure.[25]

Once infrastructure is in place, operating water supply and sanitation systems entails significant ongoing costs to cover personnel, energy, chemicals, maintenance and other expenses.

The sources of money to meet these capital and operational costs are essentially either user fees, public funds or some combination of the two.

But this is where the economics of water management start to become extremely complex as they intersect with social and broader economic policy. Such policy questions are beyond the scope of this document, which has concentrated on basic information about water availability and water use. They are, nevertheless, highly relevant to understanding how critical water issues will affect business and industry in terms of both risks and opportunities. The ongoing work of the WBCSD program on Water and Sustainable Development will provide an opportunity for further exploration in collaboration with civil society and government.

Ref. 24: "The cost of meeting the Johannesburg targets for drinking water" Henri Smets, Water academy France (Académie de l'eau), March 2004

Ref. 25: "Towards water security: a framework for action" GWP, and "The financing of hydropower, irrigation, and water supply infrastructure in developing countries" Briscoe, J., cited by "Financing Water For All" Camdessus, M., 2003

Someone has to pay!

- When revenue equals expenses, sustainable water service is possible.
- When expenses exceed revenues, water service deteriorates and is not sustainable.

Sustainable urban water service

Revenue

there are two primary sources of financing:

- User fees
- Public funds

Examples of expenses

to build operate and maintain water supply and sanitation systems:

- Training and paying workers
- Repay loans for infrastructure investment
- Maintenance of pipes, pumps and equipment
- Materials for cleaning water
- Energy to deliver water

What can industry do to alleviate water stress?

Put its own house in order by

Measuring and monitoring water use
Understanding the water "footprint" of the business both inside and outside the corporate "fenceline".

Continuing to reduce water consumption per dollar of output and work towards the goal of zero discharge by:

- Recycling and reusing water
- Lowering toxic and other contaminants in all operations involving water
- Changing production processes to be more water efficient

Encouraging suppliers and purchasers up and down the supply chain to adopt best management practices – assisting small and medium sized enterprises to improve water management.

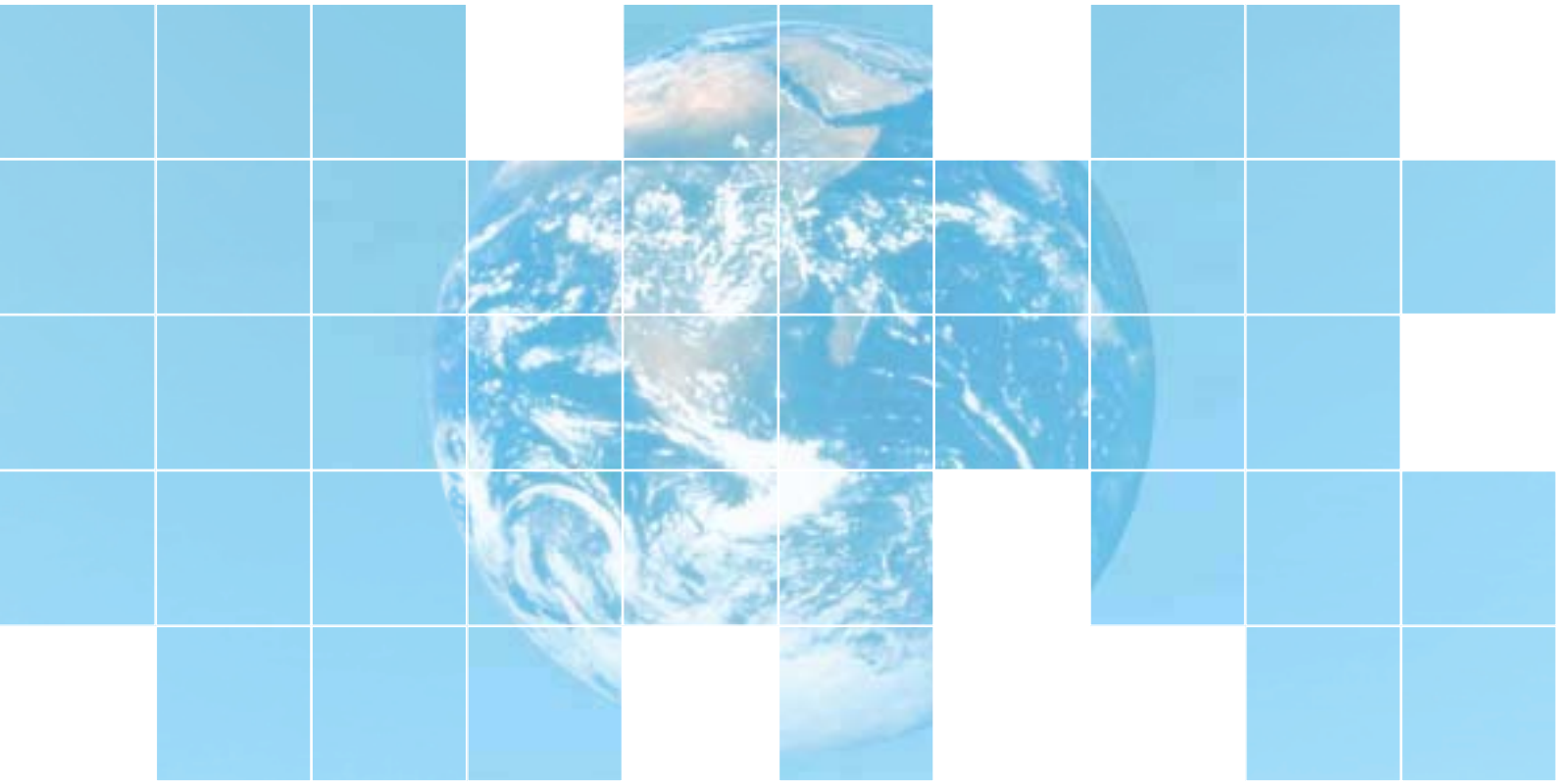
Innovating
Searching for new more efficient water treatment technologies.

Enter into creative partnerships with

Municipalities
where business operates to develop cost-effective water supply and sanitation options.

Non-governmental groups
to encourage water conservation and improved water management systems.

The scientific community
to improve understanding of water resources and their management and to develop technologies to get the most value out of the water cycle.



About the WBCSD

The World Business Council for Sustainable Development (WBCSD) is a coalition of 180 international companies that share a commitment to the principles of sustainable development via the three pillars of economic growth, ecological balance and social progress. The WBCSD benefits from a global network of national and regional business councils and partner organizations representing a large and diversified group of business leaders.

Our mission

To provide business leadership as a catalyst for change toward sustainable development, and to support the business license to operate, innovate and grow in a world increasingly shaped by sustainable development issues.

Our aims

Our objectives and strategic directions, based on this dedication, include:

- **Business leadership:** to be a leading business advocate on sustainable development.
- **Policy development:** to participate in policy development to create the right framework conditions for business to make an effective contribution toward sustainable development.
- **The business case:** to develop and promote the business case for sustainable development.
- **Best practice:** to demonstrate the business contribution to sustainable development solutions and share leading-edge practices among members.
- **Global outreach:** to contribute to a sustainable future for developing nations and nations in transition.

The activities of the WBCSD are carried out worldwide.

4, chemin de Conches
CH - 1231 Conches-Geneva
Switzerland

Tel: (41 22) 839 31 00
Fax: (41 22) 839 31 31

E-mail: info@wbcsd.org
Web: www.wbcsd.org