

FACTS ABOUT WATER

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Sources:

UNESCO World Water Assessment Programme (WWAP), Encyclopedia of Life Support Systems, World Water Development Report (WWDR), Water for People, Water for Life <http://www.unesco.org/water/wwap/wwdr/> and from the WWDR http://www.unesco.org/water/wwap/facts_figures/

All facts are from past studies and thus may not reflect current conditions.

Some selected facts

- Water covers nearly three-fourths of the earth's surface.
- Most of the earth's surface water is permanently frozen or salty.
- Over 90% of the world's supply of fresh water is located in Antarctica.
- The earth's total allotment of water has a volume:
 - 93% is sea water
 - 2.5% is in aquifers deep below the earth's surface.
 - 2% is frozen in polar ice caps.
 - <1% passes through the planet's lakes and streams, is atmospheric moisture and is locked within the bodies of living things.
- If all the world's water were fit into a gallon jug, the fresh water available for us to use would equal only about one tablespoon.
- It doesn't take much salt to make water "salty." If one-thousandth (or more) of the weight of water is from salt, then the water is "saline."
- The General Comment on the right to water, adopted by the Covenant on Economic, Social and Cultural Rights (CESCR) in November 2002, is a milestone in the history of human rights. For the first time water is explicitly recognized as a fundamental human right and the 145 countries that have ratified the International CESCR will now be compelled to progressively ensure that everyone has access to safe and secure drinking water, equitably and without discrimination.
- Freshwater resources are unevenly distributed, with much of the water located far from human populations. Many of the world's largest river basins run through thinly populated regions. There are an estimated 263 major international river basins in the world, covering ~231 059 898 km² or 45.3% of the Earth's land surface area (excluding Antarctica).
- Groundwater represents about 90% of the world's readily available freshwater resources, and some 1.5 billion people depend upon groundwater for their drinking water.
- Agricultural water use accounts for about 75% of total global consumption, mainly through crop irrigation, while industrial use accounts for about 20%, and the remaining 5% is used for domestic purposes.
- The Global Water Supply and Sanitation 2000 Assessment (WHO/UNICEF, 2000) shows that 1.1 billion people lack access to improved water supply and 2.4 billion to improved sanitation.
- An estimated that two out of every three people will live in water-stressed areas by the year 2025. In Africa alone, it is estimated that 25 countries will be experiencing water stress (below 1,700 m³ per capita per year) by 2025. Today, 450 million people in 29 countries suffer from water shortages.
- Clean water supplies and sanitation remain major problems in many parts of the world, with 20% of the global population lacking access to safe drinking water. Water-borne diseases from fecal pollution of surface waters continue to be a major cause of illness in developing countries. Polluted water is estimated to affect the health of 1.2 billion people, and contributes to the death of 15 million children annually.
- To ensure our basic needs, we all need 20 to 50 litres of water free from harmful contaminants each and every day.
- A child born in the developed world consumes 30 to 50 times as much water resources as one in the developing world.
- In the year 2000 between 1,085,000 and 2,187,000 deaths due to diarrhoeal diseases were attributed to the water, sanitation and hygienic factor, 90% of them among children under five.

- If improved water supply and basic sanitation were extended to the present-day unserved, it is estimated that the burden of infectious diarrhea would be reduced by some 17%; if universal piped, well-regulated water supply and full sanitation were achieved, this would reduce the burden by some 70%.
- Drinkable water is becoming increasingly scarce. By the year 2025, it is predicted that water abstraction will increase by 50% in developing countries and 18% in developed countries, as population growth and development drive up water demand. Effects on the world's ecosystems have the potential to dramatically worsen the present situation, and current assessments suggest that existing practices are not adequate to avert this.
- Although freshwater ecosystems such as rivers, lakes and wetlands occupy less than 2% of the Earth's total land surface, they provide a wide range of habitats for a significant proportion of the world's plant and animal species: the number of known freshwater species worldwide is estimated at between 9,000 and 25,000, but this number is rapidly decreasing due to human interference.
- By some estimates, the expansion of agricultural demand for food by a wealthier and 50% larger global population could drive the conversion of an additional billion hectares of unmodified ecosystems to agriculture by 2050. This could result in nitrogen- and phosphorus-driven eutrophication of freshwater and near-shore marine ecosystems being more than doubled, with comparable increase in pesticide use.
- An estimated 30 million people depend on Lake Victoria, a lake whose natural resources are under increasing stress. The population on the shore has grown fast over the past century with corresponding increases in the demand for fish and agricultural products. Following the introduction of gill nets by European settlers at the beginning of the 20th century, populations of indigenous fish species declined. Many were specially adapted to eat algae, decaying plant material, and snails that host the larvae of schistosomes. The lake started to eutrophicate and people became more vulnerable to disease.
- As fish catches declined, non-native species were introduced, causing further stress to indigenous fish. The greatest impact resulted from the introduction of Nile perch (*Lates niloticus*) in the 1960s, as the basis of commercial freshwater fisheries. This had repercussions on the local fishing economy and distribution of wealth. Local people who previously met most of their protein requirements from the lake began to suffer from malnutrition and protein deficiency. Although 20,000 tonnes of fish are exported annually to European and Asian markets, local people can afford only fish heads and bones from which the flesh has been removed.
- Lake Malawi (southern Africa) is an aquatic system that was originally endowed with a great deal of fish as well as freshwater snail biodiversity. However, loss in fish biodiversity has resulted in the favouring of certain snail species that play a role in the transmission of schistosomiasis. The increased health risk has greatly affected the tourist industry of Malawi and the whole economy has declined.
- Around 50% of the world's wetlands present in 1900 had been lost by the late 1990s, with conversion of land to agriculture being the main cause of loss.
- Worldwide, 70% of the water that is withdrawn for human use is used for agriculture, 22% for industry and 8% is used for domestic services. In general, these proportions vary according to a country's income: in low- and middle-income countries, 82% is used for agriculture, 10% for industry and 8% for domestic services. In high-income countries, the proportions are 30%, 59% and 11%, respectively.
- It is estimated that the average person in developed countries uses 500-800 litres of water per day (300 m³ per year), compared to 60-150 litres per day (20 m³ per year) in developing countries.
- At the start of the twenty-first century, agriculture is using a global average of 70% of all water withdrawals from rivers, lakes and aquifers. The Food and Agriculture Organization (FAO) anticipates a net expansion of irrigated land of some 45 million

hectares in ninety-three developing countries (to a total of 242 million hectares in 2030) and projects that agricultural water withdrawals will increase by some 14% from 2000 to 2030 to meet future food production needs.

- Hydropower is already a major contributor to the world's energy balance, providing 19% of total electricity production (2,740 terawatts per hour in 2001).
- Golf tourism has an enormous impact on water withdrawals: an eighteen-hole golf course can consume more than 2.3 million litres a day. In the Philippines, water use for tourism threatens paddy cultivation. Tourists in Grenada (Spain) generally use 7 times more water than local people and this discrepancy is common in many developing tourist areas.
- Developed countries show a wide range of variation in water pricing: in Germany it costs \$1.91 (USD), in Denmark it costs \$1.64, in Belgium \$1.54, in the Netherlands \$1.25, in France \$1.23, in the UK \$1.18, in Italy \$0.76, in Finland \$0.69, in Ireland \$0.63, in Sweden \$0.58, in Spain \$0.57, in the United States \$0.51, in Australia \$0.50 and in Canada \$0.40.
- When the supply systems are deficient, the poor are the first to suffer. Water from informal vendors is more than 100 times more expensive than water supplied by house connection. In Vientiane (Lao PDR) the cost of water through a house connection is \$0.11/m(USD) and the price charged by an informal vendor is \$14.68/m, which means that there is a difference of 135.92%. In Delhi (India) the price of the water through a house connection is \$0.01/m and the price charged by an informal vendor can be as much as 4.89 - 489% more.
- According to the World Commission on Dams there was a world total of 47,655 large dams in 1998 and an estimated 800,000 smaller ones.
- 60% of the world's 227 largest rivers are strongly to moderately fragmented by dams, diversions and canals, and a high rate of dam construction in the developing world threatens the integrity of remaining free-flowing rivers.
- In the Mobile Bay drainage basin in the United States, dam construction has had a catastrophic impact on what was probably the most diverse freshwater snail fauna in the world. Nine families and about 120 species were known from the drainage basin. At least 38 species are believed to have become extinct in the 1930s and 1940s following extensive dam construction in the basin: the system now has 33 major hydroelectric dams and many smaller impoundments, as well as locks and flood-control structures.
- In some mountainous regions of East Africa, women spend up to 27% of their caloric intake in collecting water
- It has been calculated that in South Africa alone, women collectively walk the equivalent distance of 16 times to the moon and back per day gathering water for their families.
- Some 30% of women in Egypt walk over 1 hour a day to meet water needs. In some parts of Africa, women and children spend 8 hours a day collecting water.
- On average women and children travel 10-15 kilometers per day collecting water and carrying up to 20 kilos or 15 litres per trip.
- Medical research has documented cases of permanent damage to women's health attributed to carrying water. Problems range from chronic fatigue, spinal and pelvic deformities, to effects on reproductive health such as spontaneous abortions. In some parts of Africa, where women expend as much as 85% of their daily energy intake fetching water, the incidence of anaemia and other health problems are very high.
- 70% of the world's blind are women who have been infected, directly or through their children, with trachoma, a blinding bacterial eye infection occurring in communities with limited access to water.
- The economic value of this unpaid contribution is enormous: in India it is estimated that women fetching water spend 150 million work days per year, equivalent to a national loss of income of 10 billion Rupees.

- From a public health perspective, it is better to provide a whole city's population with safe water supplies to taps within 50 metres of their home than to provide only the richest 20% with access to safe water.
- Hygiene interventions including hygiene education and promotion of hand washing can reduce diarrhoeal cases by up to 45%.
- 88% of diarrhoeal disease is attributed to unsafe water supply, inadequate sanitation and hygiene.
- 1.8 million people die every year from diarrhoeal diseases (including cholera); 90% are children under 5, mostly in developing countries.
- Every 8 seconds a child dies from drinking contaminated water (that is 10,000 a day).
- 500 million people are at risk from trachoma, 146 million are threatened by blindness and 6 million people are visually impaired from this disease.
- In Bangladesh, between 28 and 35 million people consume drinking water with elevated levels of arsenic.
- Over 26 million people in China suffer from dental fluorosis due to elevated fluoride in their drinking water.
- Today, approximately 40% of the world's population, mostly those living in the world's poorest countries, is at risk of malaria.
- Malaria is Africa's leading cause of mortality for children under the age of five (20%) and constitutes 10% of the continent's overall disease burden.
- Malaria kills an African child every 30 seconds.
- Malaria has been estimated to cost Africa more than US\$ 12 billion every year in lost GDP, even though it could be controlled for a fraction of that sum.
- Economists believe that malaria is responsible for a growth penalty of up to 1.3% per year in some African countries. When compounded over the years, this penalty leads to substantial differences in GDP between countries with and without malaria and severely restrains the economic growth of the entire region.
- Levels of suspended solids in rivers in Asia have risen by a factor of four over the last three decades. Asian rivers also have a biological oxygen demand some 1.4 times the global average, as well as three times as many bacteria from human waste as the global average.
- Bangladesh is grappling with the largest mass poisoning (concentrations of arsenic in drinking water) in history, potentially affecting between 35 and 77 million of the country's 130 million inhabitants.
- Excessive amounts of fluoride in drinking water can also be toxic. Discoloration of teeth occurs worldwide, but crippling skeletal effects caused by long-term ingestion of large amounts are prominent in at least eight countries, including China, where 30 million people suffer from chronic fluorosis.
- During a stop on El Hierro Island (Canarias) on his way to the Americas, Bartolom de las Casas took interest in the aborigine Bimbachos culture, which was already disappearing in the XVI century. The Bimbachos devoted a cult to a tree, the Garoe (*Ocotea foetens*), which supplied them with abundant freshwater. This holy tree was capable of capturing the water held in the mist and drizzle, which allowed for agriculture in an area with very low rainfall. The Garoe was uprooted by a hurricane in 1610. Curiously, its disappearance coincided with that of the Bimbachos culture on El Hierro Island.
- Every morning the Namib fog beetle (*Onymacris unguicularis*) makes an arduous journey to the top of a sand dune, where he turns his body into the wind, straightens out his rear legs and lowers his head. The fog rolling in from the sea gradually collects on his back, forming droplets of water, which glide downwards and hang from the insect's mouthparts. In this way, this beetle is always assured of a healthy morning drink, despite being miles from the nearest freshwater.

- 25% to 40% of the water in coastal redwood forests comes from fog. The trees get some of that water through their roots, when fog-saturated leaves and branches drip water onto the ground.
- The Nile River is the longest river in the world. From Lake Victoria to the Mediterranean Sea the length of the Nile is 5,584 km. From its remotest headstream, the Ruvyironza River in Burundi, the river is 6,671 km long.
- The largest river basin in the world is that drained by the Amazon. It covers about 6,145,186 km².
- The Amazon is the river that carries the most water in the world. In Brazil, an average of 120,000 m³ of water flows from the Amazon into the Atlantic Ocean every second.
- Over the period 1992-2001, weather and climate related disasters killed about 622,000 people, affected more than two billion, left millions more homeless, devastated arable land and spread disease.
- Studies suggest that the number of weather-related disasters have increased threefold over the past 30 years.
- The world's lowest annual precipitation average has been measured in Arica (Chile). In 59 years of records the annual average has been 0.8 mm.
- The world's highest annual precipitation average has been measured in Lloro (Colombia). In 29 years of records the annual average has been 13,230 mm.
- Because of their small size and particular geological, topographical and climatic conditions, many small island developing States face severe constraints in terms of both the quality and quantity of freshwater.
- Nauru Island received most of its water in ships until it installed a desalination plant, and some of the small islands of Fiji and Tonga also receive water from nearby islands by barge or boat.
- During severe droughts or natural disasters some of the small islands of Fiji, Kiribati, and the Marshall Islands have relied on coconuts for water.
- Hong Kong receives about 50% of its potable water requirements via twin pipelines from the adjacent mainland.
- The different assessments carried out by the Intergovernmental Panel on Climate Change (IPCC) have shown that the emissions of greenhouse gases released in the atmosphere since the 19th century will lead to a global warming of the earth over the period 1990-2100, with an expected increase of the average annual temperature in the range of 1.4C to 5.8C.
- Among the associated effects of global warming are rises in the ocean level (in the range of 0.09 to 0.88 metres for the same period) and, as a consequence of the availability of more energy in the climate system, an intensification of the global hydrological cycle.
- Climate change will lead to more precipitation, but also to more evaporation. In general, this acceleration of the hydrological cycle will result in a wetter world.
- Increasingly heavy rain and snow are falling on the mid- and high latitudes of the Northern Hemisphere, while rains have decreased in the tropics and subtropics in both hemispheres.
- The new climate conditions may directly affect the magnitude and timing of runoff, the intensity of floods and drought and have significant impacts on regional water resources, affecting both surface water and groundwater supply for domestic and industrial uses, irrigation, hydropower generation, navigation, in-stream ecosystems and water-based recreation.
- In large parts of eastern Europe, western Russia, central Canada and California, peak stream flows have shifted from spring to winter as more precipitation falls as rain rather than snow, therefore reaching the rivers more rapidly.

- In Africa's large basins of the Niger, Lake Chad and the Senegal rivers, total available water has decreased by 40 - 60%.
- Glaciers and icecaps cover about 10% of the world's landmass. These are concentrated in Greenland and Antarctica and contain approximately 70% of the world's freshwater.
- According to the United States Geological Survey (USGS), 96% of the world's frozen freshwater is at the South and North poles, with the remaining 4% spread over 550 000 km² of glaciers and mountainous icecaps measuring about 180 000 km³.
- Glacial ice often appears blue when it has become very dense. Years of compression gradually make the ice denser over time, forcing out the tiny air pockets between crystals. When glacier ice becomes extremely dense, the ice absorbs all other colours in the spectrum and reflects primarily blue, which is what we see. When glacier ice is white, that usually means that there are many tiny air bubbles still in the ice.
- If all land ice melted, sea level would rise approximately 70 metres worldwide.
- Almost 90% of an iceberg is below water only about 10% shows above water.
- Between 1980 - 2001, the thickness of 30 major mountain glaciers decreased by an average of 6 metres.
- The Kutiah Glacier in Pakistan holds the record for the fastest glacial surge. In 1953, it raced more than 12 kilometers in three months, averaging about 112 metres per day.
- Between 1962 and 2000 the Kilimanjaro has lost approximately 55% of its glaciers.
- In Asia, almost 84% of the water withdrawal is used for agricultural purposes, compared to 71% for the world.
- The unit cost of irrigation development varies with countries and types of irrigated infrastructures, ranging typically from US\$ 1,000 to US\$ 10,000 per hectare, with extreme cases reaching US\$ 25,000 per hectare. The lowest investment costs in irrigation are in Asia, which has the bulk of irrigation and where scale economies are possible. The cost expensive irrigation schemes are found in sub-Saharan Africa, where irrigation systems are usually smaller and the development of land and water resources is costly.
- Irrigation water withdrawal in developing countries is expected to grow by about 14% from the current 2,130 km³ per year to 2,420 km³ in 2030.
- Harvested irrigated area (the cumulated area of all crops during a year) is expected to increase by 33% from 257 million hectares in 1998 to 341 million hectares in 2030.
- Wetlands capture and retain rainfall, and prevent valuable sediments from being washed into lakes and rivers. They add moisture to the atmosphere, which falls as rain and cools the environment.
- A global review of wetland resources submitted to the Conference of the Parties to the Convention on Wetlands in 1999, while affirming that it is not possible to provide an acceptable figure of the areal extent of wetlands at a global scale, indicated a best minimum global estimate at between 748 and 778 million hectares.
- 50% of the world's wetlands have been lost in the past century alone.
- Some recent economic studies have indicated that ecosystems provide at least US\$ 33 trillion worth of services annually, of which US\$ 4.9 trillion are attributed to wetlands.
- Wetlands are among the world's most productive environments. They are cradles of biological diversity, providing the water and primary productivity upon which countless species of plants and animals depend for survival.
- Mountains are often called nature's water towers. Because of their size and shape, they intercept air circulating around the globe and force it upwards. Here it condenses into clouds, which provide rain and snow.
- Each day, an estimated 1 in 2 people consume water that originated in mountains.

- 1 billion Chinese, Indians and Bangladeshis, 250 million people in Africa, and the entire population of California, United States, are among the 3 billion people who rely on the continuous flow of fresh, clean mountain water.
- In humid parts of the world, mountains provide 30% to 60% of downstream freshwater. In semi-arid and arid environments, they provide 70% to 95%.
- Floods throughout Asia in 1998 killed 7,000 people, damaged more than 6 million houses and destroyed 25 million hectares of cropland in Bangladesh, China, India and Viet Nam.
- In September 2000, flooding and landslides in Japan forced the evacuation of 45,000 people; the rainfall was the highest ever recorded in a 24-hour period since records began in 1891.
- In 1999 alone, natural disasters accounted for at least 50,000 deaths. The burden of loss, of course, is greatest in poor countries, where thirteen times more people die from such events than in rich ones.
- Databases of the United States Office of Foreign Disaster Assistance (OFDA) and the Centre for Research on the Epidemiology of Disaster (CRED) reveal that more than 2,200 major and minor water-related disasters occurred in the world during the period 1990 - 2001. Of these, floods accounted for half of the total disasters, water-borne and vector disease outbreaks accounted for 28% and drought accounted for 11% of the total disasters; 35% of these disasters occurred in Asia, 29% in Africa, 20% in the Americas, 13% in Europe and the rest in Oceania.
- A recent study estimated that desertification processes affect 46% of Africa and that 55% of that area is at high or very high risk. The worst affected areas are along desert margins, and in total about 485 million people are affected.
- Numerous ocean and river gods such as Neptune, Poseidon, Triton and Oceanus, with their spouses and offspring, as well Nepomuk, the saint of bridges who goes back to pre-Christian tradition, bear witness that from time immemorial, humankind both feared the power of water and exploited it. As early as 3000 BC the inhabitants of Egypt and Mesopotamia used water wheels such as the ones still used today in much the same way.
- No one knows why people started bringing drink offerings, or libations, very early on in history. Perhaps someone once noted that rinsing out one's drinking vessel is beneficial to health, whereupon this act of cleanliness was elevated to a ceremony.
- Virtual water is an essential tool in calculating the real water use of a country, or its water footprint, which is equal to the total domestic use, plus the virtual water import, minus the virtual water export of a country.
- 140 litres of water is the amount of water needed to produce 1 cup of coffee.
- 550 litres is the amount of water needed to produce enough flour for one loaf of bread (400 grams).
- The production of 1 litre of milk requires 1,000 litres of water.
- The production of 1 kilogram of:
 - rice requires 3,000 litres of water
 - maize requires 900 litres of water
 - wheat requires 1,350 litres of water
 - beef requires 16,000 litres of water
- Almost 50% of the world's coasts are threatened by development-related activities.
- Severe eutrophication has been discovered in several enclosed or semi-enclosed seas. It is estimated that about 80% of marine pollution originates from land-based sources and activities.
- In marine fisheries, most areas are producing significantly lower yields than in the past. Substantial increases are never again likely to be recorded for global fish catches. In contrast, inland and marine aquaculture production is increasing and now contributes 30% of the total global fish yield.

- Impacts of climate change may include a significant rise in the level of the world's oceans. This will cause some low-lying coastal areas to become completely submerged, and increase human vulnerability in other areas.
- Because they are highly dependent upon marine resources, small island developing states are especially vulnerable, due to both the effects of sea level rise and to changes in marine ecosystems.

Facts about water in Africa

- The WHO/UNICEF 2000 Assessment statistics for sanitation for 43 of Africa's large cities showed that 19% of the population remains unserved. Among these populations, only 18% have toilets connected to sewers, a very low proportion as confirmed by an analysis of the Demographic and Health Surveys suggesting that a mere 25% of Africa's urban population has access to toilets connected to sewers. This conclusion is also supported by statistics on the proportion of households with sewer connections in the largest city in each African nation. In most of these cities, less than 10% of the population has sewer connections while in many, including Abidjan (Cote d'Ivoire), Addis Ababa (Ethiopia), Asmara (Eritrea), Brazzaville (Congo), Cotonou (Benin), Kinshasa (Congo), Libreville (Gabon), Moroni (Comoros), NDjamena (Republic Of Chad), Ouagadougou (Burkina Faso), and less than 2% have connections.
- By the 1990s, among 67 urban centres in 29 African nations (including most of the continent's largest cities), 58% were using at least rivers 25 kilometres away, and just over half of the urban centres that relied on rivers depended on interbasin transfers.
- In Africa, about 85% of water withdrawals are for agriculture, but this figure varies considerably from one region to another:
 - Arid regions, where irrigation plays an important role in agriculture, have the highest level of water withdrawal for agriculture;
 - North Africa alone represents more than half of the continent's agricultural withdrawal;
 - The humid regions show the lowest agricultural withdrawals: 62% for the Gulf of Guinea and 43% for the Central region.
- Malaria has been estimated to cost Africa more than USD\$12 billion every year in lost GDP. Economists believe that this disease is responsible for a growth penalty of up to 1.3% per year in some African countries.
- Malaria is Africa's leading cause of mortality for children under the age of five (20%) and constitutes 10% of the continent's overall disease burden. This disease kills an African child every 30 seconds.
- An estimated 246.7 million people worldwide are infected with the parasitic Schistosoma flatworm, which causes Schistosomiasis, also known as bilharzias. 80% of the transmissions of this disease take place in Sub-Saharan Africa.
- In some mountainous regions of East Africa, women spend up to 27% of their caloric intake in collecting water
- It has been calculated that in South Africa alone, women collectively walk the equivalent distance of 16 times to the moon and back per day gathering water for their families.
- The Middle East and North Africa is the most water-scarce region of the world. Home to 6.3 percent of the world's population, the region contains only 1.4 percent of the world's renewable fresh water. Twelve of the world's 15 water-scarce countries are in this region.
- Due to population growth, the per capita annual renewable fresh water for the Middle East and North Africa had decreased from 3,645 to 1,640 m³ and will reduce to 1,113 m³ in 2025. Among the countries in this region, Iraq had the most per capita annual renewable fresh water as 4,087 m³, whereas Kuwait had the smallest amount as just 9 m³ in 2001.

Facts about water in Asia

- Only 47% of the Asian population has improved sanitation coverage, by far the lowest of any region of the world.
- Asia is home to 80% of the global population without access to improved sanitation.
- Water supply coverage is at 81%, the second lowest after Africa.
- Nearly all urban rivers and nearby water bodies have been seriously polluted. River water quality in the region has seen widespread deterioration to levels that pose significant risks to health standards.
- Asia, and particularly China, has seen the dominant share of aquaculture development, and this growth is expected to continue.
- Asian countries are constructing many new hydropower schemes, and the region is set to quadruple its 1995 deployment by 2010, primarily through large hydropower.
- More than 10 % of the regions hydropower is generated from small schemes, and micro-hydro installations are widespread, with significant potential for further development.
- Over the past 10 years, Asia has experienced nearly one third of all worldwide water-related (flood and drought) disasters. A total of 1.8 billion people were affected (90% of all people affected worldwide).
- Whereas 80% of affected persons in Africa were impacted by drought, in Asia 80% of affected persons were impacted by floods.

China and Taiwan

- China is among the countries encountered worst desertification problems. As much as 27.5% of the total national land area has become a desert. Desertification is expanding at a rate of 10.4 thousand km² annually.
- Sand storms are one of the serious consequences of desertification in China. The number of sand storm events reached the record high as 32 in 2001, whereas the number was just 14 from 1980 to 1989. The national capital Beijing was witnessed many super sand storms in recent years. The nearest sand dome is now just 70 km away from Tiananmen Square at the center of Beijing City and this distance is reducing each year.
- The Three Gorges Project (TGP) in Yangtze River in China is among the largest in the world. The maximum flood discharge capacity of the dam is 11,610 cms, the biggest in the world. The TGP power plant has an installed capacity of 18.2 million KW and an annual power generation of 84.68 billion KW-hr, both the largest in the world.
- The TGP Reservoir actually drowned 632 km² of land that covers 21 counties/cities where 844 hundred thousand people lived. Over a million people have been reallocated in last two decades because of the TGP.
- 22.4 % of the river segments for 194 main rivers in China were classified as severely polluted in June 2005.
- The surface area of the biggest salty water lake Qinghai Lake in China is shrinking and water quality is deteriorating. From 1975 to 2000, the total area of Qinghai Lake had been diminished by 150 km². The north shore of this lake is retreating at a rate of 131 meters per year. From 1995 to 2000, the annual water recharge to the lake was 3.69 billion m³ but the annual water consumption and loss reached 4.05 billion m³, resulting in a net loss of 0.36 billion m³ per year.
- The peak discharge per unit drainage area in Taiwan is the largest in the world. For instance, the specific peak discharge of Wu River is as high as 10.5 cms/km³, i.e., 620

times that of Yangtze River in China and 13,000 times that of Nile River in Egypt and Sudan.

- In comparison with the records in the world, the rivers in Taiwan have the steepest slope, the largest discharge per unit drainage area, and the shortest flood peaking time.
- The one-hour to 3-day maximum precipitation rates in Taiwan are approximately 85 to 93% of the world records. One day precipitation records exceed 60% of the average annual precipitation in Europe and 100% of the average annual precipitation in San Francisco, Vienna and Berlin.
- Having steep terrain and excessive rainfall, the most severe disaster in Taiwan is flooding which is caused by typhoons and storms in summer season with concentrated intensive rainfall and rapid flows.
- Most of the mountain regions in Taiwan are sedimentary and metamorphic rocks which are fragile and highly weathered. Severe erosion occurs due to intensive rainfall and rapid flows, the erosion is even worsen by frequent earthquakes and severely affects the stability of hillsides.
- There were 350 typhoons in over one thousand storms occurred in Taiwan from 1897 to 1997. However, there were 45 typhoons hitting Taiwan from 1998 to 2004, making the average in these seven years as high as 6.5. The record high number as 9 occurred in 2001, 2003, and 2004. The Nanmadol attacking Taiwan in December 2004 was the first December typhoon in history.
- Losses due to natural disasters reached 12.8 billion NTD from 1983 to 1995. The amount is approximately 4.6 times the fire damages in the same periods.
- Extremely high rainfall density can occur in Taiwan. A record high 24-hr rainfall brought about by a typhoon in October 1987 was recorded in a mountain area as high as 1,135 mm.
- In Taiwan, over-pumping of groundwater for coastal fish cultivation has resulted in a serious land subsidence problem all over the island. About 1,747 km², equaling over 16 % of the plain area is still subsiding now. The maximum accumulative subsidence depth was as high as 3.22 meters and the maximum subsidence rate was 10.4 cm per year for a county in 2004.
- In Taiwan, over 8 % of the main reaches of rivers were severely polluted. Some rivers have more than 50% in length severely polluted.
- In Taiwan, the per capita domestic water consumption is about 350 liter/day but the average water price is just around US\$ 0.27 per cubic meter.
- Landslides and debris flows become common disasters accompanying with typhoons and big storms in Taiwan. In a segment of Da-Chia Basin, a single typhoon in August 2004 washed down 10.4 million cubic meters of sediments to the river bed and which was lifted as high as 12 meters in one day. A serial of hydropower generation plants were buried by the sediments and rocks and thus destroyed. In some places along the river, the river bed has been lifted 30 meters in three years.

Nepal, Himalayas, and Singapore

- Nepal has one of the highest amounts of water resources in Asia, mainly from river originating from the Himalayan Mountains. However, people living in mountain areas cannot get water and thus use an average of only 5 liters per capita per day. It is estimated that only 10% of the groundwater in this country was used.
- Himalayan glaciers represent the greatest concentration of ice on earth after the Arctic poles. Because of global warming they are receding at an average rate of 10 to 15 meters per year. Scientists predict that this will cause flooding due to melted ice in the near future. In future decades it will result in lower stream and river flows that could adversely impact economic and environmental conditions in western China, Nepal and northern India.

- The small but rich country Singapore, with a 4.2 million population, consumes 1.4 million m³ of fresh water per day, 40% of which has been imported from its neighbor country Malaysia since 1960s.
- Singapore government has made self-sustainability in water one of its national priorities. One of the most important strategies is to reclaim water from sewage and pump the reclaimed water to the city's water system. The country is looking to turn 90 percent of the entire island into fresh water catchment areas.

Central Asia, Middle East, and other Asian regions

- Much of Central and Southeast Asia is characterized by an annual monsoon and dry season cycle, resulting in the need for water storage.
- Southeast Asia is one of the water-rich regions in the world. It is also one of the most populated, with about 522 million in 2002 and growing at an annual rate of 2.1%. Nearly 33% of the population lives in urban areas; this is expected to increase further by about 3% annually.
- Southeast Asia has an average annual water resource of about 6,476 km³, representing 15% of the world's total. More than 90% of total freshwater withdrawals go to agriculture; the remaining 10% go to household and industrial uses.
- One in three Asians lack access to safe drinking water. Half the people living in Asia and the Pacific do not have access to adequate sanitation.
- Conflicts over sharing of scarce water resources are increasing throughout the region
- Limited water resources of small island countries in the Pacific are threatened by climate change, pollution, and population pressures.
- Development over the years has caused critical damage to the reef and degraded village water sources on the Coral Coast in the Fiji Islands.
- During a three-year drought, women from the arid rural areas in the state of Gujarat, India, were spending at least three hours every day fetching water from a steadily diminishing source.
- Long years of war and civil strife left Phnom Penh's water supply system in ruins. An estimated 70% of the city's water was lost through the decrepit distribution system and illegal connections.
- There is conflict over water use between upstream and downstream communities on the Ping River in northern Thailand.
- The small island countries of Kiribati and Tonga in the Pacific rely mainly on fragile groundwater aquifers for fresh water. But ground-water sources just below the surface are highly vulnerable to pollution and salt water intrusion, as populations grow and concentrate in urban areas.
- Dhaka is the fastest growing mega-city in Asia, with a population expected to reach 16 million by 2010. Over three million poor people live in squalid slums. Most are considered illegal squatters who have no access to city water or sanitation services.
- The Aral Sea surrounded by Kazakhstan, Uzbekistan, and Turkmenistan in Central Asia shrank from 67,300 km² in 1970s to less than 10,000 km² today, due to irrigation demands for cotton and rice cultivation as a policy of former USSR at that time.
- With the collapse of the Soviet Union, the well-established network of the information exchange on water, economy, and environment also collapsed. In addition, considerable knowledge has been lost by the emigration of many experts who had worked in the system.
- Although Central Asian states have quite rapidly developed regional structures, the provision and circulation of information about development, accounting and use of water and associated land and natural resources in the Aral Sea Basin, has deteriorated. As a consequence, regional, bilateral and national agreements, policies and interventions are often not based on accurate data and a sound analysis of the

situation. In addition, sectoral and compartmentalized approaches to water use and management hamper the development of integrated and sustainable solutions.

- There are totally 11 typhoons attacking Japan in 2004, causing an agricultural damage of more than one billion US\$.

Facts about water in Europe

- Water resources are unevenly distributed in Europe. Annual average run-off ranges from 3,000 mm in western Norway to 100-400 mm over much of central Europe and less than 25 mm in central and southern Spain.
- Water resources in Europe have been profoundly influenced over the past century by human activities, including the construction of dams and canals, large irrigation and drainage systems, changes of land cover in most watersheds, high inputs of chemicals from industry and agriculture into surface and groundwater, and aquifer depletion. As a result, problems of overuse, depletion and pollution have become evident, and conflicts are developing between various uses and users.
- In Europe, improved water supply coverage is high, with access provided for 97% of the population. 100% of the urban population has coverage, compared with 89% of the rural population.
- In terms of sanitation, 95% of the population is totally covered: 99% of the urban population and 78% of the rural population.
- Only 4 European countries reported not having full water supply and sanitation coverage in 2000, all of which are in Eastern Europe: Estonia, Hungary, Romania and the Russian Federation.
- Improvements have been made in reducing water pollution, mostly through stricter controls on industrial discharges and more sophisticated and comprehensive sewage and stormwater treatment.
- A majority of European rivers, particularly in their middle and lower reaches, are in poor ecological condition due to the impacts of canalization, dams, pollution and altered flow regimes.
- About 12 million people have been affected in Europe by floods or droughts over the past decade, split about evenly between the two. There have been nearly 2,000 deaths from floods, approximately 0.5% of all flood-related deaths worldwide.
- Half of Europe's alpine glaciers could disappear by 2025. In 2003, extreme warm and dry weather conditions caused an average decrease in glaciers thickness in the Alps of about 3 metres water equivalent, nearly twice as much as during the previous record year, 1998, and roughly 5 times more than the average loss recorded during the exceptionally warm period of 1980-2000.
- In the Russian Federation, 1,400 areas with polluted groundwater have been identified, 82% of them are west of the Ural Mountains. In 36% of the cases, pollution is due to industry, in 20% to agriculture (fertilizers and wastes from farm animals), in 10% to municipal landfills and in 12% to mixed sources.
- The Baltic Sea is the youngest sea on the planet. It has a unique marine ecosystem that plays an important role for the 85 million people who live in the area the only sea almost entirely within the European Union. However, the ecosystem is highly sensitive to pollution as there is little exchange of water with the neighbouring Atlantic Ocean. As a result, the sea's contaminated water can remain in place for 25 to 30 years.

Facts about water in Latin America and the Caribbean

- Latin America is extremely rich in water resources: the Amazon, Orinoco, So Francisco, Paran, Paraguay and Magdalena rivers carry more than 30% of the world's continental surface water. Nevertheless, two thirds of the region's territory is classified as arid or semi-arid. These areas include large parts of central and northern Mexico, northeastern Brazil, Argentina, Chile, Bolivia and Peru.
- This region has relatively high service levels but is characterized by large differences from one area to the next. Total water supply coverage is extended to approximately 87% of the population, while total sanitation coverage is slightly lower at 78%.
- Large disparities are apparent between urban and rural areas, with an estimated 86% of the urban population with sanitation coverage, compared to only 52% of the rural population.
- One of the origins of groundwater pollution in Latin America is seepage from improper use and disposal of heavy metals, synthetic chemicals and hazardous wastes. The quantity of such compounds reaching groundwater from waste dumps appears to be doubling every 15 years in Latin America. Aquifer depletion and salt water intrusion are also important sources of groundwater contamination.
- 94% of the urban population enjoys water supply coverage, compared with only 65% of the rural population. A total of 68 million people are without access to improved water supply in the region, while 116 million people (the vast majority in South America) are without access to improved sanitation.
- The cost of supplying water to cities is continually rising. In Mexico City, water is pumped over elevations exceeding 1,000 metres into the Valley of Mexico, and in Lima, upstream pollution has increased treatment costs by about 30%.
- In Latin America, about a quarter of the total population more than 100 million people lives in water stressed areas, mostly in Mexico, Argentina and countries along the Western coastline of the continent.
- Central America and the Caribbean have experienced about 20% of the world's hydrometeorological disasters of the past decade. Although this represents just 1% of all people affected worldwide, in the past decade it nonetheless adds up to a total of 36,000 deaths, that is, one third of all deaths worldwide due to flooding.

Facts about water in the US

- Currently, 600,000 miles of US rivers lie behind an estimated 60,000 to 80,000 dams.
- The United States has 3,500,000 miles of rivers. The 600,000 miles of rivers lying behind dams amounts to fully 17% of river mileage.
- The Missouri River is about 2,540 miles long, making it the longest river in North America. The Nile is the longest river in the world at 4,132 miles as it travels northward from its remote headwaters in Burundi to the Mediterranean Sea.
- The 8 longest rivers in the U.S. are (in descending order) Missouri, Mississippi, Yukon, St. Lawrence (if you count the Great Lakes and its headwaters as one system), Rio Grande, Arkansas, Colorado, Ohio.
- The 8 largest rivers in the U.S., based on volume, are (in descending order) Mississippi, St. Lawrence, Ohio, Columbia, Yukon, Missouri, Tennessee, Mobile.
- The United States consumes water at twice the rate of other industrialized nations.
- 1.2 Billion -- Number of people worldwide who do not have access to clean water.
- 6.8 Billion -- Gallons of water Americans flush down their toilets every day.
- Water use in the United States alone leaped from 330 million gallons per day in 1980 to 408 million gallons per day in 1990, despite a decade of improvements in water-saving technology.
- Water used around the house for such things as drinking, cooking, bathing, toilet flushing, washing clothes and dishes, watering lawns and gardens, maintaining swimming pools, and washing cars accounts for only 1% of all the water used in the U.S. each year.
- Eighty percent of the fresh water we use in the U.S. is for irrigating crops and generating thermoelectric-power.
- More than 87% of the water consumed in Utah is used for agriculture and irrigation.
- Per capita water use in the western U.S. is much higher than in any other region, because of agricultural needs in this arid region. In 1985, daily per capita consumption in Idaho was 22,200 gallons versus 152 gallons in Rhode Island.
- The average American consumes 1,500 pounds of food each year; 1,000 gallons of water are required to grow and process each pound of that food. -- 1.5 million gallons of water is invested in the food eaten by just one person! This 200,000-cubic-feet-plus of water-per-person would be enough to cover a football field four feet deep.
- About 39,090 gallons of water is needed to make an automobile, tires included.
- Only 7% of the country's landscape is in a riparian zone -- only 2% of which still supports riparian vegetation.
- The U.S. Fish and Wildlife Service estimate that 70% of the riparian habitat nationwide has been lost or altered.
- More than 247 million acres of United States' wetlands have been filled, dredged or channelized -- an area greater than the size of California, Nevada and Oregon combined.
- Over 90% of the nearly 900,000 acres of riparian areas on Bureau of Land Management land are in degraded condition due to livestock grazing.
- Riparian areas in the West provide habitat for more species of birds than all other western vegetation combined -- 80% of neotropical migrant species (mostly songbirds) depend on riparian areas for nesting or migration.
- Fully 80% of all vertebrate wildlife in the Southwest depends on riparian areas for at least half of their life.
- Of the 1200 species listed as threatened or endangered, 50% depend on rivers and streams.
- One fifth of the world's freshwater fish -- 2,000 of 10,000 species identified -- are endangered, vulnerable, or extinct. In North America, the continent most studied, 67% of all mussels, 51% of crayfish, 40% of amphibians, 37% of fish, and 75% of freshwater mollusks are rare, imperiled, or already gone.

- At least 123 freshwater species became extinct during the 20th century. These include 79 invertebrates, 40 fishes, and 4 amphibians. (There may well have been other species that were never identified.)
- Freshwater animals are disappearing five times faster than land animals.
- In the Pacific Northwest, over 100 stocks and subspecies of salmon and trout have gone extinct and another 200 are at risk due to a host of factors, dams and the loss of riparian habitat being prime factors.
- A 1982 study showed that areas cleared of riparian vegetation in the Midwest had erosion rates of 15 to 60 tons per year.
- One mature tree in a riparian area can filter as much as 200 pounds of nitrates runoff per year.
- At least 9.6 million households and \$390 billion in property lie in flood prone areas in the United States. The rate of urban growth in floodplains is approximately twice that of the rest of the country.
- If all the water in the Great Lakes were spread evenly across the continental U.S., the ground would be covered with almost 10 feet of water.
- The National Wild and Scenic Rivers System has only 11, 303 river miles in it -- just over one-quarter of one percent of our rivers are protected through this designation, and this protection is often contended.

Facts on women and water

- Lack of energy services and infrastructure (water supply systems) limits women's productive and community development activities: they are generally responsible for gathering fuel and performing household duties involving energy use, such as cooking. Women often have to spend a great deal of time and physical energy searching for fuel and water far from home and hauling it back over long distances. Girls are likely to be kept home from school to help with household chores when women are overburdened, which contributes to the perpetuation of female poverty.
- Only a functioning infrastructure, including energy and water supply allows women to escape this vicious circle, because it frees up their time. Having access to lighting in the evening makes it possible for them to pursue educational and entrepreneurial opportunities.
- Women play a central part in the management and safeguarding of water, which makes it critical to involve them at all levels of the decision-making process. As women are concerned with health, sanitation, domestic water and food supplies, their increased participation in water management could have a positive impact on sharing water.
- In seeking to overcome their own water management problems, communities generate precious knowledge. The adoption of participatory approaches in water management, greater public consultation on proposed schemes and devolved responsibilities for water user groups have stimulated knowledge among wide numbers of people on specific issues. It has also contributed to challenging assumptions about gender-based divisions of labour, a first step towards giving women a greater say in planning water schemes.

Facts about water and population

- Rapid growth of the world's population has been one of the most visible and dramatic changes to the world over the last 100 years. Population growth has huge implications for all aspects of resource use, including water.
- During the 20th century, water use increased at double the rate of population growth; while the global population tripled, water use per capita increased by six times.
- Although water is a renewable resource, it is only renewable within limits; the extent to which increasing demands can be met is finite.
- Worldwide, per capita water supplies decreased by a third between 1970 and 1990, and there is little doubt that population growth has been and will continue to be one of the main drivers of changes to patterns of water resource use.
- Although there are differences of opinion, most projections expect this slowdown of demographic growth rates to continue and for the world's population to stabilize at about 9.3 billion people (still over 50% higher than the 2001 population of 6.1 billion) somewhere in the middle of the 21 century.
- The global overview of water availability versus population stresses continental disparities, and in particular the pressure put on the Asian continent, which supports 60% of the world's population with only 36% of the world's water resources. Europe has 13% of the world's population and 8% of the world's water resources; Africa has 13% of the world's population and 11% of the world's water resources; North and Central America has 8% of the population and 15% of the water; Oceania has less than 1% of the world's population but 5% of the world's water resources; and South America has 6% of the world's population yet 26% of the world's water resources.
- Freshwater is distributed unevenly, with nearly 500 million people suffering from water stress or serious water scarcity.
- A number of scenarios have been developed based on the most recent UN population projections. Based on these projections, the future for many parts of the world looks bleak. The most alarming projection suggests that nearly 7 billion people in 60 countries will suffer from water scarcity by 2050. Even according to conservative projections, just under 2 billion people in 48 countries will struggle against water scarcity in 2050.
- Between now and 2025, it is expected that the world will need 17% more water to grow food for the increasing populations in developing countries and that total water use will increase by some 40%.
- Sub-Saharan Africa has the lowest level of access to safe water coverage of any region, with only 60% of the population served.

Facts about water and natural disasters

- The world is experiencing a dramatic increase of suffering from the effects of disasters, ranging from extreme droughts to huge floods, caused by the poor water and land management and possibly by climate change.
- The burden of loss, of course, is greatest in poor countries, where 13 times more people die from such events than in rich ones.
- Some 75% of the world's population lives in areas affected at least once by earthquake, tropical cyclone, flood or drought between 1980 and 2000.
- As a result of disasters triggered by earthquake, tropical cyclone, flood or drought more than 184 deaths per day are recorded in different parts of the world.
- More than 2,200 major and minor water-related disasters occurred in the world between 1990 and 2001. Of these, floods accounted for half of the total disasters, water-borne and vector disease outbreaks accounted for 28% and drought accounted for 11% of the total disasters. Of these disasters, 35% occurred in Asia, 29% in Africa, 20% in the Americas, 13% in Europe and 3% in Oceania.
- The impacts from just one single disaster have, in some cases, lowered the Gross National Product (GNP) in poor economies by as much as 10%.
- Annual economic losses associated with such disasters averaged US \$75.5 billion in the 1960s, US \$138.4 billion in the 1970s, US \$213.9 billion in the 1980s and US \$659.9 billion in the 1990s.
- More people were affected by disasters during the 90s than over the previous decade up from an average of 147 million per year (1981-1990) to 211 million per year (1991-2000).
- Floods accounted for over 65% of people affected by natural disasters, while famine affected nearly 20%.
- Between 1973 and 1997 an average of 66 million people a year suffered flood damage, making flooding the most damaging of all natural disasters.
- From 1991 to 2000, drought has been responsible for over 280,000 deaths and has cost tens of millions of US dollars in damage.
- The Indian state of Orissa experienced massive flooding in 2000, followed in 2001 by the worst drought in a decade and new floods. Out of a population of 32 million, some 27 million people were affected.
- The Zimbabwe drought of the early 1990s was associated with an 11 percent decline in Gross Domestic Product (GDP) and a 60% decline in the stock market; more recent floods in Mozambique led to a 23% reduction in GDP while the 2000 drought in Brazil led to a 50% decrease in projected economic growth.

Facts about floods

- Flooding, including flash and riverine floods, coastal floods, snowmelt floods, and floods related to ice jams and mud flows, is the most taxing water-related natural hazard to humans, material assets, as well as to cultural and ecological resources.
- Annually, flooding affects about 520 million people and their livelihoods, claiming about 25,000 lives worldwide.
- The annual cost to the world economy, of flooding and other water-related disasters, is between US\$ 50 and US\$ 60 billion.
- When flooding occurs in less developed countries, it can result in thousands of deaths and lead to epidemics, as well as effectively wipe out decades of investment in infrastructure and seriously cripple economic prosperity.
- Agriculture-centered developing economies largely depend on fertile flood plains for food security and poverty alleviation efforts.
- The wetlands in floodplains contribute to bio-diversity as well as provide employment opportunities. It is estimated that one billion people, one sixth of the global population -the majority of them among the world's poorest inhabitants -live on flood plains today.
- In Asia, the continent with the greatest potential flood hazard, between 1987 and 1997, floods claimed an average of 22,800 lives per annum and caused an estimated US\$ 136 billion in economic damage.
- The 2002 floods in Europe claimed 100 lives and caused US\$ 20 billion in damage.
- With the frequency and variability of extreme floods events changing because of urbanization, coupled with the population growth in flood-prone areas, deforestation, potential climate change and rise in sea levels, the number of people vulnerable to devastating floods worldwide is expected to rise.

Facts on desertification and drought

- *What is Desertification?* Desertification is the degradation of land in arid, semi-arid and dry sub-humid areas. It is caused primarily by human activities and climatic variations. Desertification does not refer to the expansion of existing deserts. It occurs because dry land ecosystems, which cover over one third of the world's land area, are extremely vulnerable to over-exploitation and inappropriate land use. Poverty, political instability, deforestation, overgrazing and bad irrigation practices can all undermine the land's productivity. Combating desertification is essential to ensuring the long-term productivity of inhabited dry lands.
- Over 250 million people are directly affected by desertification. In addition, some 1 billion people in over 100 countries are at risk.
- Droughts are undoubtedly the most far-reaching of all natural disasters. From 1991 to 2000 alone, drought has been responsible for over 280,000 deaths and has cost tens of millions of US dollars in damage.
- By the year 2025, the estimated number of people living in water-scarce countries will rise to between 1 and 2.4 billion, representing roughly 13 to 20 percent of the projected global population. Africa and parts of western Asia appear to be particularly vulnerable.
- Durations and extents of droughts vary greatly. Examples of severe, persistent droughts over large geographical areas include those in the Sahel, covering 7.3 million km², from 1970 to 1988; continental Europe, covering 9 million km², from 1988 to 1992; and India, covering 3 million km², from 1965 to 1967. There are other examples of extreme droughts in North America and Australia.
- Droughts have been categorized in three ways: as meteorological (due to a lack of precipitation), hydrological (lack of water in streams and aquifers) or agricultural (when conditions are unable to sustain agricultural and livestock production). The concept of what constitutes a drought varies from country to country. In England, three weeks without rain is considered a problem; in many parts of the world much longer dry periods are normal.
- Droughts are undoubtedly the most far-reaching of all natural disasters. From 1991 to 2000 alone, drought has been responsible for over 280,000 deaths and has cost tens of millions of US dollars in damage.
- Desertification, of course, did not begin with the recent droughts. Archaeological records suggest that Africa's arid areas have been getting progressively drier over the past 5,000 years. What is new is the coincidence of drought with the increasing pressures put on fragile arid and semi-arid lands by mounting numbers of people and livestock.
- An FAO/UNEP assessment of land degradation in Africa suggests that large areas of countries north of the equator suffer from serious desertification problems. For example, the desert is said to be expanding at an annual rate of 5 km in the semi-arid areas of West Africa.
- A recent study estimated that desertification processes affect 46% of Africa and that 55% of that area is at high or very high risk. The worst affected areas are along desert margins, and in total about 485 million people are affected.
- Durations and extents of droughts vary greatly. Examples of severe, persistent droughts over large geographical areas include those in the Sahel, covering 7.3 million km², from 1970 to 1988; continental Europe covering 9 million km², from 1988 to 1992; and India covering 3 million km², from 1965 to 1967.
- The Zimbabwe drought of the early 1990s was associated with an 11% decline in Gross Domestic Product (GDP) and a 60% decline in the stock market; more recent floods in Mozambique led to a 23% reduction in GDP, while the 2000 drought in Brazil led to a halving of projected economic growth. Even in developed countries, an

extreme drought may cause considerable disturbances in terms of environmental, economic and social losses. The 1988 drought in the United States may have caused direct agricultural losses totaling US\$13 billion.

Facts about drylands

- Drylands, as defined by the UNCCD, encompass the arid, semi-arid, and dry sub-humid zones. In these zones, ratios of mean annual precipitation to mean annual potential evapotranspiration range from 0.05 to 0.65 (excluding polar and sub-polar regions).
- Drylands occupy 41% of the earth's land area and are inhabited by over 2 billion people worldwide.
- Drylands are found in all continents, except for Antarctica. Australia, the United States, the Russian Federation, China and Kazakhstan are the countries with the most extensive drylands.
- 40% of people in Africa, South America and Asia live in drylands.
- Drylands do not include the true deserts of the world, such as the Sahara and the Kalahari. Deserts are harsh environments with little productive potential. Few people live in deserts, and those who do, live there for only short periods of time.
- Drylands are generally subject to climate regimes that are not highly favourable to crop production. Low total rainfall and high variability in rainfall patterns present difficult challenges for growing crops.
- Desertification is the degradation of drylands. It involves the loss of biological or economic productivity and complexity in croplands, pastures and woodlands. It is due mainly to climate variability and unsustainable human activities.
- 70% of the world's drylands (excluding hyper-arid deserts), or some 3,600 million hectares, are degraded.
- A major part of the poor people in the world live in arid areas and depend directly on adjacent natural resources, including water, for their livelihoods.
- Many dryland inhabitants are self-subsistent small-scale farmers who also have some livestock. For them, retaining as much water as possible is a question of survival, yet in arid areas, a substantial amount of rainwater is lost through surface run-off, evaporation and percolation.

Facts about wetlands

- Under the text of the Ramsar Convention, wetlands are defined as: areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.
- The Convention on Wetlands is an intergovernmental treaty adopted on 2 February 1971 in the Iranian city of Ramsar. Thus, though nowadays the name of the Convention is usually written Convention on Wetlands (Ramsar, Iran, 1971), it has come to be known as the Ramsar Convention. The original emphasis of the Convention was on the conservation and wise use of wetlands with the primary goal of providing habitats for waterbirds. Over the years, however, the Convention has broadened its scope to cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.
- Wetlands capture and retain rainfall, and prevent valuable sediments from being washed into lakes and rivers. They add moisture to the atmosphere, which falls as rain and cools the environment.
- A global review of wetland resources submitted to the Conference of the Parties to the Convention on Wetlands in 1999, while affirming that it is not possible to provide an acceptable figure of the areal extent of wetlands at a global scale, indicated a best minimum global estimate at between 748 and 778 million hectares.
- The 3 largest wetlands in the world by area are those of the West Siberian Lowlands (780,000-1,000,000 km²), the Amazon River (800,000 km²) and the Hudson Bay Lowlands (200,000-320,000 km²).
- Wetlands are among the world's most productive environments. They are cradles of biological diversity, providing the water and primary productivity upon which countless species of plants and animals depend for survival. They support high concentrations of birds, mammals, reptiles, amphibians, fish and invertebrate species.
- Some recent economic studies have indicated that ecosystems provide at least US\$ 33 trillion worth of services annually, of which US\$ 4.9 trillion are attributed to wetlands.
- Humans have damaged wetlands by damming, dyking and canalizing rivers, converting floodplains to aquaculture, planting trees on bogs, draining marshes for agriculture, forestry and urban development and mining them for peat, often with heavy state subsidy. But throughout history, agricultural activity has been the most important single cause of damage, with wetlands drained to provide croplands.
- More than 247 million acres of United States' wetlands have been filled, dredged or channelized -- an area greater than the size of California, Nevada and Oregon combined.
- 50% of the world's wetlands have been lost in the past century alone.

Facts about groundwater

- Since antiquity, humans have obtained much of their basic water needs from subterranean sources. But for many millennia, their ability to abstract this vital fluid was tiny in comparison to the available water resources.
- Rapid expansion in groundwater exploitation occurred between 1950 and 1975 in many industrialized nations, and between 1970 and 1990 in most parts of the developing world.
- Systematic statistics on abstraction and use are not available, but globally groundwater is estimated to provide about 50% of current potable water supplies, 40% by the industrial demand and 20% of water use in irrigated agriculture. Systematic statistics on abstraction and use are not available, but about 50% of current potable water supplies, 40% by the industrial demand and 20% of water use in irrigated agriculture.
- Today, with a global withdrawal rate of 600-700 km³/year, groundwater is the world's most extracted raw material.
- Groundwater systems unquestionably constitute the predominant reservoir and strategic reserve of freshwater storage on planet Earth probably about 30% of the global total and as much as 98% of all freshwater in liquid form.
- Calculating of the total volume of global groundwater storage is by no means straightforward, and the precision and usefulness of any calculation will inevitably be open to question. Actual estimates, which are always massive, range from 7 million km³ to 23.4 million km³, but all are subject to major assumptions about the effective depth and porosity of the freshwater zone.
- Groundwater forms a cornerstone of the Asian green agricultural revolution, provides about 70% of piped water supply in the European Union, and supports rural livelihoods across extensive areas of sub-Saharan Africa.
- The case of India is worthy of specific mention, since groundwater directly supplies about 80% of domestic water supply in rural areas, with some 2.8 to 3.0 million hand-pump boreholes having been constructed over the past 30 years. Further, some 244 km³/year is currently estimated to be pumped for irrigation from about 15-17 million motorized dugwells and tubewells, with as much as 70% of national agricultural production being supported by groundwater.

Facts about fog

- Fog consists of visible minute water droplets (or ice crystals), suspended in the atmosphere near the Earth's surface, generally reducing the horizontal visibility at the Earth's surface level to less than 1 km.
- Water droplets are only about 0.01 millimetres in diameter. A dense fog contains about 1,200 visible drops per cubic centimetre of empty space barely enough water to wet an objects surface.
- Historically, in the Atacama Desert (Chile), both dew and fog were collected by means of a pile of stones, arranged so that the condensation would drip to the inside of the base of the pile, where it was shielded from the day's sunshine. The same technique was employed in Egypt, where the collected water was stored underground.
- During a stop on El Hierro Island (Canarias) on his way to the Americas, Bartolom de las Casas took interest in the aborigine Bimbachos culture, which was already disappearing in the XVI century. The Bimbachos devoted a cult to a tree, the Garoe (*Ocotea foetens*), which supplied them with abundant freshwater. This holy tree was capable of capturing the water held in the mist and drizzle, which allowed for agriculture in an area with very low rainfall. The Garoe was uprooted by a hurricane in 1610. Curiously, its disappearance coincided with that of the Bimbachos culture on El Hierro Island.
- The water for the 350 residents of the coastal village of Chungungo (north of Chile) had to be trucked in once or twice a week from a town 40 km away. Along the coast of Chile, there is a persistent and extensive cloud deck (camanchaca) that rarely results in rain but creates fog in the slopes and peaks of the mountains that intercept it. A group of scientists have developed a method of harnessing the camanchacas as a source of water: the fog moisture is caught using collectors that resemble oversized volleyball nets. As fog passes through the nets, beads of water form on the mesh. The water runs down the nets into gutters that drain into a 100,000-litre reservoir. The fog-catchers supply the village with an average of 10,000 litres of water every day.
- Every morning the Namib fog beetle (*Onymacris unguicularis*) makes an arduous journey to the top of a sand dune, where he turns his body into the wind, straightens out his rear legs and lowers his head. The fog rolling in from the sea gradually collects on his back, forming droplets of water, which glide downwards and hang from the insect's mouthparts. In this way, this beetle is always assured of a healthy morning drink, despite being miles from the nearest freshwater.
- 25% to 40% of the water in coastal redwood forests comes from fog. The trees get some of that water through their roots, when fog-saturated leaves and branches drip water onto the ground.

Facts about water quality

- The quality of natural water in rivers, lakes and reservoirs and below the ground surface depends on a number of interrelated factors. These factors include geology, climate, topography, biological processes and land use.
- The most frequent sources of pollution are human waste (with 2 million tons a day disposed of in watercourses), industrial waste and chemicals, and agricultural pesticides and fertilizers. Key forms of pollution include faecal coliforms, industrial organic substances, acidifying substances from mining aquifers and atmospheric emissions, heavy metals from industry, ammonia, nitrate and phosphate pollution and pesticide residues from agriculture, sediments from human-induced erosion to rivers, lakes and reservoirs.
- Shiklomanov (2004) provides estimates of the volume of wastewater produced by each continent, which gave a global total in excess of 1,500 km³ for 1995. Then there is the contention that each litre of wastewater pollutes at least 8 litres of freshwater, so based on this figure some 12,000 km³ of the globe's water resources are not available for use. If this figure keeps pace with population growth, then with an anticipated population of 9 billion by 2050, the world's water resources would be reduced by some 18,000 km³.
- Levels of suspended solids in rivers in Asia have risen by a factor of four over the last three decades. Asian rivers also have a biological oxygen demand some 1.4 times the global average, as well as three times as many bacteria from human waste as the global average.
- A recent study (BGS and DPHE, 2001) suggests that Bangladesh is grappling with the largest mass poisoning (concentrations of arsenic in drinking water) in history, potentially affecting between 35 and 77 million of the country's 130 million inhabitants.
- Excessive amounts of fluoride in drinking water can also be toxic. Discoloration of teeth occurs worldwide, but crippling skeletal effects caused by long-term ingestion of large amounts are prominent in at least eight countries, including China, where 30 million people suffer from chronic fluorosis.

Facts about river basins

- The Nile River is the longest river in the world. From its major source, Lake Victoria in east central Africa, the White Nile flows generally north through Uganda and into Sudan where it meets the Blue Nile at Khartoum, which rises in the Ethiopian highlands. From the confluence of the White and Blue Nile, the river continues to flow northwards into Egypt and on to the Mediterranean Sea. From Lake Victoria to the Mediterranean Sea the length of the Nile is 5,584 km. From its remotest headstream, the Ruvyironza River in Burundi, the river is 6,671 km long. The river basin has an area of more than 3,349,000 sq. km.
- The largest river basin in the world is that drained by the Amazon. It covers about 6,145,186 sq km.
- The Amazon is the river that carries the most water in the world. In Brazil, an average of 120,000 m³ of water flows from the Amazon into the Atlantic Ocean every second.
- The widest river in the world is the Plate, with a distance of 221.5 km between Cape San Antonio and Punta del Este.
- The top three large basins in terms of fish species are the Amazon with more than 3,000 species, the Congo with 700, and the Mississippi with 375.
- The most forested basins are the Amazon (73.4%) and Orinoco (50.5%) basins in South America, the Congo (44.0%) and Ogoou (75,1%) in Central Africa, basins in Papua New Guinea and Kalimantan, Indonesia, basins in Southeast Asia, and basins in northern latitudes with low population densities, such as the Yukon and Mackenzie Basins in North America, the Lena and Pechora in Russia, or the North Dvina in Europe.
- The top five basins with the greatest percentage of their area classified as dryland include the Ural Basin in Russia and Kazakhstan, the Guadalquivir in Spain, the Yaqui in Mexico and the United States, the Tapti in India, and the Tigris and Euphrates in Iran, Syria and Turkey.
- Today, there are more than 45,000 large dams (more than 15 meters high) in the world, with more than half of these in China alone.

Facts about water use

- Worldwide, 70% of the water that is withdrawn for human use is used for agriculture, 22% for industry and 8% is used for domestic services. In general, these proportions vary according to a country's income: in low- and middle-income countries, 82% is used for agriculture, 10% for industry and 8% for domestic services. In high-income countries, the proportions are 30%, 59% and 11%, respectively.
- It is estimated that the average person in developed countries uses 500-800 litres of water per day (300 m³ per year), compared to 60-150 litres per day (20 m³ per year) in developing countries.
- In developing countries in Asia, Africa and Latin America, public water withdrawal represents just 50-100 litres per person per day. In regions with insufficient water resources, this figure may be as low as 20-60 litres per day.
- At the start of the twenty-first century, agriculture is using a global average of 70% of all water withdrawals from rivers, lakes and aquifers. The Food and Agriculture Organization (FAO) anticipates a net expansion of irrigated land of some 45 million hectares in ninety-three developing countries (to a total of 242 million hectares in 2030) and projects that agricultural water withdrawals will increase by some 14% from 2000 to 2030 to meet future food production needs.
- Industry impacts on water may be considered twofold:
 - Quantity: Water, often in large volumes, is required as a raw material in many industrial processes. In some cases, it may be a direct raw material, bound into the manufactured product and thus exported and lost from the local water system when these products are sent to market. In other cases, and perhaps more commonly, water is an indirect raw material, used in washing and cooling, raising steam for energy, cooking and processing and so on. In the latter case, the wastewater may be returned to the local water system through the sewerage system or directly to watercourses.
 - Quality: Although industry requires water of good quality for manufacturing, the water it discharges may not meet the same quality standards. At best, this represents a burden on treatment plants responsible for restoring water quality to appropriate standards and suitable for recycling. At worst, industrial wastewater is discharged without treatment to open watercourses reducing the quality of larger water volumes and, in some cases, infiltrating aquifers and contaminating important groundwater resources.
- Freshwater data set out in the World Development Indicators Report (World Bank, 2001) show that water for industrial use represents approximately 22% of total global freshwater use. In general, industrial use of water increases with country income, representing 59% of total water use in high-income countries but only 8% for low-income countries. The World Water Resources and their Use database forecasts that the annual water volume used by industry will rise from 752 km³/year in 1995 to an estimated 1,170 km³/year in 2025, at which time the industrial component is expected to represent about 24% of total freshwater withdrawal.
- Hydropower is already a major contributor to the world's energy balance, providing 19% of total electricity production (2,740 terawatts per hour in 2001).
- Hotels and their guests consume vast quantities of water. In Israel, water use by hotels along the River Jordan is thought to contribute to the drying up of the Dead Sea, where the water level has dropped 16.4 metres since 1977.
- Golf tourism has an enormous impact on water withdrawals an eighteen-hole golf course can consume more than 2.3 million litres a day. In the Philippines, water use for tourism threatens paddy cultivation. Tourists in Grenada (Spain) generally use seven times more water than local people and this discrepancy is common in many developing tourist areas.

- Sources of information:
 - World Water Resources and their Use
<http://webworld.unesco.org/water/ihp/db/shiklomanov/index.shtml>
 This database, a joint State Hydrological Institute (SHI)/UNESCO product, is the first attempt to disseminate a comprehensive data set on global surface water resources, and water use for domestic, agricultural and industrial purposes. It also includes forecasts of expected water use until 2025 and a database of monthly discharges of selected rivers in the world.
 - Vital Water Graphics: Water use and management
<http://www.unep.org/vitalwater/management.htm>
 This web page, maintained by the United Nations Environment Programme (UNEP), has facts, figures and maps about: global water withdrawal and consumption, the evolution of global water use and industrial and domestic consumption compared with evaporation from reservoirs, freshwater withdrawal by sector in 2000, and global freshwater withdrawal (using country profiles based on agricultural, industrial and domestic use).
 - WCA infoNET
<http://www.wca-infonet.org/>
 The WCA infoNET information system is an Internet-based integrated information platform that merges high-quality information resources and expertise. It directs access to publications, documents, data, computer programs and discussion groups, which provide the knowledge base, support and the global platform necessary for decisions on water conservation and use in agriculture.
 - Water Use in the United States
<http://water.usgs.gov/watuse/>
 This website from the US Geological Survey (USGS) has information about the consumption of water in the United States in the field of public supply, domestic, irrigation, livestock, aquaculture, industrial, mining and thermoelectric power use.

Facts about water and energy

- Since the Rio Earth Summit in 1992, the crucial role of energy as a component in sustainable development has been widely recognized. Although Agenda 21 did not have a chapter specifically devoted to energy, its comprehensive programme for action to achieve sustainable patterns of production and consumption revealed how closely such aims are linked to the availability of affordable energy.
- The world is facing a situation in which 2 billion people have no electricity at all, and 2.5 billion people in developing countries, mainly in rural areas, have little access to commercial energy services.
- The world electricity consumption is expected to rise by 73% between 1999 and 2020, making electricity the fastest-growing form of energy. This growth will be driven mainly by developing countries.
- Water is used in most means of generating power, and in many countries hydropower is the only really sustainable energy source.
- Hydropower is already a major contributor to the world's energy balance, providing 19% of total electricity production.
- Hydropower plants generate electricity or mechanical power by converting the power available in the flowing water of rivers, canals or streams. This requires a suitable rainfall catchment area, a hydraulic head, a means of transporting water from the intake to the turbine, such as a pipe or millrace, a power house containing the power generation equipment and a valve gear needed to regulate the water supply as well as all primary mechanical and electrical equipment components, and, finally, a tailrace to return the water to its natural course.
- Hydropower supplies at least 50% of electricity production in 66 countries, and at least 90% in 24 countries. About half of this capacity and generation is in Europe and North America.
- The provision of an adequate modern energy supply for water-related activities in rural areas of developing countries offers many advantages, including time saved not having to travel to collect water, thus increasing productivity; easier access to water through the pumping of drinking water, irrigation water and water for animal husbandry; health benefits (ranging from water purification through filtration to reduced medical costs when boiling water for sterilization is unnecessary); and health and environmental benefits through the discharge of wastewater from canals, septic tanks and latrines. Energy also allows wastewater to be treated through aeration.
- Hydropower generation does not consume water. Energy generation can, however, result in location-specific water problems for other users. In the Ruhuna (Sri Lanka) basins, water diverted for energy generation now returns to the river downstream from an established irrigation system. The transfer of water from agriculture has socio-political repercussions as well as economic impacts. Although the power generation authority is willing to compensate farmers for loss of water supplies, the agricultural community has so far preferred to continue irrigated cultivation. This may be due to the limited alternative to farming in the relatively remote areas of the affected villages. In addition, compensation in place of agricultural activities leads to an increase in social and cultural problems. One farmer said: "But sir, we do not want to live in a dead village. When we cultivate, we work together and have ceremonies and parties. Vehicles come to bring inputs and take away our crops. Now no one comes, we just sit on the guard stones and wait."

Facts about water and cities

- The world 10 largest cities are Tokyo (Japan), Mexico City (Mexico), Sao Paulo (Brazil), New York (United States), Bombay (India), Los Angeles (United States), Calcutta (India), Shanghai (China), Dhaka (Bangladesh), and Dehli (India).
- The average size of the world's 100 largest cities grew from around 0.2 million in 1800 to 0.7 million in 1900 to 6.2 million in 2000.
- Sixteen cities became 'mega-cities' (10 or more million inhabitants) in 2000, comprising 4% of the population.
- Proportion of the population living in urban settlements:
 - World:
 - 38% in 1975
 - 47% in 2000
 - 54% in 2015
 - 60% in 2030 (almost 5 billion people)
 - More developed regions:
 - 70% in 1975
 - 75.5% in 2000
 - 78.5% in 2015
 - Less developed regions:
 - 27% in 1975
 - 40.5% in 2000
 - 48.5% in 2015
- In the urban areas of low-income countries, 1 child in 6 dies before the age of five.
- In areas poorly served with water and sanitation, the child mortality rate is multiplied by 10 or 20 compared to areas with adequate water and sanitation services.
- Proportion of households in major cities connected to piped water (house or yard connection):
 - World: 94%
 - Africa: 43%
 - Asia: 77%
 - Europe: 92%
 - Latin America and the Caribbean: 77%
 - North America: 100%
 - Oceania: 73%
- Proportion of households in major cities connected to sewers:
 - World: 86%
 - Africa: 18%
 - Asia: 45%
 - Europe: 92%
 - Latin America & the Caribbean: 35%
 - North America: 96%
 - Oceania: 15%

Facts on water and (un)sustainable development

- *What is sustainable development?* Environmentally sound development, which meets the needs of the present without compromising the ability of future generations to meet their own needs.
- Three whole planets like the earth would be necessary to meet humanity's needs if all members of the human family lived the EU average lifestyle. European countries standards of living heavily and increasingly depend on resources that lie outside their borders: 95 per cent of Hungary's water comes from neighboring countries and 40 per cent of Europe's gas comes from Russia via the Ukraine, an insecurity that recently drew an urgent warning from the International Energy Agency.
- In developing countries, 70% of industrial wastes are dumped untreated into waters where they pollute the usable water supply.
- More than 80% of the world's hazardous waste is produced in the United States and other industrial countries. Some 300-500 million tons of heavy metals, solvents, toxic sludge, and other wastes accumulate each year from industry.
- Hydropower plays a major role in reducing greenhouse gas emissions: developing half of the world's economically feasible hydropower potential could reduce greenhouse gases emissions by about 13%.

Facts about water price

- It is widely recognized that water has traditionally been regarded as a free resource of unlimited supply with zero cost at supply point and at best, water users have been charged only a proportion of the costs of extraction, transfer, treatment and disposal. All associated externality costs of water have been ignored and users are offered very little incentive to use water efficiently and not waste it.
- According to the World Water Development Report 'Water for People, Water for Life', water prices are expected to serve various and often conflicting purposes, including: cost recovery, economic efficiency and social equity.
- Developed countries show a wide range of variation in water pricing: in Germany 1m costs \$1.91 (USD), in Denmark it cost \$1.64, in Belgium \$1.54, in the Netherlands \$1.25, in France \$1.23, in the UK \$1.18, in Italy \$0.76, in Finland \$0.69, in Ireland \$0.63, in Sweden \$0.58, in Spain \$0.57, in the United States \$0.51, in Australia \$0.50 and in Canada \$0.40.
- When the supply systems are deficient, the poor are the first to suffer. Water from informal vendors is more than 100 times more expensive than water supplied by house connection. In Vientiane (Lao PDR) the cost of water through a house connection is \$0.11 m (USD) and the price charged by an informal vendor is \$14.68 /m, which means that there is a difference of 135.92%. In Delhi (India) the price of the water through a house connection is \$0.01 /m and the price charged by an informal vendor can be as much as 4.89, i.e., 489% more.
- Valuing water has an important role to play in regulating the water markets of the world. In Chile, water rights can be freely traded within the irrigation subsector, like real estate property rights. About 30% of the households in Amman (Jordan) have decided to obtain additional water from the private market because accessible piped quantities are not sufficient. In France, the bill paid by domestic and industrial users connected to the water system covers the cost of distribution and collection services: water pays for water. This cost varies according to the local economic and technical configuration.

Facts about biodiversity

- Although freshwater ecosystems such as rivers, lakes and wetlands occupy less than 2% of the Earth's total land surface, they provide a wide range of habitats for a significant proportion of the world's plant and animal species: the number of known freshwater species worldwide is estimated at between 9,000 and 25,000, but this number is rapidly decreasing due to human interference.
- The Freshwater Species Population Index measures the average change over time in the populations of some 194 species of freshwater birds, mammals, reptiles, amphibians and fish around the world. Between 1970 and 1999, the Freshwater Species Population Index fell by nearly 50%, which constitutes a very rapid decline in population indices.
- At a global level, around 24% of mammals and 12% of birds are in threatened categories. Only about 10% of the world's fish have been assessed, the great majority of these being from inland waters, but 30% of those are listed as threatened.
- More than 150 turtle species worldwide are restricted to, or occur in, freshwaters, and 99 were categorized as threatened in 2000, equivalent to about 60% of all the freshwater forms.
- Lake Malawi (southern Africa) is an aquatic system that was originally endowed with a great deal of fish as well as freshwater snail biodiversity. However, loss in fish biodiversity has resulted in the favouring of certain snail species that play a role in the transmission of schistosomiasis. The increased health risk has greatly affected the tourist industry of Malawi and the whole economy has declined.
- An estimated 30 million people depend on Lake Victoria, a lake whose natural resources are under increasing stress. The population on the shore has grown fast over the past century with corresponding increases in the demand for fish and agricultural products. Following the introduction of gill nets by European settlers at the beginning of the 20th century, populations of indigenous fish species declined. Many were specially adapted to eat algae, decaying plant material, and snails that host the larvae of schistosomes. The lake started to eutrophicate and people became more vulnerable to disease.
- As fish catches declined, non-native species were introduced, causing further stress to indigenous fish. The greatest impact resulted from the introduction of Nile perch (*Lates niloticus*) in the 1960s, as the basis of commercial freshwater fisheries. This had repercussions on the local fishing economy and distribution of wealth. Local people who previously met most of their protein requirements from the lake began to suffer from malnutrition and protein deficiency. Although 20,000 tonnes of fish are exported annually to European and Asian markets, local people can afford only fish heads and bones from which the flesh has been removed.
- *What is Biodiversity?* Biological diversity - or biodiversity - is the term given to the variety of life on Earth and the natural patterns it forms. The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes and, increasingly, by human influence. It forms the web of life of which we are an integral part and upon which we so fully depend. This diversity is often understood in terms of the wide variety of plants, animals and micro-organisms. So far, about 1.75 million species have been identified, mostly small animals such as insects. Scientists reckon that there are actually about 13 million species, though estimates range from 3 to 100 million. Biodiversity also includes genetic differences within each species.
- Yet another aspect of biodiversity is the variety of ecosystems such as those that occur in deserts, forests, wetlands, mountains, lakes, rivers and agricultural landscapes. In each ecosystem, living creatures, including humans, form a community, interacting with one another and with the air, water, and soil around them.

- Changes in biodiversity may occur in response to an enormous range of environmental factors, including water quality, quantity and periodicity, the individual significance of which may be unclear. While not substituting for water quality information, which is essential for health-related management goals, biodiversity measures do have the potential to provide an integrated measure of overall ecosystem condition.
- The four groups with the highest proportion of extinct or at risk species are freshwater mussels, crayfish, amphibians and freshwater fishare. All live in, or are dependent on, inland water habitats.
- Only about 10% of the worlds fish have been assessed, the great majority of these being from inland waters, but 30% of those are listed as threatened. While 34% of the 64 freshwater fish species found in Croatia are threatened species, in Madagascar and Portugal the proportion is 32%. The highest number of threatened freshwater fish species is found in the United States, with 120 species out of 822 (15%).
- For example, Lake Malawi (southern Africa) is an aquatic system that was originally endowed with a great deal of fish and also freshwater snail biodiversity. However, loss in fish biodiversity has resulted in the favouring of certain snail species that play a role in the transmission of schistosomiasis. The increased health risk has greatly affected Malawi's tourist industry, and as a result, the whole economy has declined.

Facts about water and dams

- The first dams were constructed some 5,000 years ago, but the commissioning of large dams peaked between the 1960s and the 1980s, particularly in China, the United States, the former USSR, and India. However, some 300 dams over 60 metres high were listed as under construction in 1999, and authorities are claiming that many more will be needed in the future to meet the burgeoning demand for water.
- According to the World Commission on Dams there was a world total of 47,655 large dams in 1998 and an estimated 800,000 smaller ones.
- A large dam by the definition of the International Commission on Large Dams (ICOLD) has a height of more than 15 metres, or has a dam of above 5 metres holding a reservoir volume of more than 3 million cubic metres (Mm³). These include some dams that have been constructed to increase the capacity of existing lakes, for example the Owen Falls Dam on the Nile below Lake Victoria.
- Cosgrove and Rijsberman (2000) maintain that a further 150 km³ of storage will be required by 2025 to support irrigation alone and 200 km³ more to replace the current overconsumption of groundwater.
- Most rivers carry sediment in the form of suspended load and bed load, in some cases the latter is charged with metals and other toxic materials. This sediment load is adjusted to the flow regime of the river over time, and changes to this regime accompanied by increases or decreases in the load can cause problems downstream. These include the progressive reduction of reservoir volumes by siltation, the scouring of river channels and the deposition of sediment in them, threatening flood protection measures, fisheries and other forms of aquatic life. River diversions, including dams, can produce some of these effects on sediment, but in addition they may alter the chemical and biological characteristics of rivers, to the detriment of native species.
- Recent studies in Ethiopia using community-based incidence surveys revealed a 7.3-fold increase of malaria incidence associated with the presence of microdams. The study sites were all at altitudes where malaria transmission is seasonal (in association with the rains). The increase was more pronounced for dams below 1,900 metres of altitude, and less above that altitude. In addition, observed trends in incidence suggest that dams increase the established pattern of transmission throughout the year, which leads to greatly increased levels of malaria at the end of the transmission season.
- In the Mobile Bay drainage basin in the United States, dam construction has had a catastrophic impact on what was probably the most diverse freshwater snail fauna in the world. Nine families and about 120 species were known from the drainage basin. At least 38 species are believed to have become extinct in the 1930s and 1940s following extensive dam construction in the basin: the system now has 33 major hydroelectric dams and many smaller impoundments, as well as locks and flood-control structures.

Facts on water and poverty

- It is estimated that more than 1.3 billion people in the developing world survive on less than a dollar a day and almost 3 billion survive on less than two dollars per day. In order to free people from the burden of disease and malnutrition, the need for secure access to water for the poor has been more strongly recognized.
- Inadequate access to water forms a central part of people's poverty, affecting their basic needs, health, food security and basic livelihoods. Improving the access of poor people to water has the potential to make a major contribution towards poverty eradication.
- Undernourishment is a characteristic feature of poverty. Poverty includes deprivation of health, education, nutrition, safety, and legal and political rights. Lack of access to water to provide for basic health services and support reliable food production is often a primary cause of undernourishment.
- The availability of water allows individuals and communities to boost food production, both in quantity and diversity, to satisfy their own needs and also to generate income from surpluses. Community-managed small-scale irrigation systems, by improving yields and cropping intensities, have proved effective in alleviating rural poverty and eradicating food insecurity.
- Vulnerability is now seen as one of the main characteristics of poverty: This includes both shocks (sudden changes such as natural disasters, war or collapsing market prices) and trends (for example, gradual environmental degradation, oppressive political systems or deteriorating terms of trade). Many vulnerabilities are water-related (for example, health threats, droughts or floods, cyclones and pollution).
- The poor are the most vulnerable to disasters, being exposed to resulting health hazards but without the capacity to prepare for them or re-establish life-supporting conditions after catastrophes. Another tragic consequence is that flood and drought are also the main causes of poverty and the displacement and the migration of poor populations. In 2001, 61% of food emergencies were induced by natural disasters, compared to 39% human-induced. Clearly, there is a close relationship between poverty eradication and the establishment of Comprehensive Disaster Risk Management strategies.
- As conditions of water stress develop, water becomes more expensive for those who are less privileged. A disturbing fact is that poor people with the most limited access to water supply have to pay significantly more for water. Water from informal vendors is more than 100 times more expensive than water supplied by house connection. In Vientiane (Lao PDR) the cost of water through a house connection is \$0.11 /m (USD) and the price charged by an informal vendor is \$14.68 /m, which means that there is a difference of 135.92%. In Delhi (India) the price of the water through a house connection is \$0.01 /m and the price charged by an informal vendor can be as much as \$4.89 /m³ - 489% more.
- Problems of poverty are thus inextricably linked with those of water its availability, its proximity, its quantity and its quality. For this reason, it is a composite part of the wider goal of attaining water security in the twenty-first century.

Facts about water, religions and beliefs

- Water plays a central role in many religions and beliefs around the world. As a source of life, it represents (re)birth. Water cleans the body, and by extension purifies it, and these two main qualities confer a highly symbolic even sacred - status to water. Water is therefore a key element in ceremonies and religious rites.
- Water is often perceived as a god, goddess or divine agency in religions. Rivers, rain, ponds, lakes, glaciers, hailstorms or snow are some of the forms water may take when interpreted incorporated in cultural and religious spheres.
- Religious water is never neutral and passive. It is considered to have powers and capacities to transform this world, annihilate sins and create holiness. Water carries away pollution and purifies both in a physical and symbolical sense. Water is a living and spiritual matter, working as a mediator between humans and gods. It often represents the border between this world and the other.
- Buddhism: Water is used in Buddhist funerals. It is poured and overflows into a bowl placed before the monks and the dead body. As it fills and pours over the edge, the monks recite As the rains fill the rivers and overflow into the ocean, so likewise may what is given here reach the departed.
- Christianity: Water is intrinsically linked to baptism, a public declaration of faith and a sign of welcome into the Christian church. When baptized, one is fully or partially immersed in water, or ones head may simply be sprinkled with a few drops of water. The sacrament has its roots in the Gospel, wherein it is written that Jesus was baptized by John the Baptist in the River Jordan. In baptism, water symbolizes purification, the rejection of the original sin.
- In the New Testament, 'living water' or 'water of life' represents the spirit of God, that is, eternal life.
- Hinduism: Water is imbued with powers of spiritual purification for Hindus, for whom morning cleansing with water is an everyday obligation. All temples are located near a water source, and followers must bathe before entering the temple. Many pilgrimage sites are found on riverbanks; sites where two, or even three, rivers converge are considered particularly sacred.
- Islam: For Muslims, water serves above and beyond all for purification. There are three sorts of ablutions:
 - The first and most important involves washing the whole body; it is obligatory after sex, and recommended before the Friday prayers and before touching the Koran.
 - Before each of the five daily prayers, Muslims must bathe their head, wash their hands, forearms and feet. All mosques provide a water source, usually a fountain, for this ablution.
 - When water is scarce, followers of Islam use sand to cleanse themselves; this is the third form of ablution.
- Judaism: Jews use water for ritual cleansing to restore or maintain a state of purity. Hand-washing before and after meals is obligatory. Although ritual baths, or mikveh, were once extremely important in Jewish communities, they are less so now; they remain, however, compulsory for converts. Men attend mikveh on Fridays and before large celebrations, women before their wedding, after giving birth and after menstruation.
- Shinto: This religion is based on the veneration of the kami, innumerable deities believed to inhabit nature. Worship of the kami must always begin by a ritual of purification with water. This act restores order and balance between nature, humans and the deities. Waterfalls are considered sacred in Shinto.

Facts about the UN millennium development goals

In its 2000 Millennium Declaration, the United Nations set 8 goals for development, called the Millennium Development Goals (MDGs). These goals set an ambitious agenda for improving the human condition by 2015.

Goal 1: Eradicate extreme poverty and hunger:

- Problems of poverty are inextricably linked with those of water - its availability, proximity, quantity and its quality. Improving access to water has the potential to make a major contribution towards poverty eradication.
- In the early 1990s, nearly 80% of all malnourished children lived in developing countries that produced food surpluses.

Goal 2: Achieve universal primary education

- Water factors, such as the need to collect domestic water, play a large part in school attendance. Many girls are prevented from attending school because of the lack of separate toilet facilities. In addition, many school days are lost due to illness as a result of water-related factors: improved environmental health is essential increasing school attendance.
- As well as providing an understanding of the issues surrounding water resources, a good educational base is essential if suitable professionals capable of monitoring and managing water resources are to emerge. In the past 30 years, developing countries have made enormous strides in expanding enrolment at all levels: in 1960, fewer than half of the developing worlds children aged 6 to 11 were enrolled in primary school, compared with 79% today.

Goal 3: Promote gender equality and empower women

- Women are most often the collectors, users and managers of water in the household as well as farmers of irrigated and rainfed crops. Because of these roles, women have considerable knowledge about water resources, including quality and reliability, restrictions and acceptable storage methods, and are essential to the success of water resources development and irrigation policies and programmes.
- On average, women and children travel 10-15 kilometers per day collecting water and carry up to 20 kilos or 15 litres per trip.

Goal 4: Reduce child mortality

- Every 8 seconds a child dies from drinking contaminated water (that is 10,000 a day).
- Malaria is Africa's leading cause of mortality for children under the age of five (20%). This disease kills an African child every 30 seconds.

Goal 5: Improve maternal health

- In developing countries, there is one chance in 48 for mothers to die during childbirth, although many countries have now implemented safe motherhood programmes. Access to safe water and sanitation is essential in reducing the maternal mortality rate.

- Pregnant women and their unborn children are also particularly vulnerable to malaria, which is a major cause of prenatal mortality, low birth weight and maternal anemia.

Goal 6: Combat HIV/AIDS, malaria and other diseases

- People weakened by HIV/AIDS are likely to suffer the most from the lack of safe water and sanitation, especially since diarrhoea and skin diseases are two of the more common infections.
- Today, approximately 40% of the world's population, mostly those living in the world's poorest countries, is at risk of malaria.

Goal 7: Ensure environmental sustainability

- Drinkable water is becoming increasingly scarce. By the year 2025, as population growth and development drive up water demand, it is predicted that water abstraction will increase by 50% in developing countries and 18% in developed countries. Effects on the world's ecosystems have the potential to dramatically worsen the present situation, and current assessments suggest that existing practices are not adequate to avert this.
- Around 50% of the world's wetlands in 1900 had been lost by the late 1990s, with conversion of land to agriculture being the main cause of loss.

Goal 8: Develop a global partnership for development

- In order to reach the development goals defined in the Millennium Declaration, countries will need to unite their efforts and attend the special needs of those least developed. Achieving the MDG on drinking water supply coverage will represent a major expenditure in all countries, requiring between US\$10 billion and \$30 billion a year in addition to the amount already being spent.
- This global partnership between nations will need to focus on dealing with developing countries' debts in a comprehensive way, through national and international measures, to make the debts sustainable in the long term. During the last decade, many governments, preoccupied by debt and deficit reduction, have significantly reduced their expenditures on environment-related infrastructure and services.