

3.4 WATER SCARCITY AND WATER SHORTAGES

- Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region.
- It already affects every continent and around 2.8 billion people around the world at least one month out of every year.
- More than 1.2 billion people lack access to clean drinking water.
- Water scarcity involves water stress, water shortage or deficits, and water crisis.
- While the concept of water stress is relatively new, it is the difficulty of obtaining sources of fresh water for use during a period of time and may result in further depletion and deterioration of available water resources.
- Water shortages may be caused by climate change, such as altered weather patterns including
 - Droughts or floods
 - Increased pollution
 - Increased human demand and
 - Overuse of water.
- A water crisis is a situation where the available potable, unpolluted water within a region is less than that region's demand.
- Water scarcity is being driven by two converging phenomena:
 - Growing freshwater use
 - Depletion of usable freshwater resources.
- Water scarcity can be a result of two mechanisms:
 - Physical (absolute) water scarcity and economic water scarcity, where physical water scarcity is a result of inadequate natural water resources to supply a region's demand.
 - Economic water scarcity is a result of poor management of the sufficient available water resources.
- All causes of water scarcity are related to human interference with the water cycle. Scarcity varies over time as a result of natural hydrological variability, but varies even more so as a function of prevailing economic policy, planning and

management approaches. Scarcity can be expected to intensify with most forms of economic development, but, if correctly identified, many of its causes can be predicted, avoided or mitigated.

- Some countries have already proven that decoupling water use from economic growth is possible.



Figure 3.4.1 Water scarcity

[Source: <https://images.app.goo.gl/1T9mCQz7fqHRcMie9>]

Physical & economic scarcity

Water scarcity can result from two mechanisms:

- Physical (absolute) water scarcity
- Economic water scarcity

Physical water scarcity results from inadequate natural water resources to supply a region's demand, and economic water scarcity results from poor management of the sufficient available water resources.

Effects on environment

Water scarcity has many negative impacts on the environment, including lakes, rivers, wetlands and other fresh water resources. The resulting water overuse that is related to water scarcity, often located in areas of irrigation agriculture, harms the environment in several ways including increased salinity, nutrient pollution, and the loss of floodplains and wetlands.

Through the last hundred years, more than half of the Earth's wetlands have been destroyed and have disappeared. These wetlands are important not only because

they are the habitats of numerous inhabitants such as mammals, birds, fish, amphibians, and invertebrates, but they support the growing of rice and other food crops as well as provide water filtration and protection from storms and flooding.

Causes and contributing factors:

Climate change

Aquifer drawdown or over drafting and the pumping of fossil water increases the total amount of water within the hydrosphere subject to transpiration and evaporation processes, thereby causing accretion in water vapour and cloud cover, the primary absorbers of infrared radiation in the earth's atmosphere.

Depletion of freshwater resources

Apart from the conventional surface water sources of freshwater such as rivers and lakes, other resources of freshwater such as groundwater and glaciers have become more developed sources of freshwater, becoming the main source of clean water. Groundwater is water that has pooled below the surface of the Earth and can provide a usable quantity of water through springs or wells. These areas where groundwater is collected are also known as aquifers. Glaciers provide freshwater in the form meltwater, or freshwater melted from snow or ice, that supply streams or springs as temperatures rise. More and more of these sources are being drawn upon as conventional sources' usability decreases due to factors such as pollution or disappearance due to climate changes. Human population growth is a significant contributing factor in the increasing use of these types of water resources.

Groundwater

Until recent history, groundwater was not a highly utilized resource. Changes in knowledge, technology and funding have allowed for focused development into abstracting water from groundwater resources away from surface water resources. These changes allowed for progress in society such as the "agricultural groundwater revolution", expanding the irrigation sector allowing for increased food production and

development in rural areas. Groundwater supplies nearly half of all drinking water in the world.

Glaciers

Glaciers are noted as a vital water source due to their contribution to stream flow. Rising global temperatures have noticeable effects on the rate at which glaciers melt, causing glaciers in general to shrink worldwide. Although the melt water from these glaciers are increasing the total water supply for the present, the disappearance of glaciers in the long term will diminish available water resources. Increased melt water due to rising global temperatures can also have negative effects such as flooding of lakes and dams and catastrophic results.

Expansion of agricultural and industrial users

Scarcity as a result of consumption is caused primarily by the extensive use of water in agriculture/livestock breeding and industry. People in developed countries generally use about 10 times more water daily than those in developing countries. A large part of this is indirect use in water-intensive agricultural and industrial production processes of consumer goods, such as fruit, oilseed crops and cotton. Because many of these production chains have been globalized, a lot of water in developing countries is being used and polluted in order to produce goods destined for consumption in developed countries.

Business activity ranging from industrialization to services such as tourism and entertainment continues to expand rapidly. This expansion requires increased water services including both supply and sanitation, which can lead to more pressure on water resources and natural ecosystem. The approximate 50% growth in world energy use by 2040 will also increase the need for efficient water use, and may shift some irrigation water sources towards industrial use, as thermal power generation uses water for steam generation and cooling.

Population growth

Around fifty years ago, the common perception was that water was an infinite resource. At that time, there were fewer than half the current number of people on the planet. People were not as wealthy as today, consumed fewer calories and ate

less meat, so less water was needed to produce their food. They required a third of the volume of water we presently take from rivers. Today, the competition for water resources is much more intense. This is because there are now seven billion people on the planet, their consumption of water-thirsty meat is rising, and there is increasing competition for water from industry, urbanisation bio fuel crops, and water reliant food items. In the future, even more water will be needed to produce food because the Earth's population is forecast to rise to 9 billion by 2050.

In 2000, the world population was 6.2 billion. The UN estimates that by 2050 there will be an additional 3.5 billion people with most of the growth in developing countries that already suffer water stress. Thus, water demand will increase unless there are corresponding increases in water conservation and recycling of this vital resource. In building on the data presented here by the UN, the World Bank goes on to explain that access to water for producing food will be one of the main challenges in the decades to come. Access to water will need to be balanced with the importance of managing water itself in a sustainable way while taking into account the impact of climate change, and other environmental and social variables.

Rapid urbanization

The trend towards urbanization is accelerating. Small private wells and septic tanks that work well in low-density communities are not feasible within high-density urban areas. Urbanization requires significant investment in water infrastructure in order to deliver water to individuals and to process the concentrations of wastewater – both from individuals and from business. These polluted and contaminated waters must be treated or they pose unacceptable public health risks. In 60% of European cities with more than 100,000 people, groundwater is being used at a faster rate than it can be replenished. Even if some water remains available, it costs increasingly more to capture it.

Impacts of water scarcity:

There are several principal manifestations of the water crisis.

- Food security in the Middle East and North Africa Region
- Inadequate access to safe drinking water for about 885 million people

- Inadequate access to sanitation for 2.5 billion people, which often leads to water pollution.
- Groundwater over drafting leading to diminished agricultural yields
- Overuse and pollution of water resources harming biodiversity
- Regional conflicts over scarce water resources sometimes resulting in warfare .

