

GLOBAL WATER SCARCITY : PROBLEMS AND SOLUTIONS

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Importance of Water

Water is a source of life of every living organism. Without water living beings cannot survive their lives. There is 60% water in human gross body. It is a natural resource that sustains our environments and supports livelihood. **Water is the blue gold, and that future wars will be fought for water. So, not a single drop of water received from rain should be allowed to escape into the sea without being utilized for human benefit.**

The vast majority of the Earth's water resources are salty water, with only 2.5% being fresh water. Approximately 70% of fresh water available on planet is in the icecaps of Antarctica and Greenland leaving the remaining 0.7% of total water resources worldwide available for consumption. However from this 0.7%, roughly 87% is allocated to agricultural purposes. These statistics are particularly illustrative of the drastic problem of water scarcity facing humanity. Water scarcity is defined as per capital supplies less than 1700 M³/year. The comprehensive assessment of water management in agriculture revealed that one in three people are already facing water shortage (2007). Around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical scarcity, while another 1.6 billion people, or almost one quarter of the world's population, face economic water shortage (where countries lack the necessary infrastructure to take water from rivers and aquifers); nearly all of which are in the developing countries.

Agriculture is a significant cause of water scarcity in much of the world since crop production requires upto 70 times more water than is used in drinking and other domestic purposes. **The report says that a rule of thumb is that each calorie consumed as food requires about one litre of water to produce.**

The amount of water in the world is finite. The number of us is growing fast and our water use is growing even faster. A third of world's population lives in water stressed countries now. By 2025, this is expected to rise to two-third. The UN recommends that people need a minimum of 50 litres of water a day for drinking, washing, cooking and sanitation. In 1990, over a billion people did not have even that.

Causes of Global water Crisis

There are four main factors aggravating water scarcity:

- **Population Growth :** In the last century, world population has tripled. It is expected to rise from the present 6.5 billions to 8.9 billions by 2050. Water use has been growing at more than twice the rate of population increase in the last century, and although there is no global water scarcity as such, an increasing number of regions are chronically short of water.
- Increased urbanization will focus on the demand for water among an over more concentrated population. Asian citizen alone are expected to grow by 1 billion people in the next 20 years.
- **High level of consumption :** As the world becomes more developed, the amount of domestic water that each person used is expected to rise significantly.
- Climate change will shrink the resources of fresh water.

(a) Pollution and disease

Global water consumption rose sixfold between 1900 and 1995 more than double the rate of population growth – and goes on growing as farming, industry and domestic demand all increase. As important as quantity is quality – with pollution increasing in some areas, the amount of useable water declines. More than five millions people die from water-borne diseases each year, 10 times the number killed in wars around the globe. Seventy percent of water used world wide is used for agriculture, much more will be needed if we are to feed world’s growing population – predicted to rise from about six billion to 8.9 billion by 2050. Consumption will star further as more people expect western – style lifestyle and diets – one kilograms of grain fed beef needs at least 15 cubic meters of water, while a kilo of cereals needs only upto three cubic meters.

(b) Poverty and Water

The poor are the ones who suffer most. Water shortage can mean long walks to fetch water, high price to buy it, food insecurity and disease from drinking dirty water. But the very thing needed to raise funds to tackle water problems in poor countries, economic development – requires yet more water to supply the agriculture and industries which drive it. The UN-backed World commission on water estimated in 2000 that an additional \$100 billion a year would be needed to tackle water scarcity would wide. Even if the money can be found, spending it wisely is a further challenge. Dams and other large – scale projects now affect 60% of the world’s largest rivers and provide millions with water. As ground water is exploited, water tables in part of China, India, West Asia, the former Soviet Union and the Western United States are dropping – in India by as much as 3 meters a year in 1999.

(c) Melting of Glaciers

Global warming is melting glaciers in every region of the world, putting millions of people at risk from floods, draughts and lack of drinking water. **Glaciers are ancient rivers of compressed snow that creep through the landscape, shaping the planet's surface. They are the Earth's largest fresh water reservoir, collectively covering an area the size of South Antarctica.** Glaciers have been retreating worldwide since the end of the little Ice Age (around 1850), but in recent decades glaciers have began melting at rates that cannot be explained by historical trends.

One in three people is enduring one form or other of water scarcity, according to a new report from the International Water Management Institute (IWMI). The report says that about one- quarter of the world's population lives in areas where water is physically scarce, while about one – sixth of humanity over a billion people – live where water is economically scarce, or places where “Water is available in rivers and aquifers, but the infrastructure is lacking to make thick water available to people.”

In a world of unprecedented wealth, almost two million children die each year for want of a glass of clean water and adequate sanitation. Millions of women and young girls are forced to spend hours collecting and carrying water, restricting their opportunities and their choices. Water – borne infectious diseases are growing in some of the world's poorest countries. Human development reports 2006 investigates the underlying causes and consequences of a crisis that leaves 1.2 billion people without access to safe water and 2.6 billion without access to sanitation. In 2006 the International Management Institute, reported that water scarcity affected a full third of world population. In 2007 the Intergovernmental panel on climate change predicted that due to climate change, the number of people facing water scarcity would grow. Other, too, say that there is a global water crisis, the availability of water is dwindling, the world is running out of the water.

Solution of water scarcity

(a) Water and Climate change

Water scarcity is expected to become an even more important problem than it is today. There are several reasons for this :

- First the distribution of precipitation in space and time is very uneven, leading to tremendous temporal variability in water resources worldwide (Oki et al. 2003). For example, the Atacama Desert in Chile receives imperceptible annual quantities of rainfall where as Mawsynram, Assam, India receives over 450 inches annually. If the fresh water on the planet were divided equally among the global population, there would be 5000 to 6000 M³ of water available for everyone, every year.

- Second the rate of evaporation varies a great deal, depending on temperature and relative humidity, which impact the amount of water available to replenish ground water supplies. The combination of shorter duration but more intense rain fall (meaning more run off and less infiltration) combined with increased evapotranspiration (the sum of evaporation and plant transpiration from the earth's land surface to atmosphere) and increasea irrigation is expected to lead to ground water depletion.

According to world bank, as many as two billion people lack adequate sanitation facilities to protect them from water – borne disease, while a billion lack access to clean water altogether. According to United States, which has declared 2005-15 the “Water for life” decade, 95 percent of the world cities still dump water sewage into their water supplies. Thus it should come as no surprise to know that 80 percent of all the health maladies in developing countries can be traced back to unsanitary water.

Developed countries are not immune to fresh water problem either. Researcher found a six-fold increase in water use for only a two-fold increase in population size in the United States since 1900. Such a trend reflects the connection between higher living standards and increased water usage and underscores the need for more sustainable management and use of water supplies even in more developed societies.

(b) Technical Solution

New technology can help, however, especially by cleaning up pollution and so making more water useable, and in agriculture, where water use can be made for more efficient, drought – resistant plants can also help. Drip irrigation drastically cuts the amount of water needed, low pressure sprinklers are an improvement, and even building simple earth walls to trap rain fall is helpfull. Some countries are now treating waste water so that it can be used – and drunk – several times over. Desalination makes sea water, but takes huge quantities of energy and leaves vast amount of brine.

(c) Climate Change

In any case, it is not just use who need water, but every other species that shares the planet with us – as well as the ecosystems on which we, and they, rely. Climate change will also have an impact, some areas will probably benefit from increase rainfall, but other are likely to be loser. We have to rethink how much water we really need if we are to learn how to share the Earth's supply. While dams and other large-scale schemes play a big role worldwide, there is also a growing recognition of the value of using the water already have more efficiently rather than harvesting ever more from our rivers and aquifers. For millions of people around the world, getting it right is a matter of life and death.

(d) The hydrological Cycle

The hydrological cycle begins with evaporation from the surface of ocean or land, continues as air carries the water vapour to locations where it forms clouds and eventually precipitates out. It then continues when the precipitation is either absorbed into the ground or runs off to the ocean, ready to begin the cycle over again in an endless loop. The amount of time needed for ground water to recharge can vary with the amount of intensity of precipitation.

With world population expected to pass nine billion by mid-century, solutions to water scarcity problems are not going to come easy. Some have suggested that technology – such as large scale salt water desalination plants – could generate more water for the world use. but environmentalists argue that depleting ocean water is no answer and will only create other big problems. In any case, research and development into improving desalination technologies is ongoing, especially in Saudi Arabia, Israel and Japan. Already an estimated 11,000 desalination plants exist in some 120 countries around the world.

Water Management

When we think about water scarcity, then, we should not be focusing on an absolute shortfall between the total needs of the earth's population and the available supply, but on where the useable water is and what it costs to bring enough clean water to where people are.

Applying market principles to water would facilitate a more efficient distribution of supply every where. Analysts at Harvard Middle East Water Project, for example, **advocate assigning a monetary value to fresh water**, rather than considering it a free natural commodity. They say such a approach could help mitigate the political and security tensions caused by water scarcity.

Falling prices in membrane filtering technology (reverse osmosis) and advances in ultraviolet and ozone disinfection have led to a wide array of off – the shelf water technologies. Large companies such as GE, Simens and Dow developed these technologies for consumer markets in industrial countries, spurred by the exploding market in bottled water, but they offer interesting spin – offs in developing countries.

As individuals, we can also reign in our own water use to help conserve what is becoming an ever more precious resource. We can hold off on watering our lawns in times of drought. And when it does rain, we can gather gutter water in barrels to feed garden hoses and sprinklers. We can turn off the tapes while we brush our teeth or shave, and take shorter showers. In other world, **“Doing more with less is the first and easiest step along the path toward water scarcity.”**

As a reliable and affordable technology, desalination has come of age in the last two decades. For Iceland cities such as Singapore, or for a new five star hotel on a Pacific atoll, a desalination plant is now standard technology. The cost of desalination has come down rapidly and now ranges from \$ 0.5 – 1.00 per cubic meter, depending upon price of energy. This is a reasonable price for drinking water in a developed urban area or hotel where the impact on room prices will be only a few dollars per day. For agricultural purposes, however the value of water ranges from several cents per cubic meter to grow crop such as corn, wheat, rice or sugar cane, to half a dollar for intensive flower or vegetable production. Desalination is clearly not an economical option. Desalination is similarly impractical for poor people who live on less than \$ 1 or \$ 2 per day.

Conclusion

Water is a source of life of every living organism. Without water living beings cannot survive their lives. There is 60% water in human gross body. It is a natural source that sustains our environments and supports livelihood. Water is the blue gold, and that future wars will be fought for water. So, not a single drop of water received from rain should be allowed to escape into the sea without being utilized for human benefit.

Present global water scarcity is defined as per capita supplies less than 1700 M³/year. Around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical scarcity while another 1.6 billion, or almost one quarter of the world's population, face economic, water shortage. A third of world's population lives in water stressed countries now. The report says that a rule of thumb is that each calorie consumed as food requires about one litre of water to produce.

Causes of Global water crisis are – population growth, increased urbanization, high level of consumption and climate change which strink the resources of fresh water, melting of glaciers. More than five millions people die from water-borne diseases each year around the Globe due to drinking polluted water. Underground water table is depleting on an average 3 meters a year as per research conducted in India. One in three people is enduring one form or other of water scarcity around the Globe. Almost two million children die each year for want of a glass of clean water and adequate sanitation.

If the fresh water on the planet were divided equally among the global population, there would be 5000 to 6000 M³ of water available for every one, every year. Technical solutions of water scarcity around Globe are Drip irrigation, recycling of sewage water and to make it usable for agriculture, vegetables and bathroom purposes, scientific work over hydrological cycle formation, desalination of saline water, Increasing R.O. technology. We should advocate assigning a monetary value to fresh drinking water, rather than considering it a free natural commodity. Individually every globe citizen should save water in bathing cooking, gardening i.e. their daily use purposes.

References

- 1- Goudie, As (2006). Global Warming and Fluvial Geomorphology Volume 79, September 2006, 37th Binghamton Geomorphology Symposium – The human role in changing Fluvial Systems.
- 2- Huntington, T.G. (2005) Evidence for Intensification of the global water cycle: Review and Synthesis. *Journal of Hydrology*, 319.
- 3- Konikow, Leonard et al. (2005). Ground water Depletion: A Global Problem. *Hydrogeology* (13).
- 4- Nearing, M.A. et al. (2005). Modeling Response of Soil Erosion and Run off to changes in Precipitation and cover. *Catena*, 61.
- 5- Oki, Taikan et al. (2006). Global hydrological Cycles and World Water Resources, *Science*; 313.
- 6- Vorasmarty, Charles et al. (2000). Global Water Resource: Vulnerability from Climate Change and Population Growth, *Science*, 289.
- 7- World Water Assessment Programme, 2003. Water for people, Water for life: The United Nations world water development report. UNESCO: Paris.