

WATER AVAILABILITY-THE CHALLENGE

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In India most of the precipitation is in monsoon. During other months there is little precipitation. But the tragedy is that large fraction of the water is not captured. Neither does it percolate underground nor is it stored on surface. It goes to the oceans or evaporates. Average annual rainfall in India is about 1170mm varying widely from about 100mm to about 10,000mm in different regions. The total precipitation is about 4000bcm (billion cubic metre). About 1869bcm remains available for use but all cannot be utilized due to topographic constraints. About 1123bcm remains utilizable. If we talk of per capita, the utilizable water is 1086m³. By 2050 it will come down drastically to 760m³. That is why World Bank says that India will exhaust its fresh water by 2050.

That may not be true but needs introspection. Unfortunately, only 48% of country's rainfall ends up in rivers. Only 18% remains utilizable. Due to storage crunch it is not possible to capture more. In fact we should have concentrated towards better storage infrastructure. The reality is opposite. We are destroying historical ponds, lakes, other wetlands and even rivers and streams in the lust for more land.

The main rivers, Ganga, Brahmaputra,

Mahanadi, Godavari, Krishna, Kaveri, Indus, Narmada, and Tapti, flow into the Bay of Bengal or Arabian Sea. These rivers fall into four groups: Himalayan, coastal, peninsular, and inland drainage basins. The Himalayan rivers depend on snow and glaciers, therefore have continuous flow year round. The coastal rivers, especially on the west coast, are short in length with small catchment areas. The peninsular rivers, which include the Mahanadi, Godavari, Krishna, and Kaveri flow inland and greatly increase in volume during the monsoon. As far as the rivers of the inland drainage basins are concerned, such as the Mahanadi and the Godavari, they dry out or are lost in the sands.

Water Is Scarce: About 70% of the earth's surface is covered by water. It could mean that there is more than enough water on the earth. But we rarely consider that about 97.5% of the total water is saline. Only about 2.5% is "Fresh Water" i.e. not saline can be directly consumed by us and most of the land organisms. Further out of the total fresh water on earth around about 68.9% is in the glaciers and about 30.8% is groundwater. Only about 0.3% is in rivers, lakes, ponds, streams and few other sources where we can access easily. Certainly, this quantity, about 0.007%, is too small. This water is



readily available for about 7.3 billion people and for other land organisms. Living organisms always need water. Certain organisms have more than 95% water. Human body has about 60% water. These levels cannot vary much although water is regularly lost. That is why organisms require regular water replenishment.

Apart from direct consumption, water is required by us for producing food, for dilution and treatment of wastes, and to maintain health of the environment. Both Industry and Agriculture too need water. For example, 800 to 4000 lts are needed for producing one kg of wheat; 2000 to 8700 lts for one kg of cotton; about 100 lts for one apple; about 2400 lts for one average sized hamburger. Thus agriculture and related activities consume huge quantities of fresh water. Still there is large scale wastage of food all over the world. Another issue is that water intensive crops like rice, cotton, sugarcane etc. are regularly cultivated in water deficient areas. This explains why during the last century water use has grown at more than double the rate of population growth. Estimates indicate that during the last 50 years world-wide water withdrawal has grown three times.

Water Scarcity and Contamination: Presently almost 1/3rd of the total earth's population is not able to get sufficient water for drinking requirements. By the middle of the current century 2/3rd of the world could face water scarcity. United Nations confirms that by 2025, about 1.8 billion people will live in water scarcity areas and two-thirds of earth's population will live in water-stressed regions due to overuse, increased activities, and also due to climate change. Climate change and consequent rise in earth's temperature will lead rains becoming uncertain and water evaporation faster.

People living in the developing countries are the worst sufferers. They have to compromise not only by way of quantity but also by way of quality. Most of the water sources are polluted and contaminated. Providing safe water is costly.

India

For India this issue has immense importance. An important reason is that ground water is the most important source of water supply, especially for the rural areas. Rural culture has developed historically utilizing ground water through dug wells or tube wells. Successive governments have been talking about safe drinking water but that too means

pumping underground water and supplying the same. Purification and treatment etc, are almost non-existent in rural areas. Till a few decades back this kind of arrangement was acceptable as the ground water was generally uncontaminated and free from toxic pollutants. Precipitation water percolated down, naturally filtered and stored. In last five or six decades industries have developed at an unprecedented pace. Parallel to that, urbanization is expanding fast. Both of these i.e. industries and urban areas overuse water and also dump wastes in water and on land. The wastes carry different pollutants, including highly toxic substances.

Sadly only 10% of the country's industrial effluents and municipal sewages are treated before dumping. As a result not a single river or lake in the country is free from pollution and contamination. Even the ground water is unsafe. Contaminants and pollutants, percolating down, degrade the ground water making it unfit for consumption. In large cities and towns some treatment is given before the water is pumped for consumption. In small towns and rural areas water is used directly. That is why water related health problems are enormous.

More than 1.5 million children are estimated to die of diarrhea alone every year. Estimates are that the country loses 73 million working days due to waterborne disease every year. People suffer economically in a big way at individual and community levels. People in rural areas suffer much more on account of factors like use of untreated water, inadequate health facilities, poverty, low level of education and awareness etc. Contamination of water due to natural chemicals adds another dimension. Fluoride, arsenic and iron present in the substratum contaminate ground water. About two lakh habitations face this kind of problem in the country, especially in rural areas. Open defecation prevalent in large areas of the country adds to contamination of water sources. Only 14% of the rural population has access to latrine of some kind. Obviously, the rest defecates in open. Where latrines are present if they are not properly built, they also lead to contamination of the ground water.

There are other sources of water contamination which are generally ignored. One such source is the use of fertilizers. India is the world's second largest consumer of fertilizers, consuming about 26.5 million tonnes per year. At the time of the Green Revolution (1966-67) consumption of fertilizers was only about 1 million tonnes. There

is nothing wrong in the use of fertilizers if done scientifically. But the tragedy is that in India most of the farmers apply fertilizers without any proper assessment of the requirements. Large fractions of the nutrients remain unused. With irrigation or rain water the nutrients reach surface water bodies or to the ground water causing eutrophication and contamination. Also, pesticides are regularly used in agriculture. In 2009-2010 consumption in the country was about 41,822 metric tonnes. In 1991-1992 the consumption was as high as 75,000 metric tonnes. Thus there is reduction in consumption due to Integrated Pest Management, use of bio-pesticides and ban on Heptachlor, Chlordane and BHC etc. Still the quantity is quite high. If the pesticides are not utilized correctly, the chemicals contaminate the environment including water. There have been frequent reports of pesticides poisoning. Muscle degeneration, organs failure, cancer etc. are commonly caused by the toxic chemicals. In affected areas a special terminology, "the devil's water" has been coined for that.

Another dimension is the animal waste. Only a third of the nutrients fed to animals are utilized. Excess nutrients are most pronounced in poultry production operations. Consequently, animal and poultry wastes are important sources of pollution of land and water sources. Studies from China, India, the United States and Denmark have proved this. Phosphorus excretions may be about seven to nine times that of humans, affecting the environment, including water.

Water Use in Agriculture: India needs to boost agricultural production for its growing population and the rising aspirations of people, who now spend more on food. As a result water consumption is increasing. But large quantities of precious irrigation water go waste. Over-irrigation is common. Also, there are seepages and leakages at different stages, resulting in over-extraction of water. In several states power is subsidized for agriculture which indirectly encourages over-irrigation. This fact is obvious from the fact that as per the assessment of the National Commission for Integrated Water Resources Development (NCIWRD) about 83% of available water in the country is used for irrigation. The rest 17% meets the demand for domestic, industrial and other sectors. For the year 2050 the Commission has estimated that the demand will grow to 1180bcm. This estimate takes into account possible improvement in efficiency of surface water and ground water systems and also better and more

efficient water use in different sectors, which may happen or may not happen.

Stressed Ground Water: Ground water is the most important source of water supply in the country for very large areas, more so for the rural areas. Total static groundwater available in India is about 10,812bcm. The average groundwater recharge rate of India's river basins is about 260m³/day. Estimates suggest that India has about 432bcm of groundwater which is replenished annually through rain and river drainage. Out of that about 395bcm is utilizable. About 82% of it is used for irrigation and agriculture. The remaining i.e. only about 18% is available for domestic and industrial use. With growth in demands groundwater is increasingly being pumped from lower levels and at much faster pace than precipitation can replenish it. As a result in most of the areas, water tables are dipping fast. There are approximately 20 million individual wells in India that are contributing. Owners of these wells do not have to pay for water, so there is no incentive to conserve or recycle water. Estimates suggest that India is pumping out some 190km³ of underground water a year. Nature is refilling only 120km³. So, there is shortfall of 70km³ per year. The consequences are obvious. In large parts of the country the water table is sinking. Agriculture is a big sufferer. Crops fail or give less than expected production. The poor and marginal farmers are the worst affected. They cannot upgrade pumps regularly. The rich ones do so. The surface water sources which were traditionally used by smaller farmers have mostly vanished or dry up fast. As a result at many places the small farmers have committed suicides. Also, in several areas farmers have started opposing utilization of water by industries.

In addition to agriculture drinking water is a problem in large areas. We need to remember that the rural population of India is more than 700 million living in about 14.2lakh habitations. The rural population does not have enough clout to get water supply from outside. Lack of education, poverty, socio-economic differences further complicates the matter. Under the circumstances women, have to work harder to meet the water requirements for their families. They may have to trudge for several km for one or two buckets of water. Even in a place like Cherrapunji there is scarcity of water after rains

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