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Notes

BREAKING NEW GROUND FOR GROUNDWATER

Not a month goes in India when problems connected with groundwater exploration, exploitation and management are not discussed at one or the other innumerable seminars organized for this purpose. Many a time, the same old issues are repeated, the obvious is emphasized and the need for fresh look is underlined. The matter hardly seems to progress beyond this. Droughts and floods of predictable fury recur in Andhra Pradesh, Bihar, Uttar Pradesh and other states betraying our inability to use groundwater as a benevolent buffer to break the vicious circle of drought-flood syndrome.

Management of water resources has to be considered in the light of the socio-economic status of the society and not merely from the angle of the physics and chemistry of the resource as such. In other words, equitable distribution of a non-saleable commodity like water has to be assured to the citizen on the basis of his life-needs and aspirations, irrespective of his economic level and purchasing power.

The growth patterns of population and economic activities are never uniform in a developing society and will tend to concentrate at certain preferred locations putting heavy demands on limited local water resources. It may not always be possible to plan inter-basin transfers or shifting of well-fields to meet the water requirements of one locality from another. Assessment of usable water resource with a minor river sub-basin as a unit is, therefore, necessary after an initial identification of 'Pockets' where growths of population, industry etc. are most likely to take place. This by itself forms a formidable task requiring interaction of various agencies, departments and organizations.

Even though groundwater is said to contribute over 40% to irrigation in our country, the total available groundwater potential has not been *precisely* assessed so far. The replenishable recharge to the groundwater from rainfall is estimated at about 0.27 to 0.50 million MCM (= million cubic meters) per annum. But no reliable figure is available about the total 'secular storage', say to a depth of 600 m below land surface, and which is available for utilization in times of drought. An exact figure for the snow-melt contribution from the Himalayan glaciers is also not known.

Claims have been made that with the achievement of the 'ultimate irrigable potential' from surface water sources, significant augmentation will accrue to groundwater. We do not know the quantum of such accruals within each river basin, except for an order-of-magnitude estimates.

There were about 7.25 million dug wells, a million tubewells and 4.75 million pumpsets in existence about a decade ago. Roughly 10,000 MCM of additional groundwater was planned for exploitation annually to reach the target of creating seven million hectares of irrigation potential during the 6th plan period. Once again the figure on groundwater draft is a grey area where precision lacks conspicuously.

Research needed

The intensity and diversity of demands on our total water resources, estimated at over 1.7 million MCM have increased to such an extent that within a limited period of time the management policies must be increasingly tuned to the resource availability in terms of space, time and cost. A respectable quantum of thought and money is spent on design and research before any major surface water scheme is taken up for construction. Though the annual expenditure on the programme of groundwater is estimated at over Rs. 3,500 million from different sources, regrettably, no significant investment goes into 'Research' aspects of the science of groundwater in our country. Many a time routine surveys are equated to scientific investigation in this field.

Over two-thirds of our country (almost the entire area south of Vindhyan, parts of U.P., Rajasthan and Bihar) is occupied by hard rocks. We have a special interest in these rocks which store water in their fractures. Advanced countries are paying greater attention now to these rocks from the angle of waste disposal. We are rudely woken up to several gaps in our knowledge about the movement of groundwater in them. The scientific and technical aspect of issues like the physics of saturated-unsaturated sub-surface flow, the stochaistic and deterministic concepts in rainfall-run-off predictions, thermal energy problems in transmission and storage in water-bearing rocks, instrumentation for well tests, less costly tools of borehole geophysics, chemistry of natural and man-made pollutants and toxins, remain to be understood in their entirety. Both laboratory level and field level experiments and basic research are badly needed to tackle these issues.

Groundwater happens to be only one of several components of the hydrological cycle which is a continuous global process. Many natural phenomena are involved in it. There is an urgent need to immediately formulate technological missions interacting with disciplines that deal with atmosphere, soils, plant cover, water movement and so on, so as to make available to the farmer the benefits of our advances in satellite-technology, rainfall prediction etc. through real-time advice for optimal use of surface and groundwater resources. This, incidentally, brings us to the need of monitoring the health of our groundwater reservoirs through optimising the number and standardizing measurement in a net-work of observation stations as well as isotopic determinations of groundwater recharge rates. There is a need to sink a series of water table wells specifically for this purpose. Australia maintains a laboratory at Lucas Heights to determine the age of groundwater samples collected from different reservoirs in their land and control the withdrawals from them. We have a long way to go in this direction.

As we may be fast reaching the exploitation of the total annual replenishable recharge, it is also necessary to go futuristic in the management of our peaked rainfall through the creation of underground reservoirs. Experiments have to be conducted using abandoned deep mines particularly in hard rocks devoid of weak planes of leakage as a starting point for such an objective. Not only the water levels, but its chemistry are to be studied. Suitable lift appliances have to be developed to extract water from such underground storages.

Off-shore exploration for fresh groundwater along our east coast and Gujarat may also prove fruitful to the coastal population. Utilization of renewable energy resources for groundwater lift in our rural scenerio is another area where considerable thought is necessary cutting across various disciplines.

With greater and greater exploitation of groundwater, a time may not be far away when our courts will be flooded with disputes on rights of drawing water. In order to avoid ad-hoc judgements, a beginning is to be made right now in framing of necessary legislation.

Doubtful Agencies

Formulation and implementation of Technology Missions to tackle the above problems are, undoubtedly by themselves, formidable tasks. Even if we succeed here, translating scientific achievements for the benefit of the common man, poses a bigger challenge. There is a need to develop a humane interface between advances in science and our tradition-bound rural folk. Fortunately, a few mature individuals with lot of executive and field experience started several voluntary agencies to provide this interface between an impersonal 'scheme' on paper, and the 'people' in villages, during the 6th plan period. But one has to approach a bit cautiously while harnessing the services of some of these agencies. Quite a few ambitious persons have shifted to the culture of forming a voluntary agency, finding it more lucrative, with the ostensible purpose of serving the society. They have usually their spouses or close relatives comfortably ensconced close to the seats of authority, themselves maintaining a schizophrenic character of five-star culture when amongst the citadels of power and khadi-clad image-projecting life when amongst the villagers. They trumpet that the existing systems are too ram-shackle, debilitating and archaic for their ideas and schemes. They conveniently forget that Mahatma Gandhi became the Father of the Nation not by running away from existing society but living within it and proving his uniqueness. Many an odd revolutionary rebelling against an existing institution might have created a tremor, but the lasting freedom for our country is won by the Mahatma's sustained struggle by identifying himself as one with the society. Rather than wholesale condemnation, what is required is an effort to bring an organic change in our social ethos.

Therefore, in order to take water to our teeming millions, carefully thought out scientific missions backed by adequate research inputs are highly essential. Translation of the scientific achievements for the benefit of the people requires a human interface consisting of highly experienced and mature individuals who can work within the existing systems without antagonizing our simple and needy rural folk. There is a lot of new ground to be broken with bold ideas and S and T application in optimally using our groundwater resources for maximum good.

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THE PURSUIT OF SCIENCE: ITS MOTIVATION

The pursuit of science has often been compared to the scaling of mountains, high and not so high. But who amongst us can hope, even in imagination, to scale the Everest and reach its summit when the sky is blue and the air is still; and in the stillness of the air survey the entire Himalayan range in the dazzling white of the snow stretching to infinity. None of us can hope for a comparable vision of nature and of the universe around us. But there is nothing mean or lowly in standing in the valley below and awaiting the sun to rise over the Kunchenjunga.

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