

CORRESPONDENCE

option is to construct storage tanks⁵ at appropriate places where a part of the floodwater could be stored and then released or reused subsequently. The second option is construction of seepage holes and wells, similar to those made for groundwater recharge, through which a part of flood water could be transferred to sub-surface aquifers. In both cases, the space requirement and disturbance to the existing environment is low and the structures are easy to make even in the

densely urbanized condition. An additional advantage will be of replenishing the water table, which is on decline in most of the urban areas.

1. Dhar, O. N. and Nandgiri, S., *Mem. Geol. Soc. India*, 1998, **41**, 1–25.
2. Kale, V. S., *Mem. Geol. Soc. India*, 1998, **41**, 229–256.
3. Saini, H. S., Mujtaba, S. A. I. and Pant, N. C., *Geol. Surv. India Spl. Publ.*, 1996, **48**, 101–107.

4. Leopold, L. B., *U.S. Geol. Surv. Circ.*, 1968, **554**, p. 18.
5. Terstriep, M. L., Voorhees, M. L. and Bender, G. M., *Illinois State Water Survey Publication*, 1976.

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Paradigm shift in water resources development and management

Rapid population growth, changing living standards and irrigation requirements were mainly responsible for the enormous expansion of water resources infrastructure in the twentieth century. Water resources development in the past century completely ignored the hidden costs of the environmental loss, viz. the destruction of ecosystems, dislocation of human population, inundation of cultural sites, disruption of sedimentation processes, etc. Economic analyses were generally done with incomplete information.

But, in the past two decades, there has been a major paradigm shift in water resources development and management. The old paradigm based on the philosophy of larger dams and reservoirs has begun to fail. People are now more concerned about environmental loss and economic and social issues. High value is placed upon the maintenance of the integrity of water resources and the flora, fauna and human societies that have developed

around them. Both Union and State Governments are under tremendous pressure to ensure equitable distribution of costs and benefits of water resources development projects. Efforts are constantly being made to understand the diverse interests and fulfil the needs of the affected stakeholders.

The new paradigm is directed towards 'water use efficiency' by reducing wasteful applications of water, by changing cropping patterns, by reducing losses between the field and the source and by many other methods. Water use could be sustainable by increasing the efficiency with which current needs are met and by increasing the efficiency with which water is allocated among different users. Where additional or new supplies are necessary, major new projects must now compete with innovative small-scale approaches, including micro-dams and other locally-managed solutions. Greater reliance on groundwater resources could

be an excellent solution, and efforts should be made towards new source finding and its development. In addition to this, non-traditional sources of supply could play an increasing role, including harvested rainwater, reuse of recycled wastewater and desalinated seawater.

The greatest drawback in the twentieth century water policy was the failure to understand the connections between water and ecological health. The objective of the twenty-first century water management should be to understand these connections and make a balance between the ecological health and human water needs.

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Research in biotechnology: A lucrative career option

The biotech sector is the fastest growing industry in the world today, surpassing the growth of the IT industry. Given the global environmental conditions and the increasing demand for safer and better products, millions of dollars are being invested to find solutions to critical problems of health, food and environment.

Scientific research in biotechnology and related areas has come of age and is emerging as a career which can prove lucrative and provide a social stature.

Indian molecular biologists working in research institutes, universities and laboratories have begun to develop indigenous technologies and selling them to companies at prices which may be meagre on a global level but unheard of in India. Technologies developed and sold for anthrax vaccine and blood clotting streptokinase are just a couple of examples.

The biotechnology sector, propelled by the growth in agriculture, pharmaceutical

and medical industry, growing annually at a rate of 45%, would bring in revenues worth \$5 billion by 2010 and create close to 1 million jobs¹.

This being a research-oriented field, there is a demand for researchers, scientists and trained technicians with excellent laboratory skills. To meet the requirement of skilled technical cadre, the government provides incentives at every level of education to make this career choice attractive.