


 RESEARCH AND DEVELOPMENT NEEDS RELEVANT TO THE DRINKING WATER
 SUPPLY AND SANITATION DECADE 1981-1990

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One of the major objectives of International Water Supply and Sanitation Decade programme is to provide access for protected water supply and sanitation to all, both rural and urban, in tune with the Mar-del-Plata conference theme. In this connection, a few significant Research and Development needs are identified, the fulfilling of which will further the objectives of the Decade programme.

Water Supply and Treatment

Planning factors in water treatment and supply

1. Basic assumptions on per capita rate of water supply to be provided, the minimum pressures to be maintained at the various draw off nodes of the distribution system, the time horizon into the future for which various components of the scheme are to be sized, and others, should be subject to vigorous economic and engineering analysis so that more rational design criteria could be drawn. A team of engineers and economists working together could try to construct appropriate demand functions which could provide a basis for rational decision on the per capita water supply.

2. The concept of minimum needs (particularly with regard to rural areas) should also undergo examination.

3. Application of techniques of cost effectiveness, and studying the utility of the scheme vis-a-vis investments made can be of great benefit.

A study of schemes recently completed as well as those with an established record of service may prove valuable in this context.

Sources

1. There is a need to achieve cost reduction in ground water collection systems, particularly for use in rural areas.

2. The techniques of construction need to be simplified to enable participation by local labour.

3. Cost effectiveness of alternative materials should be investigated for the piping.

4. Developing improved methods for geophysical exploration for ground water which, at present, is extremely cumbersome and costly, is necessary.

5. Reduction of evaporation and seepage losses at the source and during conveyance is necessary to conserve water, particularly in areas prone to water shortage.

6. Know-how must be developed and continuously updated for the manufacture of simple equipment like hand pumps and motors locally.

7. Training facilities must be created for developing the necessary skilled manpower to construct and maintain the ground water collection systems.

Treatment

1. A review of the drinking water quality standards prescribed at present is essential to resolve inconsistencies, if any.

2. It is necessary to take up regional or area-wise classification of raw water quality from surface and ground water sources. This will facilitate quick decisions on treatment and preparation of cost estimates and also help to identify 'problem regions' which need special solutions and alternatives.

3. Simple and more effective methods of dosage of chemicals at a desired rate for coagulation purposes should be developed.

4. Controlled desludging and backwashing operation that will help to improve the performance of the treatment units and avoid wastage of water are necessary.

5. Recycling of backwash water and recovery of alum for reuse in the treatment plant should be attempted.

6. As far as possible, surface water treatment, where required in rural areas, may be by slow sand filters and the design of the filters should be improved.

7. Low cost technology for removing iron and manganese, total dissolved solids, fluorides, hardness and brackishness is to be evaluated and/or developed.

8. Transfer of such a technology to the field for a wider implementation needs to be intensified.

9. Cost effective desalination techniques using natural, renewable sources of energy such as solar energy need to be investigated and appropriate design criteria developed and distributed widely.

10. Development of a reliable and sturdy chlorinator that will be simple and safe to use is urgently called for; this necessity is more pronounced in rural areas.

11. Development of simple, rugged laboratory instruments for instant testing of the water quality will be useful.

Transmission and Distribution

1. Factual data on demand pattern and its variation seasonally and hourly is needed. It can be obtained by conducting surveys of the diurnal and seasonal water demand patterns in representative cities and towns of various sizes.

2. Ways and means of improving the existing distribution pattern to ensure equitable distribution of flow, maintenance of adequate pressures, avoidance of leakages etc will help to realise the objectives of a protected water supply system. Identification of sources of wastage and pollution (both preventable and avoidable) is necessary.

3. Development of criteria for sizing distribution zones and arriving at rational decisions regarding capacity and heights of reservoirs will enhance effective performance of the distribution system. Water transmission and distribution arrangements in the

rural areas also need a careful review.

4. Training of personnel and development of techniques to manage and carry out preventive maintenance of distribution system (waste detection and control, maintenance of capacity of the distribution system and cleaning of the interior of pipes, etc) are necessary.

5. Appropriate cost reduction measures such as the use of cheaper but sturdier and safer materials, joints that are cheaper and easy to make, etc., need to be tried out and the experience documented.

6. Simplified instrumentation and techniques are needed for the alignment of pipes, detection of leaks, flow and pressure measurements and cleaning of pipe lines.

7. Water quality survey of individual house sumps and overhead tanks in representative communities will help to provide a clearer picture of the quality maintaining efficacy of water treatment plants, distribution systems and house service arrangements and it may then be possible to pinpoint the deficiencies and the defects in the existing system and take suitable remedial or corrective measures.

Wastewater Collection, Treatment and Disposal

Wastewater collection

1. Emphasis should be laid on community sanitation measures wherever appropriate. Wastewater collection and disposal assumes high priority in this context for urban fringer areas and larger towns.

2. The total problem of wastewater management as existing at present in developing countries needs a thorough review. The technology, economy and policies concerning existing systems should be subjected to careful examination in the light of the energy-environmental crisis and appropriate systems evolved.

3. Development of rational design criteria for sewer design in medium and large communities taking into account the actual sewage flow patterns and the actual sewage characteristics is a long-felt need.

A study on the diurnal variation of sewage flow in communities of different sizes has to be conducted based on which the design flow estimation could be rationalised.

4. The choice of system of sewers itself needs to take into account the design of houses, particularly in the old areas of cities and in old towns.

5. Data on the grit content in wastewater also needs to be collected in representative locations to rationalise the design of wastewater collection, treatment and disposal systems.

6. There is a need to develop devices and methods that could ensure maintenance of free, unhindered flow in sewers under Indian conditions (i.e. where large quantities of dung and other solid wastes are dumped into the sewers).

7. The development of a cost-effective, simple and safe wastewater collection system for rural areas should be given utmost priority.

Wastewater Treatment

1. Development of appropriate design criteria for conventional and low-cost, simple wastewater treatment systems under Indian conditions should be intensified.

2. In particular, low-cost waste treatment systems that will use local materials and labour and renewable sources of energy have to be developed and their design, construction and operation rationalised.

3. Identification and documentation of operation and maintenance problems in working the existing treatment plants should be done with a view to provide guidelines for overcoming them.

4. There is a great need for documentation of the feasibility of wastewater reuse for such purposes as aquaculture, agriculture, industrial use and for flushing and other non-potable purposes.

5. There is a need to investigate the feasibility of physical-chemical treatment methods for advanced waste water treatment in metropolitan

wastewater treatment plants.

6. In view of high cost of energy, alternative sources of energy, readily available and renewable, should be investigated and employed in wastewater treatment.

7. The use of wind energy for aeration in simple waste treatment systems, the use of biogas from an organic waste digestion plant or a wastewater treatment plant as fuel and the use of digested sludge as manure for land, hold promise and measures to tap these sources of energy to the maximum extent possible should be devised.

Wastewater Disposal

1. The development of comprehensive criteria for disposal of wastewater into water courses or on to land taking into account beneficial uses, flow regulations, weather and local conditions is warranted.

2. There is a need to selectively use modern technical tools such as systems analysis and water quality modelling for realising water quality objectives economically.

3. The several factors that inhibit or promote eutrophication in the various regions in the country need to be carefully studied.

4. Cost effectiveness of alternative control measures such as limits on nutrients to be discharged, treatment of water before use, algal control in water courses including their recovery and a combination of these, needs to be worked out.

5. Because algae have a good food value, the feasibility of alternative methods of algal harvesting needs to be evaluated under local conditions.

6. While attempting to introduce cheaper non-water carriage systems for excreta disposal as alternatives to the present water carriage system (which is generally costly), substantial research and development effort concentrating on the public health, techno-economic and socio-cultural implications of the proposed alternatives is called for before the alternatives are shown to be feasible.

Solid Wastes Collection, Treatment and Disposal

1. Investigation of existing collection methods and development of cost-effective methods of refuse collection in rural and urban areas are needed urgently.
2. The economics of larger and better storage versus greater collection frequency needs to be analysed in some of the large and medium urban complexes and semi-urban areas.
3. The study of actual operation of land fill sites and compost plants to document operational and maintenance problems will facilitate developing proper disposal techniques to suit the local conditions and to structure a management system for solid wastes taking into account local factors such as the income levels, food habits, the tradition and culture of the people, the political and the administrative framework within which to operate, the cost involved, the suitability of the different methods of disposal and others.

General Sanitation

1. Collection of information on the existing pit privies and improving their design for adoption on a large scale in rural areas will help improve rural sanitation to a great extent.
2. Development of a viable technological alternative between a privy and a sewer system which will be acceptable from the public health point of view is an urgent need.
3. Steps should be taken to evolve designs of flushing tanks, bath tubs and wash basins (to suit local conditions) requiring minimum use of water.
4. A comprehensive study on the mechanism of travel of pollution to provide a better insight into the location of points of waste collection and disposal with respect to ground water and other drinking water sources, is necessary.
5. The design of the Intermediate treatment systems such as the pit and borehole latrines and septic tanks with soak pits should be standardised for size, materials and methods of construction giving due regard to

soil and climatic conditions, presence of ground water table, etc.

6. Development of package plants for treating domestic sewage for isolated or small communities and for industrial waste treatment needs to be taken up urgently.
7. Similar package plants should be developed for water treatment, particularly for rural areas where special treatment is involved. (eg. iron removal, defluoridation, etc.)

Training Needs

1. Assessment of manpower needs and developing training programmes at all levels to generate the required manpower is an immediate necessity if the decade programme is to register any appreciable measure of success.

This catalogue of Research and Development needs in the field of water supply and sanitation is by no means exhaustive or comprehensive. The several points raised in our opinion, deserve high priority in selecting Research and Development projects during the International Decade for drinking water supply and sanitation. There are many other needs in this vast field which cannot be fully described in a paper such as this. The attempt made in this paper has been to highlight and focus on the more important basic issues. Even a 50% success rate in initiating and funding projects designed to fulfil the needs would be a significant achievement indeed.