International Conference on Water Quality Management: South Asian Perspective

11-12 April 2002, Jaipur

Jaipur Declaration on

Water Quality Management: Vision 2025

As recommended by the participants

Sponsored by
International Life Sciences Institute – India
ILSI Risk Science Institute
Department of Drinking Water Supply
Ministry of Rural Development, GOI
Government of Rajasthan

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Ministry of Urban Development, GOI
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United Nations Children's Fund (UNICEF)
United States – Asia Environmental Partnership (US-AEP)

Jaipur Declaration on
Water Quality Management

Vision 2025

Background

An International Conference on "Water Quality Management: South Asian Perspective" sponsored by International Life Sciences Institute – India (ILSI-India), ILSI Risk Science Institute, Department of Drinking Water Supply, Ministry of Rural Development, Government of India (GOI), and Government of Rajasthan and supported by the Ministry of Water Resources (GOI), Ministry of Urban Development (GOI), United Nations Children's Fund (UNICEF) and United States – Asia Environmental Partnership (US-AEP), was held in Jaipur on 11-12 April 2002. About 180 delegates from India and abroad participated.

The Conference was inaugurated by the Governor of Rajasthan, H.E. Justice (Retd) Anshuman Singh. A keynote address was presented by Mr. Som Pal, Member, Planning Commission, (GOI), and a special address was delivered by Mr. Ram Singh Vishnoi, Hon'ble Minister for Public Health Engineering Department, Government of Rajasthan. Mr. D. H. Pai Panandiker, Chairman, ILSI-India presented Conference theme. Mr. B. N. Navalawala, Secretary, Ministry of Water Resources (GOI), Mr. A. K. Goswami, Secretary (Drinking Water Supply) Ministry of Rural Development (GOI) and Mr. K. Kosal Ram, Secretary, Ministry of Urban Development (GOI), chaired different Sessions.

In the first technical session a review was made of water quality and availability in the South Asian Region. This was followed by two simultaneous workshops to discuss challenges thrown up by chemical contaminants and microbiological contaminants. In Session 3, the specific role of rural community in maintenance of water systems, in sanitation and monitoring of water quality was identified. In the next two Sessions participants deliberated on water quality standards, surveillance, water quality modeling , and waste water management. At a special Session the specific problems confronted by Rajasthan were discussed. The Conference had the benefit of three presentations by eminent speakers*. The Concluding Session was addressed by Mr. Annasaheb M. K. Patil, Hon'ble Minister of State for Rural Development (GOI) and was presented the 'Jaipur Declaration on Water Quality Management – Vision 2025'

The 'Vision 2025' was adopted by the participants and was put together by a Drafting Committee chaired by Mr. D. H. Pai Panandiker and included Dr. P.K. Seth, Director Industrial Toxicology Research Centre, Prof. S. K. Bhattacharya, Director, National Institute of Cholera and Enteric

Diseases, Dr. Terrence Thompson, Regional Advisor – Water, Sanitation and Health, WHO-SEARO, Dr. M. V. Nanoti, Deputy Director and Head, National Environmental Engineering Research Institute, Mr. Robin Lal Chitrakar, Chief Water Quaity, Department of Water Supply and Sewage, His Majesty Government of Nepal and Ms. Rekha Sinha, Executive Director, ILSI-India.

World Perspective

It is now widely recognised that in the next two decades the world will be heading for a water crisis of unusual dimensions. The first recognition of this crisis came at the Rio Conference on Environment and Development (UNCED) in 1992 and the first collective consultations were initiated by the World Water Commission at Hague in 2000.

Population explosion combined with increase in per capita consumption of water have created tremendous pressure on water resources. Besides, since water is sold generally at highly subsidised prices there is inclination to use water liberally, leading to considerable waste. On the contrary, the ground level acquifers are rapidly depleting with deterioration in quality, severely restricting availability of safe drinking water.

A recent study projected that a group of countries, including parts of India and China, housing more than 1 billion people, would face absolute scarcity of water by 2025. Even today, one-fifth of the world's population does not have access to safe drinking water.

Water is required for basic hygiene, apart from for drinking, and must therefore be available in adequate quantity. It has to be free from contamination at acceptable levels, and should be available continuously to meet normal needs to all people at affordable price. All this would be possible only if action is taken now to reverse the creeping crisis.

Characteristics of South Asian Region (SAR)

The South Asian Region (Bangladesh, India, Nepal and Sri Lanka) or SAR for short comprises of 3.6 million sq. km in area with a population of 1.17 billion. The average density is 325 per sq. km. The Region produces $ 575 billion Gross Domestic Product (GDP) with per capita income at $ 440 per year. In many parts of the Region rainfall is scanty and there is no access to adequate water resources. The per capita availability of fresh water varies from 1913 cubic meter in India to 9482 in Bangladesh.

- **Bangladesh 9482 cubic meters**
- **India 1913 -Do-**
- **Nepal 8989 -Do-**
- **Sri Lanka 2634 -Do-**

By 2025 population may cross 1.6 billion and the percentage of people in urban areas which currently is less than 25 per cent may reach 40 per cent. Per capita income would be $ 1200. All these factors will generate enhanced demand for potable water.

Water Related Diseases

Until recently, people in rural areas depended more on surface water from lakes, ponds, wells, and rivers which exposed them to a variety of water related diseases. These fall into three categories viz. water borne, water washed and water based. Water borne diseases like gastro-enteritis, typhoid, dysentery, cholera, infectious hepatitis, are the commonest and have been widespread in rural areas where water treatment is largely absent. The second group comprises of diseases that are caused due to lack of water for basic hygiene and include infant diarrhoeas and skin diseases. The third group includes diseases caused by pathogens like malaria, dengue that have their intermediate hosts in water. These diseases can be manifest as an epidemic or may be endemic.

The UNCED had estimated that 80 per cent of all diseases and over one-third of deaths in developing countries are water associated. The biggest killer is diarrhoeal disease and the greatest affliction is trachoma.

Importance of Sanitation

Almost all these diseases come from human and animal faeces which pollute water. Clean water and basic sanitation are closely interlinked. For this reason, clean drinking water program had to be combined with sanitation program. Broadly, it has been estimated that in diarrhoea disease morbidity reduction, the benefit could be attributed to clean water and basic sanitation in the ratio 2:3. Therefore improvements made to water supplies without an accompanying improvement in sanitation or hygiene may not achieve the expected decrease in risk.

Shift to Ground Water

Recognising that surface water is exposed to microbial contamination, Governments in the SAR sought to explore ground water resources using hand pumps and tube wells. Reported data indicate more than 85 per cent coverage of water supply. In Nepal it is less than 70 per cent and in India more than 97 per cent. The commendable progress made in India was entirely due to the focussed attention to rural water supply problem by the Technology Mission on Drinking Water launched in 1986 and renamed Rajiv Gandhi National Drinking Water Mission in 1991. The objective of the Mission was to provide 40 litters of water per capita per day to all habitats which did not have regular water supply, create awareness about safety and promote community participation.

The main sources are hand pump and bore well which supply 42 per cent of drinking water. Traditional wells provide 27 per cent and exposed sources 5 per cent. Recent surveys indicate that a large number of habitats that had initially been covered under the program have become dysfunctional for a variety of reasons:

- **Sources of water have become permanently inaccessible**
- **The system has outlived its life**
- **Poor operation and maintenance of equipment**

The shift from surface to ground water has undoubtedly reduced the risk of microbial contamination in spite of the water being largely left untreated. But it has given rise to another set of problems. In some parts of the region, ground water is contaminated with chemicals which are harmful to health. Symptoms of arsenic poisoning were reported since 1987 in West Bengal and 1992 in Bangladesh. The number of people at risk, in Bangladesh, has been estimated at 35-77 million and at least 8000 cases of debilitation and skin lesions are believed to have already occurred. The population at risk due to arsenic contamination in India is 5.3 million. Similarly, in parts of India and Sri Lanka, in dry zones, there has been exposure to fluoride contamination, the number of affected people exceeding 65 million. Excess iron occurs in water mostly in hilly regions causing digestive problems. Nitrates have been the other health hazard.

In SAR the responsibility for planning and construction of water supply projects in urban and rural areas lies with state water authorities, local governments and rural development agencies. The operation and maintenance is with municipal corporations or other local bodies. In rural areas, water supply is usually managed by the community. In India and Bangladesh, water supply is entrusted to public health engineering departments or local authorities. There is no private sector in water treatment or water distribution.

Water supply by its very nature is a monopoly and water being critical for human existence is often looked upon as the responsibility of Government. The perception the world over has, however, changed and in a number of countries like Australia, United States, France, United Kingdom, Indonesia, etc. water is supplied by both the public and the private sectors.

Cost of Inaction

Although the problems in respect of water shortage and water contamination have been perceived and solutions identified the results have been poor. This is so because:

- **Decisions are not translated into action**
- **Institutional arrangements are not comprehensive and responsibilities are not clearly defined**
- **There is visible lack of trained personnel and professional management**
- **Economic incentives for efficient water use are missing**
- **Supporting system for information and technology inputs are not in place**
- **Investment in water, including drinking water is not adequate**
- **In view of these shortcomings, a World Bank report pointed out that although water has been to an extent 'developed' it is not 'managed'. That has contributed to scarcity and misuse. If no concerted action is taken now the loss to SAR countries due to health costs**

alone would be would be 3 percent of GDP a year.

Water Safety Issues

Water would be absolutely safe when it is free from every agent that can cause any health disorder. That is an impossible standard which cannot ever in practice be reached. World Health Organisation (WHO) has framed guidelines taking microbial contaminants and 128 chemicals which can be hazardous to human health. These guidelines are intended to be used by national authorities as a basis for development of drinking water standards and regulations appropriate for their own socio-economic and exposure situations.

Some of the countries have set their national standards and regulations more rigorously for all categories of contaminants including microbiological, chemical and radiological as well as physical characteristics such as odour, taste and clarity.

The principal objective of setting standards and regulations is to reduce the quantity of contaminants in drinking water to a level that is 'effective' and 'efficient' in protecting public health. The effective level is a matter of technology; the efficient is the one related to cost in relation to benefit.

Risk Assessment

Extensive epidemiological studies provide evidence of the long-term effects of some of the natural and added constituents of water. The concept of risk assessment as a tool to provide information for risk management has become an integral part of policy.

Biological models, as also simpler techniques such as benchmark approach, allow for a better use of data to determine safety assessment. What is important is to benchmark risk that is 'acceptable'. Most countries rely principally on assessment made by the WHO.

India and Sri Lanka have adopted the WHO guidelines which are adequate to ensure reasonably safe drinking water if they are in practice strictly enforced. This is not easy because the supplier of water is Government itself.

Risk has to be balanced against cost. The decision about the acceptable risk has to be taken by the Government on behalf of the community. The UK Government, for instance, has set a standard for the presence of cryptosporidium in spite of the uncertainty concerning its ineffectiveness and identification. But most governments have decided against such strict standards as being impracticable and certainly not economically justified. The cost far exceeds the benefit. Besides, there should be a trade-off between the cost of reducing risks and the cost of correcting after-event consequences.

Technology Developments

Water is supplied for many uses all of which do not require the same level of treatment. For instance, water used for gardening need not be treated to the same level as water for drinking. But reducing the standards would entail much greater risks. Commercially also, to supply different varieties of water for different uses or for different consumers would be much more

expensive than supplying the same quality of water for all purposes.
Conventional treatment of drinking water consists of a combined process of screening, coagulation, sedimentation, filtration and disinfection. This process of treating water has been effectively used for a long time. It has virtually eliminated the outbreaks of water borne diseases like cholera and typhoid in developed countries. The conventional methods have been effective for most water borne diseases except very few like cryptosporidium.

Alternative disinfection is via chlorine dioxide, ozone, and Ultra Violet (UV) light. With chlorine dioxide inactivation of cryptosporidium is possible. Ozone is even a stronger disinfectant and can also remove taste and odour causing compounds. Recent researches have also brought back use of UV light for primary disinfection to inactivate cryptosporidium

In conjunction with or in place of conventional treatment, membranes of various configurations could be used. The primary membrane filtration technologies are microfiltration, ultrafiltration, nanofiltration and reverse osmosis. The last two are rarely used because of their high cost.

Water treatment technologies are undergoing rapid change with a view to eliminate a larger number of contaminants present in water and reduce health risk. In many developed countries there is greater public awareness and therefore pressure to use more developed technologies, in spite of their high cost.

While the more advanced technologies can be used in urban areas to serve large populations which are economically better off, in most other areas in SAR, application of simple technologies of filtration and chlorination would be the only practical means under local supervision.

Recycling of Waste Water

Water stress experienced by many countries has necessitated recycling of waste water. One major source of such water is municipal waste water. The treated water, after use, can also be further treated, creating an opportunity for multiple recycling of water. Every drop of Colorado River, for instance, is used six times before it reaches the sea. Israel recycles 80 per cent of its waste water.

The advantage of recycling is that it increases the water use without creating additional demand on water resources. The possibilities of recycling are one of the means of avoiding the creeping water crisis.

Recycling adds to cost. The initial cost of setting up water treatment plants is quite high and the amortisation cost inflates the cost of the treated water. In Delhi, 3 out of 28 industrial estates have set up treatment plants and 12 more are planned. The economic cost of treatment is Rs.5.3 per cubic meter of water which is much more than the price of water presently used for irrigation from ground sources. However, the rapid depletion of ground water aquifers has made it necessary to control ground water extraction. This has been found difficult unless alternative sources like recycling of waste water are made available.

The Cost of Safe Water

Cost of safe water will depend on:

- **The point at which water quality control is exercised**
- **The standard to be achieved and**
- **The size of operations**

It is recognised that integrated management for public health and natural and protected water resources is the most effective and least costly strategy. Water resource protection can prevent contamination at source itself. Upstream investment to keep human sewage out of water resources has to be balanced against the multiple downstream costs of its removal. A holistic approach involving public health departments, water providers, natural resource managers, industry and the public would be more meaningful, effective and efficient in providing safe water and at the same time preventing environmental deterioration.

In developing safety standards and regulations countries will naturally have to adopt a risk-benefit approach. Every improvement in quality increases cost. Also while cost is ascertainable, the health benefit from a prescribed standard becomes largely a matter of conjecture. A balance has therefore to be achieved between cost and risk. In any case, the minimum cost involved in achieving WHO safety standards has to be undertaken by countries in the SAR for effective water quality management.

Cost also varies with the size of operations. The smaller the unit the higher the cost per cubic meter of safe water. A study made by CSIRO Molecular Science, Australia, in 2000, brought out that the treatment cost of water sourced from semi-protected catchment using conventional methods with chemical coagulation, sedimentation, filtration and chlorination varied from A$ 4 for system size to serve 5000 population to A$1 for system size to serve 250,000 population.

Obviously, for small habitats using local water sources it would not be economical to set up regular water treatment systems. Other technologies will have to be considered ensuring the minimum standards that are required.

Monitoring, Surveillance and Control

An essential component of an effective water system is an appropriate institutional structure for monitoring and surveillance. This is the area where most failures occur and leave room for water falling below the acceptable quality level. To ensure the best practices it is necessary that the objectives are very clearly defined, there is proper accountability and the process is transparent.

Water quality monitoring is the systematic collection of samples at specified intervals and their analysis with the aim of providing information. It has to start from water sources and end up at the tap. Water quality has to be monitored to ensure that water resources can be managed fairly, contaminants are detected and controlled before they cause any damage, and environment deterioration is prevented in time.

Surveillance involves using the information for further action to ensure water safety. It includes all activities required to keep constant vigil on safety and acceptability of drinking water. It is a systematic approach to identification, assessment, prevention and control of hazards associated with supply of water.

Monitoring and surveillance in SAR are the weakest link in the chain for providing safe drinking water. Public Health Engineering Departments (PHEDs), central and state ground water pollution boards, central water commissions, etc. are all concerned with water quality. But shared responsibilities leave large room for inefficiency, negligence and delays. Besides, there is no consolidation at any level of planning and future monitoring of water quality.

For effective pre-event action the monitoring system should be mandated to ensure accountability. The reporting system should help detection of contaminants in time to enable take corrective action. While is some of SAR countries the surveillance systems are in place at select points to monitor water quality of the rivers, lakes etc. or in the urban sector at treatment point, there is no way the quality of drinking water is monitored in rural areas. Besides, the laboratory facilities are limited and laboratories are ill-equipped.

Agenda for the Future

In the next two decades it is necessary to plan, organise, execute, operate and manage projects which will provide safe, adequate and sustained water supply to all people for drinking and personal hygiene. The following specific objectives should be an integral part of the national development plans.

Water Security:

Water security is achieved by:

- **Multi-stage harvesting of rainwater for direct use and also to fully recharge ground water, preferably through flooded paddy fields which percolate water to the aquifers**
- **by recycling municipal waste water to the extent of at least 75 per cent and**
- **supplementing fresh water by desalination of sea water in coastal areas.**

Protection of Water Resources:

A holistic approach is adopted for effective prevention of pollution and treatment of human wastes, industrial effluents before they are discharged in natural water resources and management of run-offs from agriculture.

Efficient water use:

There is a system of incentives and disincentives to economise on water use, enhance water productivity in agriculture and prevent water pollution.

Water Safety:

WHO guidelines are adopted and implemented to provide adequate safe water to all people and thereby eliminate water related diseases like typhoid and cholera and reduce the prevalence and severity of other diseases like gastroenteritis, hepatitis, etc. Similarly, ground water sources wherever contaminated by chemicals like arsenic, fluoride, or iron, are fully mapped and water is treated at the community level in rural areas using simple but technically effective methods.

Capacity Building:

Facilities are created to educate and train personnel in water management skills and the water systems are operated professionally and in an integrated manner.

Public Awareness:

Public is made aware of the importance of hygiene, the dangers of pollution and the benefits of environment preservation.

There is close partnership involving all the stakeholders viz. Government authorities at different levels, industry, academia, NGOs, and local communities.

Tasks for the Future:

A. Interim Measures

It will take time to achieve the objectives set out above and interim measures will have to be taken at the household level to prevent water contamination and ensure personal hygiene. The essential steps are:

- **chlorination of water stored in households using chlorine tablets. Solar distilation would be another cost effective alternative.**
- **safe disposal of human and animal excreta**
- **personal hygiene like hand washing before meals, storage of water in proper containers, and so on.**
- **care should be taken to prevent dumping of solid wastes. Recycling of plastic containers, packaging material, etc. would also mitigate pollution. Kits for detection of contaminants should be made available to village committees and one person made responsible for their use, after necessary training.**

The more suitable agencies to create hygiene awareness are the NGOs, the media and schools. Vaccination against cholera and typhoid is now possible and its use in rural areas can be considered to give protection against these major diseases.

B. Medium Term Measures

Productivity of water in agriculture has to be increased by :

(a) using water saving methods of irrigation and
(b) adopting appropriate crop pattern.

Consequently, the percentage of the water used in agriculture will be reduced and more water released for drinking and personal hygiene.

- **Legislation should be in place to control ground water extraction. At the same time aquifers should be replenished by using rainwater to percolate through rice fields. Areas for such percolation should be identified and effective action taken to make the maximum use of rainwater.**

- **Multiple use of water should be made by recycling waste water. Private sector should be encouraged to participate in this activity and water priced economically to make investment attractive. Similarly, desalination of water in coastal areas and economical means of transportation, if commercially viable, can supplement fresh water resources.**

- **Water has to be collected, treated, transported, cleaned after use and returned to the watercourses. All this presumes an infrastructure with heavy capital costs and huge running expenses. The expenditures have to be recovered from the consumers if water has to be available for all time. Presently, water in all SAR countries is subsidised. This has encouraged misuse of water and made the system untenable. In view of this:**

  (a) Water must be charged an economic price though consideration will have to be given to the needs of the poorer sections of society.
  (b) full user charges should be recovered from irrigation.
  (c) Water pollution whether by agriculture, industry or households should be penalised. The penalty should be high enough to cover cost of treatment.
  (d) Investment in pollution free and water saving technologies has to be encouraged by instituting fiscal and financial incentives.

- **The guidelines laid down by the WHO should be adapted in the regulatory systems in all the countries of SAR.**

- **In the rural areas supply of water is on small scale and special equipment will be required to treat water for chemical and microbial contaminants. The effectiveness of different technologies should be established through field trials. Eventually, mini and minor water system should be set up in each habitat and water supplied to households through pipes.**

- **Water quality and improved sanitation in SAR have to be considered as a package What is necessary to promote hygiene is more of public awareness than any financial support. It is difficult for Government to reach out to the local communities. This task will be best done by the NGOs who have to be financially supported. The government must be only a facilitator.**

- **Involvement of the local community in monitoring water quality is absolutely necessary. The approach should be to utilise locally available infrastructure and institutions for water quality testing, at village, block and district levels. Such arrangements could be formalised into a well knit national organisation which may be called Waterwatch. This organisation**

will in part be community based and in part government based. Most of the finances will have to come from government to fund field kits, strengthen laboratories, set up water systems, while much of the skill inputs will come from the community level organisations like the village panchayats. The sharing of responsibilities must be clearly defined and panchayats made accountable for running the system effectively and efficiently.

- **All water security and safety problems should be dealt with on basin-wide basis. Hence, Inter-state River Basin Organisations should be created for management of bulk suppliers and monitoring and maintenance of water quality. Equally transboundary co-operative arrangements would enable better understanding of contamination problem and devise appropriate solutions.**

- **A well managed surveillance system has to be put in place. It should consolidate the monitoring reports from different habitats in one catchment area to identify common problems, undertake planning, assess the nature, size and source of contaminants, devise strategies for control and initiate action through local authorities. Such a surveillance system presumes proper training of ground personnel, laboratory facilities, and efficient management.**

- **Water Quality Assessment Authority should effectively co-ordinate at the national level the work entrusted to different agencies dealing with water to ensure its quality.**

- **The central governments should set up data banks with full information concerning all water related issues with access to the public on subscription basis.**

- **Large investment will be involved in setting up water systems, surveillance mechanisms, capacity building, etc. and hence 3% of the GDP should be targeted for water development and management and international institutions like World Bank, Asian Development Bank, World Health Organisation made partners in this effort.**

- **Research in water technologies has been slow partly because water has been generally supplied by governments and partly because water is priced very low and as such does not attract investment in research. Since a large part of the water supply will remain with the government authorities, it is essential that SAR governments sponsor research particularly in areas like mini water treatment plants.**

- **ILSI-INDIA should take the initiative to organise conferences on water quality management at the state level to sensitise concerned agencies to achieve 'Vision 2025'**

Recommendations of Workshops on Chemical Challenges and Microbiological Challenges

Workshop A: Chemical Challenges

The workshop was chaired by Dr P K Seth, Director, Industrial Toxicology Research Centre, Lucknow and Dr S P Sinha Ray, Member (SML), Central Ground Water Board, Ministry of Water Resources, Government of India.

The discussions centred around chemical contaminants, the techniques available for their treatment as well as technologies which had come up to prototype stage. Specific references where made to non-skeletal adverse effects of fluoride on children and their reversal through proper nutrition. Factors affecting arsenic poisoning and their treatment received special attention with emphasis on good nutritive diet rich in protein for protection against adverse effects. Water sources can also be contaminated with PCB and PAH. No detailed studies have, however, been done in these areas.

Recommendations:

1. **Huge data on the levels of chemical contaminants in water is available but it is not available at one place. It needs to be compiled and evaluated.**
2. **There is a need to map out the presence of PCB and by product of chlorination in groundwater.**
3. **The available technologies for the treatment of water for fluoride, arsenic, nitrates be evaluated and cost effective and ecofriendly technologies be adopted.**
4. **Awareness about the adverse effects of chemical contaminants among public and clinicians be created.**
5. **Remedial measures based on nutritional supplements be considered to protect children and other exposed population against the adverse effects of arsenic and fluoride.**
6. **Comprehensive monitoring and surveillance of water quality throughout the country needs to be done.**
7. **Different treatment technologies available for removal of arsenic, fluoride and desalination have a major problem of effective sludge disposal. Extensive research in this line is needed.**
8. **It is necessary to know precisely the cause of pollution / contamination of water, based on which effective and sustainable removal strategies may be evolved.**

Workshop B: Microbiological Challenges

The workshop was chaired by Prof S K Bhattacharya, Director, National Institute of Cholera and Enteric Diseases, Kolkata and Dr R K Saxena, Head, Microbiology, Delhi University, Delhi.

Several aspects of microbiological threats to water quality were discussed in papers presented by experts. These included: the threat of emerging water pathogens, sources and survival of viral pathogens, methods for analysis of microbial load in water, methodologies for household treatment of water to tackle pathogens, and quantitative assessment of microbiological risks associated with drinking water. In the discussion which followed the presentations, the above issues were deliberated threadbare by the experts and following recommendations were formulated:

Recommendations:

1. **More infrastructure should be established for surveillance and monitoring of microbiological status of drinking water whether it is source water, groundwater or municipal water.**
2. **The major or nodal laboratories which are entrusted with microbiological assessment of water should use methods like membrane filtration (MF) technology rather than the more conventional methods like PA (Presence – Absence) or MPN (Most Probable Number) techniques.**
3. **Additional emphasis should be laid on detection of viruses in water. Currently, no guidelines are available to this effect. In this regard, some hard-core professionals working on water-borne viruses should be invited to participate.**
4. **The simple and low-cost technologies developed by WHO have proven to be very effective in controlling the common water-borne pathogens. This is amply substantiated by studies conduced by WHO in certain developing countries. It has been shown that such technologies can bring down the incidence of diarrheal diseases. It is recommended that these technologies may be popularized in India and other South Asian Countries. These technologies can play a significant role in controlling the water-borne diseases in rural areas and also in the low-income groups of the urban population especially those living in urban slums.**
5. **The WHO is formulating a new set of guidelines for drinking water which are scheduled to be implemented w.e.f the year 2003. The eventual aim of these guidelines is to manage the water-related infectious diseases. All the professionals involved in water testing, monitoring and surveillance should be aware about these guidelines. Efforts should be made to equip our personnel as well as facilities to meet these guidelines.**
6. **In the near future, a conference may be organized which would exclusively discuss the technical aspects of microbiological evaluation of water. This would also address the various aspects related to the technical training of the personnel to be entrusted with the responsibility of water quality management.**