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**Environmental sanitation problems, India**



## INTRODUCTION

The major challenge for the provision of safe water supply and excreta disposal facilities in India at present appears to be in the rural and urban-fringe areas where majority of the people lack adequate access to safe water and sanitation facilities. In fact, water/sanitation related diseases continue to be a major health problem in such areas.

An attempt has been made in this paper to identify the problems and probable reasons for not properly materialising the potential social, economic, and health benefits of water supply and sanitation programmes in these two areas. The paper also suggests measures which, in the opinion of the author, may contribute to the solution of these problems. Further, major water quality problems arising from agricultural practices, potential solutions and control measures required, and research activities needed have also been indicated in this paper.

## MAJOR HEALTH PROBLEMS

As regards community water supply and sanitation, conditions in rural and urban-fringe areas in India are much worse than those in urban areas. The urban-fringe area, however, resembles the rural area in its conditions but is even worse off sanitationwise, because its population usually has no choice between alternative water supply sources, has worse housing conditions, and lacks the open field for waste disposal and thus has a greater health risk. The diseases related to a lack of proper hygiene and sanitation is a major health problem in such areas. In fact, there is urgent need of curbing morbidity and mortality due to transmission of mainly

gastro-intestinal diseases. The following statistics on the health status in Nepal (ref.1) illustrate this strong sanitation component (in parentheses : figures for industrialised countries) :

- out of 1000 new born, 130-170 (8-40) die before the age of one;
- the mortality rate is 22 per 1000 (10) ;
- 50% of all deaths occur among children before the age of five ;
- 30% of deaths among children between the age of 0-5 years are caused by a lack of proper sanitation, i.e. mainly due to transmission of gastro-intestinal diseases ;
- 30-40% of the children admitted to hospitals suffer from diseases caused by a lack of proper sanitation ;
- prevalence of worm infection is high, i.e. :
  - 1-11% among children of 1 year
  - 10-80% among children of 1-5 years
  - 20-100% among children of 5 years.

A survey in a number of towns in Central Nepal showed that 40-100% of adults suffered from worm infection. Apart from these dangers of poor sanitation, increasing population densities in urban-fringe areas of India further aggravates the problem.

## AGRICULTURAL PRACTICES AND WATER QUALITY PROBLEMS

Another point worthy of focussing the attention is that little or no notice is taken at present of the large quantities of wastes generated by the agricultural sector and that of the agricultural chemicals introduced in large scale to rural environment. There is a great dearth of information concerning the exact role of irrigation return flows in the surface and groundwater quality problems. Agriculturists have viewed this as a natural consequence of the

many processes involved in irrigation of crops.

Whenever water is diverted for irrigation use and applied to irrigated cropland, surface runoff from irrigated land and deep percolation are the major contributors to irrigation return flow. These sources are the conveyors of dissolved salts, plant nutrients, sediments, pesticides, and other pollutants to the stream drainage system (ref.2). The surface irrigation return flows usually contains only slightly higher salt concentrations than the original water supply. The major portion of the dissolved solids, generally increased nitrate content, is present in the water percolating through the soil of the irrigated cropland. Since water is diverted many times from the major rivers for irrigation use and the return flow mixes with the natural flows in the river; the river flows show a continual degradation of quality in the downstream direction. In a study (ref.3) of Agricultural Research Service, Fort Collins, Colorado, USA, the average annual loss of nitrogen to groundwater under irrigated row crops was estimated at 29.6 to 35.6 kg/ha.

#### SOLUTIONS AND CONTROL MEASURES

##### Potential solutions

The unsatisfactory health situation is caused to a large extent, by a lack of proper hygiene and sanitation. Provision of safe water alone will, therefore, be not effective in preventing water/sanitation related diseases unless it is accompanied by proper disposal of excreta and other wastes. Health education stressing personal hygiene and sanitary handling of food must also be given high priority. It is pertinent to mention in this regard that in many locations in India, where need for improved water supply arises, an increase of water quantity for bathing and washing is also required in order to improve personal and domestic hygiene. Hence stress is also needed on the water quantity for washing, bathing and drinking rather than qualitative (drinking) aspects of water only, so that the role of improved water supply may have desired health benefits.

In this context it may be mentioned

that disease transmission is also dependent on a person's and society's behaviour, social norms, and religious or cultural habits. Incidentally, in India, local, cultural, and socio-economic conditions are usually of decisive importance. Integration of behavioural and cultural dimensions into the planning and implementation of water and sanitation programmes seems very much needed. The planning and implementation authorities of such programmes should, therefore, look into this aspect. Involving the community, particularly women, in water and sanitation projects shall help in this aspect; since a community is more likely to cooperate in the implementation, operation, and maintenance of new systems if it has had a say in the preparation of the plans. Such joint planning based on an investigation of the local situation shall have the desired health impact. Recently, a methodology has been proposed by WHO (ref.4) for assessing benefits to health from water supply and sanitation projects. The method permits the conversion of community and project information into a numerical form, thus simplifying the project appraisal process prior to the allocation of resources to project implementation.

Further, for achieving adequate project viability, it is necessary to achieve maximum construction quality and system maintainability. It will be helpful to strengthen local capability, for example, through training of motivated or assigned local personnel to cater for operation, preventive maintenance, minor repairs etc. Promoting community interest by establishing a maintenance committee to control activities of local maintenance workers shall also help in this aspect.

##### Control measures

The most important measure for the prevention of the spread of water/sanitation related diseases is the sanitary disposal of human excreta and protection of water supplies. The standard form of rural sanitation in developed countries is the one based on septic tank and soakage pit or trench. The treatment and the disposal of septage is, however, difficult

and the necessary routine of pumping out septage once in 3-4 years is considered a dirty job (ref.5). Sanitation facilities for rural and urban-fringe areas in India will normally necessitate on-site sanitation systems such as low-cost pour-flush waterseal latrines (ref.6) which can be readily adapted to meet the needs of different areas particularly where water is used for ablution. Ventilated improved pit latrines (ref.7) may also be used instead of traditional (unventilated) pit latrines. These traditional pit latrines have a bad smell and substantial number of flies and other disease-carrying insects may breed in them. The practice of bucket service latrines shall be altogether stopped and replaced with waterseal latrines. It may be rather advantageous to have stabilization ponds for the disposal of sewage originating from the densely populated urban-fringe suburbs of cities, if the community can afford the sewerage system required for carrying the sewage to the stabilization pond.

For the provision of adequate drinking water, perhaps handpumps installed in wells, where groundwater of appropriate quality is readily available, provide one of the simplest and least expensive means of supplying drinking water to rural areas. Even in the urban-fringe suburbs of cities and towns such systems may serve the purpose. In a recent report (ref.8) activities essential for the success of rural and urban-fringe handpump programmes, including community participation, caretaker training, and proper construction of wells and bore holes have been reviewed.

As regards agricultural wastes, including animal and poultry wastes, it seems over 150 types of diseases are spread by animals and animal products, including manure (ref.9). It appears that biogas production from animal wastes, and composting of agricultural wastes may serve as control measures for this problem. It may be mentioned here that the biogas plants set up in India and other South-East Asian countries are considered mainly as rural sources of energy. Perhaps, the biogas workers themselves have not correlated biogas with sanitation in their overenthusiasm for a source of rural energy, despite the fact that biogas is a by-product of sewage

treatment. However, an integrated recycling of dairy farm waste for improved sanitation, energy, fodder, and all round development of the environment has also been reported (ref.10). Reports on the application of organic manure for improved crop production (ref.11) and algal regenerative system for single-family farms and villages (ref.12) are also available. While many workers have made limited studies on different aspects of rural development and a few on integrated farming systems, it seems a total approach to the environment taking simultaneous attention to the social and economic problems through application of appropriate technology in an integrated manner is necessary. Possibilities of improved sanitation, energy in the form of biogas production, manure in the form of compost, utilisation of farm sewage for irrigation, and other social, economic, and health benefits may thus materialise. TOLBA (ref.13) has also discussed the significance of environment as a whole in the matter of health.

It should be mentioned here that prevention and control of quality degradation of water resources due to irrigation return flow will usually be both difficult and expensive. Important methods which can, however, be used to control irrigation return flow quality may include restricting irrigation development in areas of potentially high salt pick-up, regulations on the use of fertilizers or agricultural chemicals, and irrigation scheduling to ensure that proper amounts of water are applied at the times required by the plants.

#### RESEARCH NEEDS

From the earlier discussion it seems research efforts in the following area will be useful :

1. Investigation regarding the relationship between on-site disposal and groundwater quality is urgently needed, since the two solutions to the population's need viz., increased use of groundwater and on-site sanitation systems may conflict, particularly with certain combination of hydro-geological conditions.
2. Although a 'rule of thumb' separation of 15 metres between groundwater supply installations and

on-site sanitation units is widely adopted, investigation towards understanding the complexity of the processes operating in the unsaturated and saturated zones, and the heterogeneity of permeability is very much needed.

3. Development of prediction techniques which describe the quantity and quality of irrigation return flow is very necessary. This will help making long-range projections of water quality in a receiving stream due to irrigation projects.

4. Research efforts are also needed towards biological ways of reducing the dependence of rice farmers on chemically-fixed nitrogen fertilizers. Rice being the staple food of almost two-thirds of the world's population, biological nitrogen fixation as an alternative will help reducing the effects of chemical fertilizers on the environment.

#### CONCLUSION

The need for the provision of adequate supplies of safe water and adequate sanitation facilities is widely acknowledged. Yet water supply and sanitation programme do not always have the desired health impact. Neither do the potential social and economic benefits always materialise. It seems, however, that community participation in water supply and sanitation projects may contribute to the solution of these problems.

Further, increased use of groundwater and major construction programme utilising on-site sanitation systems will be needed to improve adequate water supplies and sanitation facilities in rural and urban-fringe suburbs of cities and towns in India. The extensive use of unsewered disposal systems may, however, cause severe groundwater pollution problems and thus reduce the anticipated health benefits of providing sanitation facilities. Groundwater quality monitoring programme should, therefore, be established whenever on-site sanitation systems and water supply wells and boreholes are to exist side by side.

Finally, in a country like India where majority of the people live in villages, no environmental reform will be meaningful unless the rural masses are made aware of the need for

abatement of environmental hazards in rural communities. However, in India, local, cultural, and socio-economic conditions are usually of decisive importance. Nevertheless, continued sanitation education, with simultaneous attention to the social and economic problems, is likely to lead better sanitation practices.

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