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## **Appraisal of rural water supply in India**



### 1. Introduction

As part of 'Decade' activities, the Central Public Health and Environmental Engineering Organisation (CPH & EEO), Ministry of works & Housing, (since bifurcated) Govt. of India requested the National Environmental Engineering Research Institute (NEERI), Nagpur, to undertake a comprehensive evaluation of completed rural water supply schemes in India. Sixty-six representative water supply schemes from eleven states were critically studied with a view to identify technological, administrative, financial and socio-economic constraints in effective implementation, operation and maintenance of the schemes. Schemes serving population groups below 1000 and between 1000 to 10000 persons and which have been in operation for at least 2-3 years were evaluated. The type of schemes included hand pump tubewells and piped water supply systems with distribution through only public stand posts as well as through public stand posts and individual house connections. Summary data on schemes selected for study are given in Tables 1 and 2.

#### Field Study

The study consisted of field visits to villages for on-site observations, collection and analysis of water samples, personal interviews with villagers regarding degree of service, health status, environmental sanitation etc., and discussions with engineers of State Public Health Engineering Departments and Local officials. Proforma developed and field tested for the purpose were used for collecting information. Relevant data for seventeen reference villages were also collected to compare the

impact of providing organised water supply on the health status of user community.

### 3. Assessment & Evaluation

In-depth evaluation was made of rural water supply systems covering various aspects such as design norms, source of supply and source protection and reliability of yield, treatment, distribution, operation and maintenance, degree of service, financial management, community participation and health impact. Salient observations of the survey and recommendations arising thereof are presented below :

#### 3.1

##### Organisational Set Up

Public Health Engineering Departments (PHEDs), Water supply and Sewerage Boards undertake planning and implementation of water supply and sewerage systems in the States. In some of the states, there are more than one agency to implement rural water supply programmes. In such cases, there is lack of effective co-ordination among the various agencies.

#### 3.2 Planning & Implementation

- Criteria for classification of villages are decided at national state level but norms for priority differed from state to state.
- Objectives set forth with reference to adequacy and reliability of yield at the source and degree of service have not been fully met. Many of the sources tapped for the schemes dry up in summer when the need for water is greater.
- Demands of users for a higher level of service have not been met in many systems (eg. no provision for house connections though the consumer is willing to pay).
- Delay in according administrative and financial approval for taking up the designed schemes has been

noticed.

- Soundness of initial construction of tube wells, stand posts as well as overhead reservoirs has been lacking.
- There is no organised system of evaluation, monitoring and feedback of completed rural water supply schemes to guide future planning and design.

### 3.3 Operation & Maintenance

- Systems maintained by local bodies are not found satisfactory while those maintained by PHED's are costly.
- Irregular electric power supply, particularly during summer, adversely affects the degree of service.
- Performance of India-Mark II deep well hand pumps has been found satisfactory.
- Batch disinfection of water supply using bleaching powder has not been regular and/or effective.
- Bacteriological quality of samples (Table 3) obtained from surface sources and open dug wells is unsatisfactory while that of tube wells fitted with hand pumps is better.
- Community participation is lacking in operation and maintenance.

### 3.4 Financial Management

- Financial Allocation by states as well as the centre for rural water supply programme is very much short of the actual requirements.
- The resource mobilisation by state governments for water supply is inadequate and therefore they look to the centre for grants.
- Financial contribution by the village community, wherever applicable, is often not realised due to the poor financial condition of local bodies-
- Collection of water charges wherever levied has been satisfactory only in those villages where no alternative source of supply is

- readily available to the consumer.
- When distribution is only through public stand posts, collection of water tax, wherever levied, is poor.
- When the operation and maintenance is looked after by any government agency, the allocation of grants for the purpose from the governments is not commensurate with the requirement.

### 3.5 Health Aspects

- Village-wise record/information on morbidity and mortality due to water-borne diseases is conspicuously lacking at Primary Health Centres (PHCs).
- Knowledge and awareness of the role of water in transmission of diseases have been found to be poor.
- Environmental sanitation in general is poor in villages and open field defecation is common.
- Motivation, health education and community participation are lacking.

### 3.6 Community Participation

- Lack of community participation in implementation and management of water supply schemes results in inefficient maintenance, low level of service and poor collection of water tax.
- Wherever alternative sources of water are available and the degree of service is poor, there is a general apathy on the part of the villagers towards the public water supply. This can be largely rectified by involving the community at all stages of planning, implementation, operation and maintenance of water supply schemes.

### 3.7 Constraints

- Scarcity and non-availability of materials in time.
- Inadequate allocation of funds for capital works.
- Lack of trained personnel for operation and maintenance.

- Inadequate funds for operation and maintenance.
- Outmoded administrative and financial procedures causing delay in implementation.
- Financial powers of Chief Engineers and other senior engineers not commensurate with professional capabilities and responsibilities.
- Non-availability of adequate data on health aspects for meaningful interpretation of health impact.

#### 4. Recommendations

1. The 'Decade' target will be difficult to achieve unless water supply (and sanitation) is treated as a core sector and resource allocation matches with the magnitude of the problem.
2. The drinking water supply and sanitation programme should be closely coordinated with programmes in related sectors like rural development, health, irrigation, education, and social welfare to maximise the benefits to the people.
3. In order to coordinate and help the state efforts and formulate national policies and provide guidance, the organisational set up at the national level is grossly inadequate. A strong organisation similar to the Central Water Commission should be created which might be designated 'National Commission for Water Supply and Sanitation'.
4. Water supply is primarily a state subject. Nevertheless, the states look to the centre for funds. It is essential to have norms clearly indicated for classification of villages and allocation of funds at the national level. During execution of schemes, each state should have sufficient flexibility, provided the national norms are adhered to.
5. A separate agency/department is required at state level with its functions decentralised at district level. While the former will be responsible for policy decisions, financial allocation, monitoring and over all coordination, the latter will be the implementing agency (preinvestment studies, design, execution as well as operation and maintenance of the systems).
6. The district level organisation should consist of engineers, district collector, medical health officer, elected representatives, officials of other sectors of development like agriculture, industry with suitable infrastructure.
7. The criteria/norms adopted for the design of rural water supply schemes do not reflect the real situations obtained in many villages. There is an urgent need to review the norms and develop suitable design guidelines for intermittent water supply.
8. Smooth flow of construction materials like cement, steel, pipes and specials to the district level agency should be ensured. Use of plastic pipes be specified to obtain economy and reduce demand on conventional pipes.
9. In view of the experience that water supply schemes handed over to local bodies (Panchayats) generally suffer for want of trained personnel and professional supervision, all the water supply schemes should be entrusted to PHED/district level agency for operation and maintenance.
10. The three-tier system of maintenance of hand pumps evolved in Tamil Nadu, with minor local modifications could form the basis for wider application in all the states. Local persons should be encouraged to participate in the operation and maintenance of water supply systems.
11. Statutory provisions should be made for levy of water tax on the beneficiaries and ensure return of part or whole of the expenditure on operation and maintenance. Any deficit should be made good through grants by the state government.
12. Direct monetary returns, if any, from a rural water supply project is closely linked to the level of service provided by the water agency. Water distribution through house connections creates an awareness among the users, that water when provided through a tap in the house has to be paid for. While

the socio-economic conditions of the user community play an important role in the acceptance of this philosophy, wherever the situations are favourable, provision for house connection service should be made rather than a blanket ban.

13. Monitoring and evaluation and feedback for improvement by implementing agencies of rural water supply projects in general have not been given the attention it deserves. This should form an integral part of any water supply agency with separate cells at state and national level.
14. Training centres should be established at district level or at the existing institutes (ITI) for operators of rural water supply schemes. These centres should have fulfilled workshops to undertake on payment basis minor as well as major repairs of machinery and equipment commonly used in water supply systems.
15. While there is a great deal of political awareness among the rural population, their knowledge, attitude and practice towards use of water supply, sanitation and personal hygiene are far from satisfactory due to lack of motivation and effective health education which should form an integral part of rural water supply programmes. Health guides from amongst the villagers be selected, trained and appointed for the purpose.
16. Community participation should be ensured from planning to implementation as well as continued operation and maintenance. This can be achieved by proper motivation through an integrated and multi-disciplinary team of engineers, health and medical staff, social workers, revenue officials and local leaders.
17. Existing information system at state and national level are grossly inadequate. A suitable system incorporating modern data collection, processing and retrieval system, should be created urgently with suitable linkages at state and national level.
18. Each state should have a research and development wing attached to the Public Health Engineering Department/Boards. At least two per cent of the total investment for the projects in the decade programme should be earmarked for R & D.
19. Health education through mass media like radio-television, films should form part of the total programme.

Table 1 - Village Water Supply Systems Evaluated

| Sl.No. | State          | Number & type of systems selected for study |              |              |                                     |              |              | Reference Villages | Total No. of Villages |
|--------|----------------|---|--------------|--------------|-------------------------------------|--------------|--------------|--------------------|-----------------------|
|        |                | Tubewells with Piped water supply           |              |              | Handpumps with PSP only with PSP+HC |              |              |                    |                       |
|        |                | <1000 popul.                                | >1000 popul. | <1000 popul. | >1000 popul.                        | <1000 popul. | >1000 popul. |                    |                       |
|        |                |   |              |              |                                     |              |              |                    |                       |
| 1      | Andhra Pradesh | -   | 2            | 1            | 1                                   | -            | 2            | 2                  | 8                     |
| 2      | Gujarat        | 1   | 1            | -            | 1                                   | -            | 3            | 1                  | 7                     |
| 3      | Haryana        | -   | -            | 1            | 4                                   | -            | -            | 1                  | 6                     |
| 4      | Kerala         | -   | -            | 1            | 1                                   | 1            | 1            | 1                  | 5                     |
| 5      | Madhya Pradesh | 2   | 1            | -            | -                                   | -            | 3            | 1                  | 7                     |
| 6      | Maharashtra    | -   | -            | 2            | 1                                   | -            | 4            | 2                  | 9                     |
| 7      | Orissa         | 2   | 1            | -            | 1                                   | -            | 2            | 1                  | 7                     |
| 8      | Rajasthan      | 1   | 1            | 1            | 1                                   | -            | 1            | 2                  | 7                     |
| 9      | Tamil Nadu     | 2   | -            | 1            | 1                                   | -            | 2            | 1                  | 7                     |
| 10     | Uttar Pradesh  | 1   | 1            | 1            | 1                                   | 3            | -            | 1                  | 8                     |
| 11     | West Bengal    | 1   | 1            | 3            | 3                                   | -            | -            | 4                  | 12                    |
| Total  |                | 10  | 8            | 11           | 15                                  | 4            | 18           | 17                 | 83                    |

PSP - Public Stand Post

HC - House Connection

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Table 2 - Classification of Schemes According to Operation &amp; Maintenance (O &amp; M) Agency

| Sl. No. | State          | No. of Schemes | Type of Scheme |     |        | O & M Agency |            |
|---------|----------------|----------------|----------------|-----|--------|--------------|------------|
|         |                |                | Hand Pump      | PSP | PSP+HC | Local Body   | PHED/Board |
| 1       | Andhra Pradesh | 6              | 2              | 2   | 2      | 6            | -          |
| 2       | Gujarat        | 6              | 2              | 1   | 3      | 3            | 3          |
| 3       | Haryana        | 5              | -              | 5   | -      | -            | 3          |
| 4       | Kerala         | 4              | -              | 2   | 2      | -            | 4          |
| 5       | Madhya Pradesh | 6              | 3              | -   | 3      | 3            | 3          |
| 6       | Maharashtra    | 7              | -              | 3   | 4      | 7            | -          |
| 7       | Orissa         | 6              | 3              | 1   | 2      | -            | 6          |
| 8       | Rajasthan      | 5              | 2              | 2   | 1      | 1            | 4          |
| 9       | Tamil Nadu*    | 6              | 2              | 2   | 2      | 4            | 2          |
| 10      | Uttar Pradesh  | 7              | 2              | 2   | 3      | -            | 7          |
| 11      | West Bengal    | 8              | 2              | 6   | -      | 2            | 6          |
| Total   |                | 66             | 18             | 26  | 22     | 26           | 40         |

\* O &amp; M by TWAD but cost-borne by Local Body.

Table 3 - Bacteriological Quality of Rural Water Supply in India.

| Sl.No. | Source of Supply                             | Treatment |     | No. of Samples | Bacteriological Quality |       |       |        |       |       |    |    |
|--------|--|-----------|-----|----------------|-------------------------|-------|-------|--------|-------|-------|----|----|
|        |  | -----     |     |                | Coliforms               |       |       | E.coli |       |       |    |    |
|        |  | Yes       | No. |                | +ve %                   | -ve % | +ve % | -ve %  | +ve % | -ve % |    |    |
| 1.     | Hand pump tube wells                         | -         | 21  | 36             | 20                      | 56    | 16    | 44     | 13    | 36    | 23 | 64 |
| 2.     | **Tube well with Power Pumps                 | 9         | 7   | 28             | 21                      | 75    | 7     | 25     | 17    | 61    | 11 | 39 |
| 3.     | Open dug wells                               | 5         | 3   | 15             | 14                      | 93    | 1     | 7      | 12    | 80    | 3  | 20 |
| 4.     | Surface sources (Spring, Canal, River, etc.) | 21        | 2   | 59             | 39                      | 66    | 20    | 34     | 32    | 54    | 24 | 46 |

\* 3 Values missing

\*\* in 3 cases dug well &amp; tube well water mixed for supply

NOTE : Except in case of Handpumps, Samples were collected from PSPs.