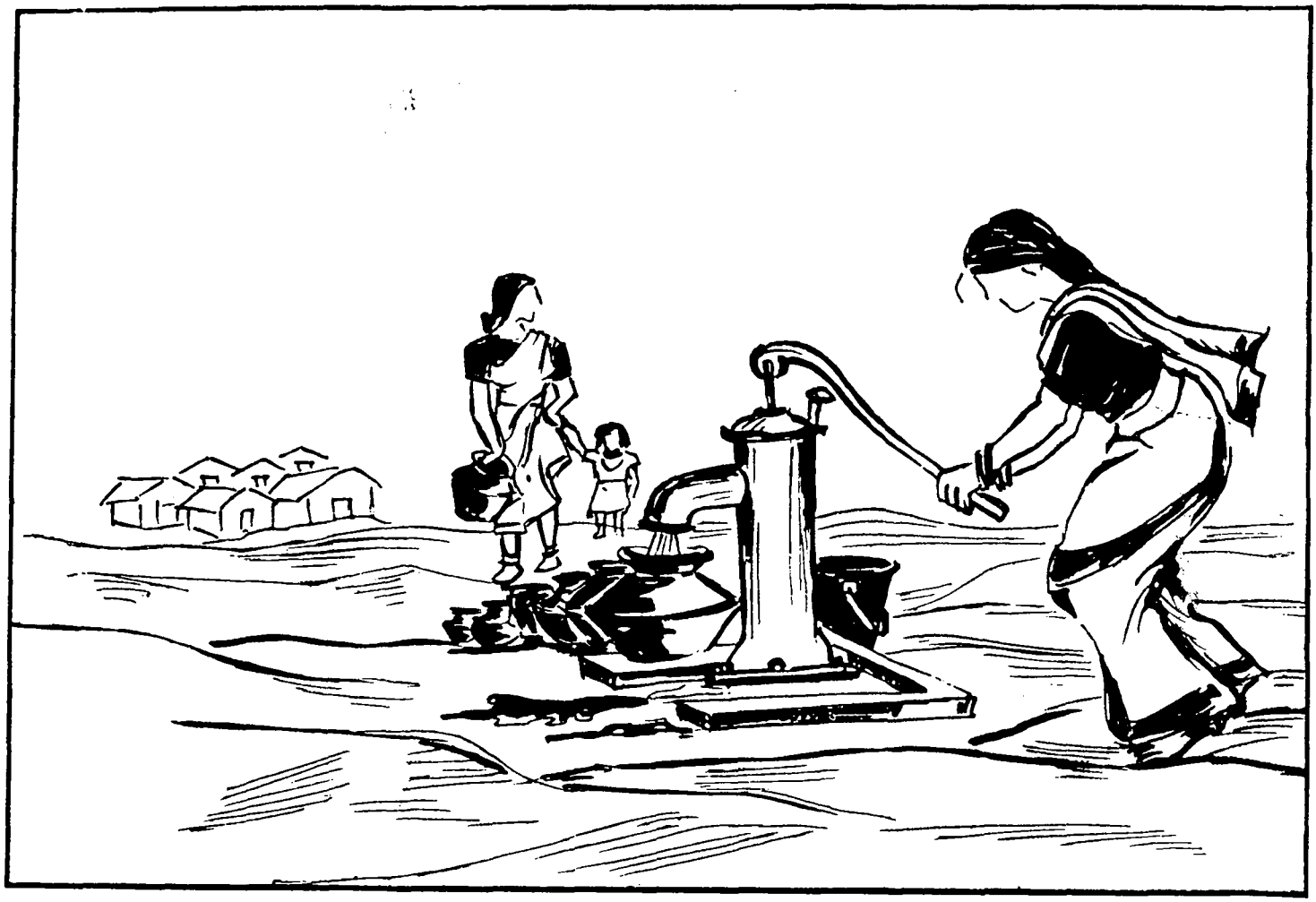
SYMPOSIUM ON INDIA AND THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE

Proceedings



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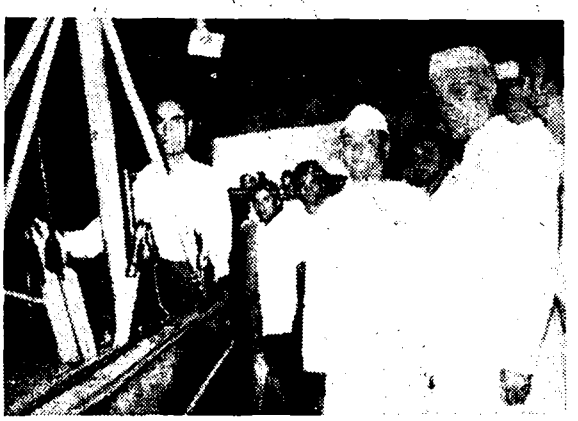

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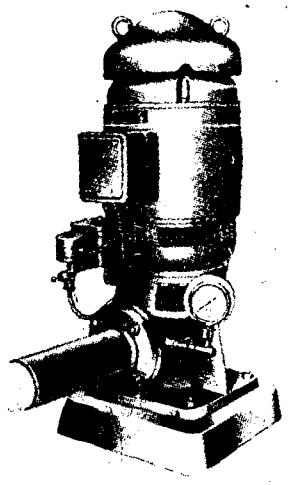

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SYMPOSIUM ON INDIA AND THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE

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FOREWORD

THE symposium held on "India and the International Drinking Water Supply and Sanitation Decade", generated considerable enthusiasm and support for the programme of the Decade from the people from different walks of life. For the first time, all the sections involved in the sector, namely technologists, economists, social workers, leaders of public opinion, equipment manufacturers, consultants, research organisations, universities, State Public Health Engineering Departments, State Water and Sewerage Boards, CPHEEO and a broad spectrum of non-official organisations had assembled at a single forum and discussed the issues and problems involved. The symposium has proved itself a forerunner of the decadal activities in the country.

The discussions and conclusions of the symposium received wide coverage both in the national press as well as AIR and TV. They have evoked a positive and warm response from the Members of Parliament who have been urged to build up the necessary political will both at the Centre as well as at the State levels for successful implementation of the programmes of the Decade. The main objectives of the symposium that is, to stimulate interest in the activities of the Decade and help generate a general awareness among the people, have thus been achieved at least to some extent. However, we have still a long way to go and the objectives have to be pursued further with full vigour and concerted efforts.

There has been a persistent demand from all sections of the people for publication of the full proceedings of the symposium together with full texts of the papers presented at it. It has accordingly been decided to bring out this report on the proceedings of the symposium. In this connection, we are grateful to the Department of Science and Technology, Government of India for their financial assistance in bringing out this publication.

The report is broadly divided into five parts. Part I contains the background to the symposium. Part II gives broad conclusions of symposium. The texts of the papers presented and discussed at the symposium are given in Part III. Part IV consists of the discussions that had taken place in the three sessions which were devoted to the magnitude of the problem, resources and public participation and institutional arrangements, respectively. Part V gives the coverage in the media and the reactions.

It is earnestly hoped that this publication will stimulate further thinking on the issues involved, bring out the much-needed national consensus and commitment for the cause and actively involve the general mass of the people at all levels of implementation of the programmes of the Decade. We call upon the Central and State Governments in India to give these conclusions their utmost consideration.

Part I
Background to the Symposium

BACKGROUND TO THE SYMPOSIUM

THERE is an increasing realisation now in the developing countries that access of safe water supply to a large number of people must be provided. The economic benefits from improving the quality and quantity of village water supplies is generally accepted. Moreover, it is also appreciated that provision of safe water is of prime importance to public health and in combination with other sanitary measures is an essential prerequisite to eradicate many epidemic diseases.

In India, the awareness of the need to ensure adequate safe water supply became pronounced barely three decades ago. The Bhore Committee (1944) which was the first body to be appointed by the Government of India to review the position on a national scale drew pointed attention to the importance of safe drinking water supply. Along with other recommendations, they suggested that the target should be to provide safe water for drinking purposes to the entire population within a period of 35 years with set priorities. The Government of India appointed another Committee, namely Environmental Hygiene Committee (1948) which suggested the preparation of a comprehensive Plan to provide water supply and sanitation facilities to 90 percent of the population within a period of 40 years.

In 1954, the Government of India launched the National Water Supply and Sanitation Programme as a part of the First Five Year Plan with a view to provide assistance to the State Governments and to speed up the process of providing basic amenities to the people. Beginning from 1962, the Union Ministry of Health undertook an assessment of the rural water supply problem to have a right perspective for launching the programme to meet the urgent needs of the scarcity and problem villages on a priority basis.

By 1972, the assessment was completed by the States which showed that there were 1.53 lakh problem and scarcity villages in the country which had to be provided with water supply on a priority basis. It is now estimated that the total number of problem villages that would have remained without provision of safe drinking water supply as on 31st March, 1980, will be about 2 lakhs.

Judging the water supply and sanitation situation in the world, particularly in the developing countries, the United Nations Conference on Human Settlements (HABITAT), held in 1976, recommended that "countries should set targets for community water supply and waste disposal and formulate specific action programmes to attain them, while evaluating the progress made at regular intervals". The U.N. Conference held at Mar Del Plata, Argentina, in March 1977, called that "action must focus on promoting (a) increased awareness of the problems, (b) commitment of national Governments to provide all people with water of safe quality and adequate quantity and basic sanitary facilities by 1990, according priority to the poor and less privileged and to water scarce areas, and (c) larger allocation to this sector from the total resources available for general economic and social development". It was also recommended that the Decade should be designated as 'International Drinking Water Supply and Sanitation Decade' (IWSSD). India is a party to these decisions and the thirtyfirst UN General Assembly formally launched the Decade in November, 1980. In India the Decade commenced from the current financial year from the 1st April, 1981.

The Symposium

The symposium on 'India and the International Drinking Water Supply and Sanitation Decade' was held at the India International Centre Auditorium, New Delhi, on 9th May, 1981. It was jointly organised by the WATER WORLD and DELHI SCIENCE FORUM. The aims and objectives of the symposium were :

- to help create a general awareness in India on the launching of the Decade by the United Nations;
- to support and broaden the base of national activities in India in connection with the Decade;
- to stimulate interest in the activities in India in connection with the Decade;
- to provide a platform to facilitate involvement of manufacturers of equipment and consultancy institutions in the country;

— to provide a forum for voluntary agencies and different workers who are engaged in the Water Supply Sector for closer involvement in the Decade activities;

— to consider and facilitate public participation in the Decade programme.

More than hundred representatives from all the sections involved in the sector attended the symposium, namely technologists, economists, social workers, leaders of public opinion, equipment manufacturers, consultants, research organisations, Universities, State Public Health Engineering Departments, State Water and Sewerage Boards. CPHEEO and a broad spectrum of non-official organisations **(See Annex I)**

The symposium consisted of four sessions which were organised as below :

First Session	—	Inauguration of the symposium and consideration of the 'Magnitude of the Problem'
Second Session	—	Consideration of the resources position'
Third Session	—	Public participation and institutional arrangements
Fourth Session	—	Concluding Session

The following were the Chairmen for different Sessions :

Session	Chairman
First Session	Shri P.R. Vyas Bhiman
Second Session	Shri P.S. Rajvanshy
Third Session	Prof. Ram Lal Parikh
Fourth Session	Shri P.R. Vyas Bhiman

Welcome Remarks

At the outset, Shri K.V. Krishnamurthy, Editor, WATER WORLD, extended a warm welcome to the participants and briefly explained the significance of the aims and objectives of the symposium. He stated that there have been several instances of specially designated years and Decades organised by the international comity of nations but they do not, however, arouse the sustained enthusiasm on a scale expected at the time of launching. The Decade with which this symposium is associated is totally different—because it deals with the provision of such a basic and essential element for the sheer physical survival of human existence as water—water which transcends all divisions, political, economic, social, cultural, caste, creed, etc. It encompasses all sections of the people in all countries, both developing and developed. It should, therefore, be possible to obtain the greatest possible mobilisation of all sections of the people in any country behind such a vital, elementary and essential human demand. Explaining the need for public participation, he stated that the planning of the water supply facilities is spread over such vast areas that it is impossible to conceive how a programme like this can be fulfilled without the involvement of all the people. If ever there is a need of potential for galvanising people's energy and enthusiasm, it is this. The Decade should, therefore, be conceived in such a manner that it energises or activates not only institutions in the Government but also at all levels outside the Government. He explained that, in fact, this is one of the fundamental reasons why this symposium was organised in order to involve sections of people not so far drawn into the activities of the Decade.

The Inaugural Address

The inaugural address was by Dr. K.L. Rao, Former Union Minister for Irrigation and Power. In the absence of Dr. Rao, the address was read by Shri V.V. Prasad, a member of the Editorial Advisory Board of the WATER WORLD.

During the course of his address, Dr. Rao reviewed the progress in the country since independence in the Water Supply and Sanitation Sector. He pointed out certain imbalances between water supply and sanitation on the one hand and between urban and rural sanitation on the other. He called for rearrangement of priorities so that by the end of the Decade, specific and tangible results could be obtained in urban as well as rural India.

Dr. Rao called for abolition of 'centage' charges levied by the department on works designed by the department for clients. He emphasised the importance of ensuring participation of the people in the Sector not only in one or the other aspects like maintenance or operations but in all the phases including planning and construction—not only at the State level or the Federal level but at the grassroot level in each district—nay in every village. He said that it is absolutely essential that the role

of voluntary agencies in the implementation of the programme during the Decade should be strengthened.

Another aspect that Dr. Rao touched upon was in relation to the choice of technology. He said that we have to spread the services to all the sections of our population using low-cost technologies on which there is need for conducting research with an open mind and an innovative spirit. Some way has to be found in order to provide facilities appropriate to our economic, political and social conditions, and it is here that he called upon the engineers and all other technologists working in the field to evolve suitable and appropriate low-cost technologies both in water supply treatment as well as sanitation sectors so that our people can begin to enjoy the minimum human facilities required to lead a tolerably decent life.

Dr. Rao referred to the international climate which has never been more favourable than now for obtaining international financial assistance for the sector from the developed countries. We must, therefore, not only prepare specific projects for obtaining financial assistance but we must also have a flexibility of approach and an open mind to receive constructive suggestions and criticisms from the community of the developed countries. (For full text of the address **(See Annex II)**.

Part II
Conclusions of the Symposium

Conclusions

As a result of the deliberations and discussions on the papers presented, the following conclusions were reached :

A) Magnitude of the Problem

(i) It was noted that the following targets were adopted in India for achievement by 1991.

(a) Urban Water Supply	100%
(b) Rural Water Supply	100%
(c) Urban Sewerage/Sanitation	
—all class I cities with sewerage and sewage treatment	100%
—all class II and other cities with sewerage and other methods	50%
Overall urban sanitation	80%
(d) Rural sanitation sanitary toiltets	25%

These targets indicate a higher priority for water supply vis-a-vis sanitation and, in sanitation, a higher priority for urban vis-a-vis rural sanitation.

The Plan of Action adopted at Mar Del Plata recommended a hundred per cent coverage of urban and rural population in respect of both water supply as well as sanitation, if possible. Hundred per cent coverage in water supply would necessitate corresponding coverage in treatment and disposal of waste water. As water supply and sanitation have to develop in a coordinated manner, the possibility of hundred per cent coverage in sanitation (not necessarily water-borne sewage disposal) in urban and rural areas may be given due consideration. The priorities may be reviewed and rearranged with a view to restoring a more balanced attention between water supply and sanitation and between the urban and rural sectors.

(ii) The targets in the Sixth Plan for water supply and sanitation and those set for 1991 as objectives of the Decade are expressed in percentage coverage of the population. If the targets are fixed in physical terms, it appears that the effort in the field of urban water supply during the next decade should be about twice the effort during the last decade and in case of rural water supply, it should be about four times the performance in the last decade. Added the problem of augmentation, the magnitude will be much more.

(iii) Regarding assessment of coverage, there is need to make an assessment of the present status of coverage in order to serve as a bench mark against which progress during the decade should be evaluated and monitored. Monitoring and reporting systems should be set up at State level and reporting to the Centre should be ensured on a uniform pattern.

(iv) The targets may be fixed and specific action programmes formulated in such a manner that progress could be evaluated at regular intervals.

B) Resources

(i) In regard to the resources position, the symposium considered the resources in the following sub-divisions :

(a) Financial;
(b) Equipment and material; and
(c) Manpower

(ii) The Decade's objectives by 1991 would not be possible of achievement, unless there are larger financial allocations in the Sixth Plan for this sector.

(iii) Water supply and sanitation may be included in the core sector like power, so that these aspects receive priority attention in the matter of resources and material allocations in the planning process.

(iv) Greater emphasis must be placed on the specific preparation of definite project reports in accordance with the international standards with detailed financial and economic analysis to serve as an adequate basis for funding.

(v) Socio-economic studies must be initiated in order to assess the existing tariff structure and evolve suitable charge policies to be adopted in making the water supply and sanitation schemes

self-supporting to the maximum extent possible and to serve as the basis for the formulation of a national policy.

(vi) A thorough-going and in-depth study should be made of the equipment and material resources required for the Decade in collaboration with Public Sector as well as Private Sector agencies so that the manufacture of indigenous equipment and the production of key and essential materials is planned in close relation to the programmes and projects for implementation during the Decade.

(vii) R & D effort should be intensified particularly in the development of alternative materials and equipment in order to overcome the constraints in the sector caused by scarcity of indigenous material and equipment.

(viii) In respect of manpower, an assessment should be made of manpower requirements at the various professional and sub-professional levels and intensive training programmes should be undertaken in order to provide necessary trained technical manpower for implementation and maintenance of the programmes.

C) Public Participation and Institutional Arrangements

(i) It is necessary that the Decade should be conceived as a massive national campaign, as visualised in the Mar del Plata Plan of Action. There cannot be any significant change in the tempo of progress unless the movement is broad-based involving not only technologists but also the leaders of public opinion in all walks of life in the country. Coordinating Committees should be established at various levels in the country starting from grass-root levels in the villages, districts, states and finally at the central level. Such committees should include not only representatives of Government departments, both technical as well as others but should also include representatives of the public institutions, voluntary agencies and leaders of public opinion in the country so that the movement for the Decade gains a new dimension and a new import. Unless this is done, there is every likelihood that the Decade's objectives would remain, though desirable, difficult of achievement in practice. The movement for the provision of drinking water facilities and santitation touches upon the human requirements of all sections of population and, therefore, an effort should be made on a truly national basis in order to develop a broad-based movement to ensure the success of this Decade.

(ii) Water supply sector should be effectively coordinated with other related activities like Irrigation, Command Area Development, Integrated Rural Development, Health, Water Pollution control, etc.

(iii) Women and women's organisations should be involved at all levels of decision making in the planning, implementation, operation, maintenance and monitoring of all schemes in the water supply and sanitation sector.

(iv) A look back survey should be initiated, particularly in respect of rural water supply schemes, in order to evaluate past failures and to incorporate remedial features in the planning of future schemes. This survey should investigate failures in respect of (1) sources, (2) pumping machinery, (3) power or diesel supply, (4) construction, (5) per capita levels of supply. Such survey should be initiated in each State in the country.

(v) Manufacture of rigs should be considered a small-scale industry with a view to encourage the manufacture of cheaper rigs.

(vi) Village and District Water Committees should be established in order to enable public participation and to ensure close association of people with the planning and implementation of Water Supply and Sanitation schemes.

(vii) The Central Public Health and Environmental Engineering Organisation should be suitably strengthened to enable it to cope with the increased activities in the Decade.

(viii) A National Water Supply and Sanitation Commission should be established consisting of the concerned Ministers in all the States and the Centre to plan, implement, coordinate and monitor all the Decade activities at the national level.

Part III
Papers Presented at the Symposium

List of Papers

A. Magnitude of the Problem

1. India and International Drinking Water Supply and Sanitation Decade	P.K. Chatterjee M.M. Datta
2. Rural Water Supply : Achievements, Goals and Constraints	P.K. Chatterjee V. Venugopalan
3. Problems of Rural Water Supply in India	Dr. Kanwar Sain
4. Norms for Rural Water Supply	B.B. Rau M.M. Datta
5. Quality Water	K. Rudrappa K.L.L. Narasimhan
6. International Water and Sanitation Decade—Is it a dream or reality ?	Gyan Sagar
7. Sewage Treatment and Its Essenitals	P.S. Rajvanshy S.K. Mishra
9. Social and Epidemological Issues in Rural Water Supply Programme	Prof. D. Banerji
8. Rural Drinking Water Supply	Col. B.L. Varma
10. Water Supply in Mewat Region of Haryana	Subhan Khan, R.K. Punjia, M.L. Sharma
11. Rural Water Supply in India	Bhanu Pratap Singh
12. Report from Andhra Pradesh	U.R.K. Murthi
13. Report from Haryana	M.M. Datta
14. Report from Jammu & Kashmir	G.M. Kanth
15. Report from Karnataka	P.R. Bellubbi M.V. Ramaswamy
16. Report from Punjab	Bhupinder Singh
17. The Decade in Tamilnadu	R. Krishnaswamy S.A. Jagadeesan
18. Targets and Constraints in West Bengal	S.K. Das Gupta
19. Report from Andamans	---
20. The Decade in Meghalaya	P. Arunachalam

B. Resources

1. Financing for Rural Water Supply and Tariff Policy	K.R. Qureshi
2. Provision of Basic Services for the Urban Poor	D.N. Basu C.V. Vaidya J.D. Maskara
3. Imporatance of Tubewells in Programme of the Decade	G.L. Malik
4. Mini Water Turbines for Water Supply in Hilly Regions	D.R. Bhutani T.N. Visweswara
5. Water Supply and Sanitation Decade—Training and Research needs	Prof. K.J. Nath

C. Public Participation and Institutional Arrangements

1. Women and Problems Associated with Water Supply and Sanitation	Ms. O. Jean Chapman
2. Information Support for the Decade	S.G. Bhat S.K. Kesarwani

D. Other Documents

1. Community Water Supply and Waste Disposal	(Recommendations of the United Nations Water Conference 1977)
2. Community Water Supply—Action Plan	(Resolution—II of the United Nations Water Conference, 1977)
3. Background papers presented on :	
i) Magnitude of the problem	
ii) Resources	
iii) Public participation and institutional arrangements	

Texts of Papers

A Magnitude of the Problem

India and International Drinking Water Supply and Sanitation Decade

By

P.K. Chatterjee* & M M. Datta**

INDIA is the most populous country in the South-East-Asia region, the second most populous in the world and ranks as the seventh largest country, covering an area of 3,267,500 sq. km. The landmass of India rises from sea level in the south to the Himalayan heights in the north. The sub-continent lies between 8°.4′ and 37°.6′ north latitude and 68°.7′ to 97°.25′ east longtitude, with the tropic of cancer dividing the country in two halves. It is approximately 3,200 kms. from north to south and about 2,500 kms. from east to west.

During 1975 India's population was about 621 million of which 124 million (21.6%) was urban, distributed over 147 towns of over 100,000 population each, 185 towns between 50,000 to 100,000 and 2309 towns with a population of less than 50,000 each. The rural population of 480 million lives in 575,721 villages, 55% of which has a population of less than 500 each, and 44% of 500 to 5,000, and the remaining 1% of the villages have a population of over 10,000 each. The country is divided into 22 States and UnionTerritories and has a density varying from 100 to 550 people per sq. km.

The National Water Supply and Sanitation Programme (NWSSP) was included as a part of the National Five Year Plan of Development in 1954. The outlay and expenditure on Water and Sanitation Sector in the First Five Year Plan (1951-56) was only Rs. 49.00 crores (2.45% of total Public Sector Outlay of Rs. 1960.00 crores in the First Five Year Plan) and Rs. 11.00 crores respectively. Compared to that, the outlay and expenditure of this Sector during the Fifth Five Year Plan (1974-79) was Rs. 970.68 crores (2.47% of total Public Sector Outlay of Rs. 39304.00 crores in the Fifth Five Year Plan) and 781.50 crores respectively. The tentative outlay as envisaged for this Sector in the Sixth Five Year Plan (1980-85) will be of the order of Rs. 3500.00 crores (3.89% of total Public Sector Outlay of Rs. 90,000.00 crores in the Sixth Five Year Plan).

In terms of percentage of population, the following table indicates the coverage in Water Supply and Sanitation Sectors in India as obtained in 1980.

Urban Water Supply	82%
Rural Water Supply	30%
Urban Sanitation	27%
Rural Sanitation	2%

Though on Urban Water Supply front the progress is not very discouraging, in the rural water supply, out of 1.53 lacs problem villages (as identified during 1972) about 40,000 villages had only been covered by the various State Governments & UTs till the end of March, 1977. Coverage of problem villages (1972 identification) during the last three years is as under :—

1977-78		12.922
1978-79		20.920
1979-80		18.535
	Total	52.377

Thus it is observed that about 92.377 problem villages have been covered upto March 1980. Many of the State Governments claimed that the original list of problem villages did not represent the magnitude of the problem, partly because of incomplete survey and partly because of drought conditions subsequent to 1972. It was decided to obtain information from all the States and Union Territories about the problem villages as on 31.3.1980 satisfying the criteria as laid down earlier. The details are

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now being received from the State/U.T. Governments. In the absence of full particulars, it is estimated that the total number of problem villages that would have remained without provision of safe drinking water supply as on 31.3.1980 will be about 2 lakhs.

Water supply and sanitation is a state subject. The Central Govt. has from the beginning impressed upon the State Govts, UTs to give priority to provide safe drinking water to backward areas predominantly inhabited by the Scheduled Castes and Tribes. In a recent study carried out by the Programme Evaluation Organisation of the Planning Commission, it was revealed that 34% of the localities inhabited exclusively by the poor (poor as defined in the study "Those who belong to the Scheduled Castes and Tribes and the landless agricultural labourers") only 16% had drinking water points through pipes, borewells, tubewells and drilled holes. As against this, 17% of the localities inhabited exclusively by the non-poor 19% had the water points. Similarly the piped water points in the localities of the poor were only 10% as against 17% of the localities of the non-poor. Pipe water private points were 3 times more in the localities of the non-poor as compared to the poor. The many reasons why the poor have not benefited from the drinking water facilities is that the points were far away (point at a distance) or there were alternative sources close by. In the field of urban and rural sanitation, very little has been done in the last 25 years in the country. This shows concentrated efforts are urgently needed to improve water supply and sanitation in the country.

In India, water supply and sanitation are state subjects and planning and implementation are done by the State Government. The Union Ministry of Works and Housing which exercises control through the Central Public Health and Environmental Engineering Organisation (CPHEEO) ensures coordination, guidance and monitoring of plan activities. To secure a well integrated development, priorities and goal setting are decided between 'the Centre and the States, the Planning Commission operating as the coordinating agency. In Rural Water Supply sector, State efforts are supplemented by resources in the Centrally Sponsored Accelerated Rural Water Supply Progamme since 1977-78.

The Planning Commission coordinates the proposals of all the Ministries and approves the policies, programmes and allocation of funds to the different Ministries and State Govts. for their programmes.

The Department of Economic Affairs in the Ministry of Finance is responsible for allocation, distribution and reimbursement of financial assistance received from various foreign agencies under water supply and sanitation programme of the country.

The following constraints affect the attainment of National Water Supply and Sanitation objectives.

i) Lower priority in Development programme

Water Supply and Sanitation is not in the Core Sector. It is a part of the Social Services Sector and does not get due priority in the planning process. Due to restricted overall resources of the State Governments, if cuts are to be made in the plan outlays, the Social Services Sector including the water supply Sector suffers. Right from the inception of the First Five-Year Plan to date, the outlays for water supply and sanitation sector have been very low in relation to the overall plan outlays.

ii) Insufficiency of internal finance :

As the resources position at the State level is very difficult, it always happens that the final plan outlay for the water supply and sanitation sector is much lower than what was drawn up originally. power, irrigation, agriculture, which are in the core sector get higher outlays.

iii) Inapporpriate financial framework :

Funds from external resources, such as World Bank, bilateral aids, etc. as well as funds to be generated from L.I.C. are all pooled in the country's plan resources and as such there is no additionality to the plan, once the plans are finalised. The beneficiaries contribution to the water supply sector is also very meagre, that too restricted in the urban areas. Local Bodies and Panchayat institutions are financially too weak to be in a position to contribute for projects in the water supply and sanitation sector.

iv) Insufficiency of materials :

More than 50% of the cost of water supply and sanitation projects go towards the cost materials, such as pipes etc. It has been the experience that shortage of pipes and scaricity of cement for imple. menting the water supply and sanitation projects in the country are two of the major constraints. At present, even though there is adequate installed capacities for the manufacture of pipes, most of the units manufacturing these items are working far below their installed capacity. The reasons are :

—shortage of power
—shortage of raw materials
—shortage of coal
—industrial relations problem
—shortage of wagons for the conveyance of raw materials as well as finished products.

For some of the States which are implementing time bound schemes, the matter was taken up with the concerned Ministries for solving some of the problems faced by the industry. Measures are also being taken up by the Govt. of India and it is hoped that the present shortage of cement might be overcome within a short period.

Inappropriate organisational infra-structure

To meet the increased workload expected during the Decade as well as to obtain long term credits from lending agencies on easy terms, it will be necessary to have suitable organisational reforms which have necessarily to be much different from the existing ones. Autonomous organisation with special powers to get loans from open markets both within and outside the country would be appropriate.

Judging the water supply and Sanitation situation in the World, particulary in the developing countries, the United Nations Conference on Human Settlements (HABITAT) held in 1976 recommended that safe water supply and hygienic waste disposal should receive priority from Governments and international agencies. The U.N. Water Conference held at Mar del Plata, Argentina, in March, 1977, called for the provision of clean water and sanitation for all during the decade 1981-90. It was also recommended that the decade should be designated as 'INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE (IWSSD)' —India is a party to these decisions and the 31st UN General Assembly formally launched the Decade, in November, 1980. The International Conference on Primary Health Care, held at Alma Ata, USSR, in 1978, also emphasised the importance of water supply and sanitation facilities to the health of people all over the world. According to the W.H.O. 80% of all sickness and disease in the Third World is attributable to contaminated water. The conference accorded high pirority to the provision of adequate supplies of safe water as well as basic sanitation.

India was represented at all these Conferences and was a signatory to the resolutions.

The present levels of population coverage in the water supply and sanitation sector in India are indicated below along with the recommendations for 1990 made by the Regional Consulation meeting held in November, 1979, and by the Conference of Chief Engineers held in February, 1980:

	As obtained in 1980	Target set for 1990
a) Urban Water Supply	82%	100%
b) Rural Water Supply	30%	100%
c) Urban Sanitation	27%	80%
d) Rural Sanitation	25%	25%

A beginning has already been made in the country by declaring country's intention to accord high priority to rural drinking water supply in the Sixth Plan period (1980-85). The target is to cover all the problem villages with safe drinking water supply by 1985.

The following actions were taken in India during the preparatory phase of the Decade.

A rapid assessment was undertaken of the status of drinking water supply and sanitation in India jointly by the World Health Organisation and Government of India and a clear picture emerged of the dimensions of the problem to be solved in the future.

A sector study was carried out covering the present status of water supply and sanitation sector, as well as future requirement of funds, materials

and man power for all the States and Union Territories in India.

The Government of India, in collaboration with World Health Organisation, organized a Workshop during November 1978, at New Delhi wherein most of Chief Engineers of the States participated. The workshop discussed the preparedness of the States for taking up the Accelerated Sector Development as well as steps needed to overcome constraints. A rough assessment was made of the projected requirement of funds for the Decade of about Rs. 15,000 crores (based on the State Government indications).

In 1979, the Government of India informed to the UNDP that the Technical Wing of the Ministry of Works & Housing, namely the Central Public Health and Environmental Engineering Organization (CPHEEO) will serve as an over all national co-ordinating machinery as well as the country's focal point in respect of activities connected with the International Drinking Water Supply and Sanitation Decade.

A Conference was held at Nagpur in 1979 of State Chief Public Health Engineers to discuss the Decade Programme with special reference to minimum service in the sector, within urban and rural areas.

The Regional Consultation meeting held by WHO at New Delhi from November 26-28, 1979, was attended by Indian team consisting of Adviser (PHEE), Planning Commission, and Joint Secretary (Technical Cooperation), Department of Economic Affairs, Ministry of Finance, Government of India.

Realising the need to accept lower standards of service and keeping in view the decisions taken at the Nagpur Conference in November, 1979. CPHEEO projected the requirement of funds for the Decade Programme, to achieve the goals set, at around Rs. 10,900 crores, as under :

	Rs. in Crores
(a) Urban Water Supply	2,475
(b) Urban Sewerage & Sanitation	2,590
(c) Rural Water Supply	4,228
(d) Rural Sanitation	1,584
Total	10,877
Say Rs.	10,900 crores

A conference of Chief Engineers (PH) and Senior Engineers was held at Trivandrum in February 1980, where discussions centered around the preparatory actions for international Decade as well as requirement of materials and manpower for the Decade Programme. The Conference resolved that the following coverage target for the Decade may be adhered to :

(a) Urban Water Supply 100%

(b) Rural Water Supply 100%

(c) Urban Sewerage/Sanitation 100%

(d) Urban Sewerage/Sanitation 100% of all class I cities with sewerage and sewage treatment and 50% in respect of class II and other cities with sewerage and other methods of sanitary disposal of human wastes. (Notes : Overall coverage would be 80% by means of sewerage or other simple sanitary methods of disposal).

(e) Rural Sanitation 25% or more to be covered with sanitary toilets.

A conference of Chief Engineers (PH) was held in Ootacamund in May 1980 to discuss the plans for the International Drinking Water Supply and Sanitation Decade wherein it was decided that CPHEEO in cooperation with WHO will prepare and circulate proformae in order to collect data on uniform basis all over the country with a view to enable the preparation of the National Document pertaining to the Decade Programme.

A set of 28 tables (Proformae) was prepared and circulated to all the States for collection and compilation of data.

Four Indian consulting firms were engaged to assist some of the States and Union Territories in the collection and compilation of data in the pres-

cribed proformae as well as to assist them in collecting adequate data for the preparation of the feasibility report of selected projects in each State/ Union Territories which could be presented for external financial assistance.

Four regional meetings were held in 1980 at Chandigarh, Calcutta, Bangalore, and Panjim. These meetings were attended by Chief Engineers of the different States/UTs. in the region as well as Secretaries, in addition to the representatives from CPHEEO and WHO. The discussions in these meetings centered around collection and compilation of data in the prescribed proformae within the prescribed time as well as collection of data for the preparation of feasibility reports.

Guidelines for the preparation of projects acceptable for World Bank assistance were circulated to all the States/UTs.

A conference of Chief Engineers (PH) was held at Hyderabad in December, 1980 and the Draft National Document was discussed. At the concluding session of the conference, a broad decision on the preparation of the National Document has been taken and will be amended accordingly in collaboration with State Governments for presentation to the National Development Council.

Govt. of India has set up an Apex Committee (National Action Committee) to give guidance in the preparation of the National Documents.

The Apex Committee on the International Drinking Water Supply and Sanitation Decade, has constituted three working groups—one for the Resources Requirements, second for materials and equipment requirements and third for manpower requirements for the Decade Programme. These working groups have to submit reports to the Member-Secretary of the Apex Committee, before the end of February, 1981.

Rural Water Supply : Achievements, Goals and Constraints

By

P.K. Chatterjee* and V. Venugopalan**

THE awareness of the need to ensure adequate and safe water supply became pronounced barely three decades ago. The Bhore Committee (1944), which was the first body to be appointed by the Government of India to review the position on a national scale, drew pointed attention to the importance of the safe drinking water supply. Along with other recommendations, they suggested that the target should be to provide safe water for drinking purposes to the entire population within a period of 35 years with set priorities.

The Government of India appointed another Committee, namely Environmental Hygiene Committee (1948) which suggested the preparation of a comprehensive plan to provide water supply and sanitation facilities to 90% of the population within a period of 40 years.

In 1954, the Government of India launched the National Water Supply and Sanitation Programme as a part of the First Five-Year Plan with a view to provide assistance to the State Governments and to speed up the process of providing basic amenities to the people. Starting from 1962, the Union Ministry of Health undertook an assessment of the rural water supply problem to have a right perspective for launcing the programme to meet the urgent needs of the scarcity and problem villages on a priority basis. A preliminary assessment in 1965 showed that about one third of the rural population lived in villages which suffered from water scarcity and health problems such as cholera, guinea-worm, etc.

By 1972, the assessment was completed by the States which showed that there were 1·53 lakh problem and scarcity villages in the country which had to be provided with water supply on a priority basis.

The outlay for rural water supply in the last 27 years (1951-78) has been over Rs. 840 crores. The Government of India have announced a decision to achieve the target of providing complete coverage of all problem villages before the end of the Sixth Five-Year Plan (1983). With this in view, the tentative plan outlay for the VI Plan (1978-83) has been fixed at Rs. 1,387 crores. Out of this, Rs. 326 crores has been provided under the Central Sector for the Accelerated Rural Water Supply Programme to assist the States

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with cent-per-cent grant for the problem and scarcity villages. The State Governments are also required to take up problem and scarcity villages even under the State Sector Revised Minimum Needs Programme.

INDIA is one amongst the developing nations which have made an impressive beginning to achieve the goals set up at Mar del Plata as well as recommendations of the 31st U.N. General Assembly. With special emphasis laid by the Government and increased outlay for rural water supply one should expect to achieve the target of serving each and every villager with basic minimum and safe water supply by 1990. It is also the endeavour of the U.N. and International Agencies such as, UNDP, WHO UNICEF, World Bank; ILO and ESCAP to assist the member countries in fulfilling the targets set for 1990.

The planners and decision-makers who are aiming at fulfilling the targets set for 1990 in the field of water supply should also have a look at the major constraints in the implementation of the programme. The major constraints in the development of the sector can be classified under the following three major heads :

(i) Funds and associated items;

(ii) Technical problems;

(iii) Organisation, planning and management.

(i) Funds and associated items :

A lot of problems are envisaged especially for locally generated funds. The beneficiaries' contribution in rural areas has been discouraging. As the majority of the people are below the poverty line in rural areas, contribution towards not only capital cost but also towards annual recurring expenditure becomes difficult. It also becomes difficult to make rural water supply self-supporting as the tariff structure cannot be drastically increased due to the people's inability to pay. Raising loans from banks for the sector becomes difficult as the rate of interest charges is very high and the repayment period is short. The assistance from international agencies such as the World Bank is limited though they are offered at cheaper rates of interest with longer term of repayment. However, conditions imposed, such as making water supply and sanitation sector to be run on commercial lines and to make them self-supporting, are difficult to be fulfilled in case of rural schemes.

(ii) Technical problems

The following are a few items which act as constraints :

(1) Lack of proper organisation to carry out investigation; and prepare projects which can be posed to lending agencies;

(2) Lack of adequate projects to utilize bilateral assistance which is made available now and then;

(3) Lack of development of appropriate technology in the sector as well as low cost solutions in the field;

(4) Lack of knowledge of software, such as community participation.

(iii) Organisation, Planning and Management

There is urgent need for :

(a) Setting up of Autonomous Water Supply and Sewerage Boards in all the States clothed with powers to raise finances from the open markets;

(b) To overcome the deficiency in the sub-professional and artisan level;

(See page 30)

Problems of Rural Water Supply in India

By

Dr. Kanwar Sain*

LACK of clean water supply lies at the root of a majority of illnesses in the third world countries. Shortage of clean water for washing gives considerable scope to skin and eye infections. Diarrhoea in combination with malnutrition is the biggest killer of the third world.

Studies have shown that better water and sanitation could cut most of the ailments by anything from 50 to 100 per cent. The WHO Director-General, Halfdan Mehler comments: "The ratio of hospital beds to population is far less important than the water taps to population ratio in achieving community health. Investment in water is not just humanitarian measure; it brings immediate bankable savings." It has been estimated that for just $ 3 per head, every man, woman and child in the developing world will be able to get safe drinking water: the world roughly spends $ 100 per head on armaments every year.

In India, paucity of funds and other competing claims on available resources were responsible for the slow growth of rural water facilities during the last five Plans. Even after an expenditure of Rs. 622 crores, only 64,000 villages, covering 10 per cent of the rural population, had safe drinking water supply facilities at the commencement of the Five-Year Plan 1978-83, and about a lakh of problem villages had not even the elementary water supply facilities. The real beginning in tackling the problem of rural water supply was made only from the Fourth Plan onwards. In the Fifth Plan this was brought under 'Minimum Needs Programme' and outlays were specially ear-marked for water supply in problem and difficult villages. An assessment survey undertaken in 1971-72, at the instance of the Central Government, identified 1.52 lakh villages as falling under the category of problem and difficult villages. The State Governments, however, felt that this earlier survey was incomplete and due to continuous drought in some areas, the water table had dropped down or the sources of water had dried up, thereby increasing the number of difficult villages. According to the figures now made available by the State Governments, the number of these villages is about 1.54 lakhs at the end of 1977-78 notwithstanding the water supply made available to many such villages after 1971-72. It is thus necessary that the situation is correctly assessed so that a realistic plan could be drawn up.

Low-Cost Solutions

Providing adequate water supply to the problem and difficult villages requires large investments. As such low cost solutions are essential to spread the investment to as many villages as possible. The approach, to start with, should be one well for the village so that the villages are assured of a definite sources of safe water supply. Piped supplies are highly costly and may be adopted only where the less costly measures, such as tubewells and sanitary dug wells, are impracticable on account of the geographic, and terrain conditions. The Plan provides Rs. 765 crores as outlay for the period 1978-83. With this outlay it may be possible to cover most of the problem and difficult villages and to augment water supply in such vil-

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lages where the supply is utterly inadequate or unprotected.

It will be realised that huge investments necessitate public participation on a large scale. Cheaper technologies would be necessary and new drilling and pumping techniques will have to be discovered. Also the programmes in this field should involve, increasingly, the community itself both in the decision process and implementation. Throughout Latin America, democratic water committees choose sites; provide free labour and collect contributions for the important task of maintenance.

In Bangladesh 50,000 tubewells in a year are being installed with UNICEF help. Local industries have grown up to make the pumps, and a comprehensive repair and maintenance network with village caretakers has been set up. Three quarters of the rural households are now within 200 metres of a tubewell. Still problems remain. While everyone uses tubewell water for drinking, they still get water for washing from polluted rivers and ponds.

Specific Action Programmes

With the Water Decade international and national preparations are gathering pace. Far too many countries, however, have yet to draw up specific action programmes. Seven of the leading United Nations Agencies have recently joined in a cooperative action group to coordinate international effort. Responsible representatives of the U.N. development programmes will help coordinate assistance for individual countries. Special efforts, however, will be needed to improve organisation and training on national and local levels by linking water supply with primary health-care and rural development.

Technologies and expertise exist to make the 1990 target possible. It is, however, necessary that local participation is ensured to mobilise and channelise funds in the right direction. The third world countries will have to divert more resources to rural areas which contain about two-thirds of the population but got only 17 per cent of the investment in water and sanitation in early seventies.

If one waits for the availability of vast amounts of international aid, the programmes will have to wait for a very long time. Local and national resources supplemented by bilateral international funds can provide the basis for rapid extension of water supply to the people on a large scale.

In the developed countries like North America and Western Europe, the community has learnt the value of safe water supply. Although in the beginning, the Federal and State Governments had to subsidise the capital cost on providing such services, local communities are now willing to finance such services through bonds as well as pay sufficient service charge for keeping the services going.

AS FREE AS AIR ?

In the developing countries incomes from most water-supply systems, at present, hardly pay for the interest or ammortization of capital investment. In fact, it is rare that such incomes support even the operation and maintenance costs. The commodity such as water which does not have adequate selling value is unlikely to be an attractive investment. On the other hand, no government, howsoever humanitarian or socialistic its policy may be, can successfully supply to the people with essential services such as electricity, water and sewerage without any hope of repayment in some form or the other. The cost of the utility services must be reimbursed at least in part if not in toto as each community is gadually raised to a level of self-support. The mythology that a commodity which costs money to produce and to deliver can be as free as the air must be rapidly expunged from the minds of both the officials and the people. It is worth pointing out here that almost no where in the world is electric power provided free.

To cover payment for water investment, property tax and levies from other sources have been used. It is, however, rare that both capital charges and maintenance and operation cost are fully provided for. The position was summed up by Eugene Black, the then President of the International Bank for Reconstruction and Development in the following words :

"A steadily expanding supply of essential public utility service is a requisite of economic growth in underdeveloped countries today. Over the next decade many thousands of millions of dollars in capital for these services must be found. There is simply no practical way to raise this money unless a substantial part of it is generated by the utilities themselves by adequate charge to the users of these services."

As far back as 1961 the National Water Supply and Sanitation Committee appointed by the Ministry of Health, Government of India concluded: "The solution of sanitation problems in India will require that local bodies should be encouraged to promote water supply and sewerage schemes as of self-supporting nature just as electricity undertakings are provided and operated The method of financing should be patterned after the procedures and practices which have succeeded and established themselves in the more advanced countries with such modifications as are dictated by conditions in this country. The Committee has, therefore, no misgivings of such a venture failing if pursued vigorously. A certain amount of initial education and leadership would be necessary in order to wean the citizens and the local bodies from their established conventional notion that drinking water should be provided as a partial gift by the Government."

This writer also believes that people can and do learn to pay for safe drinking water if one takes pains to make the facts understood.

Public Participation

Public participation, in the matter of financing the water-supply schemes as well as in their execution is imperative if the Indian villages are to be provided with adequate and safe drinking water in a reasonable time. It is to be granted that the per capita income of the people living in Indian villages is pitiably low and they cannot be expected to contribute in a large measure towards the huge investments required for such a project. But, notwithstanding this limitation, there is a way and an important way whereby they can contribute towards this venture and that is their contribution in the shape of their labour. Such a contribution could partly be as 'shramdan' and partly be on the basis of wage payment. After all the aim is to provide them with something which they need badly. This has necessarily to be on a self-supporting basis. Unless people help themselves no one else can.

Whereas public participation is necessary in providing this basic requirement, the use of local materials is never the less essential if the scheme is to be made economically viable and as such in preparing plans for water-supply, care should be taken to use local materials to the greatest extent possible even if some innovation in details of the designs and specifications is necessary.

Rural Water Supply : Achievements, Goals and Constraints

(From page 27)

(c) To organise training programmes for drillers and technicians;

(d) To arrange advance level training for managerial personnel and select areas such as hydrogeology, geophysics, system analysis, etc.; and

(e) To make an assessment of the materials and equipment required for the Decade Programme and to carry out advance planning for stepping up production of materials and equipment in the country.

Project planning, programming and implementation are to be done so as to ensure the fullest involvement and participation of the local authorities/communities concerned. Relevant decisons for implementation and operation, maintenance for the facilities must be agreed between the executive departments, local government/panchayats.

Norms for Rural Water Supply

By

B.B. Rau* and M.M. Dutta**

IN the Draft Five Year Plan (1978-83) a provision of Rs. 675 crores has been made under the Revised Minimum Needs Programme (RMNP) to cover all the 1 lakh remaining problem villages (identified in 1972) by 1983.

Based on the cost of different types of schemes approved both under the MNP and the Accelerated Rural Water Supply Programmes (ARWSP) for the different States during the last two years and assuming a suitable mix of ground and surface sources, the cost of covering the balance one lakh problem villages as on 1.4.1978 comes to Rs. 1092 crores as detailed in Statement A. These villages have been referred to in the following paragraphs as first-priority villages. It is also seen that because of the large number of villages and the nature of schemes needed, the ten States of Assam, Haryana, Himachal Pradesh, Jammu & Kashmir, Kerala, Madhya Pradesh, Manipur; Nagaland and Sikkim and the three Union Territories of Andaman & Nicobar Islands, Delhi and Mizoram cannot cover all the villages by 1981 but would do so by 1983, if concerted efforts are made from now on. All the balance 12 states and three Union Territories of Arunachal Pradesh, Goa, Daman & Diu and Pondicherry can cover all these problem villages by March 1981, if not earlier as in the case of Gujarat, Karnataka, Orissa and Tamil Nadu provided requisite funds are made available to the States UTS in time.

The following issues need due consideration while fixing norms for rural water supply in the country.

1. Criteria for defining problem villages
2. Number of problem villages
3. Type of coverage
4. RMNP classification
5. Sources of supply
6. Provision of House service connection
7. Rural Water Supply other than RMNP
8. Population
9. Per Capita rate of supply
10. Per Capita cost

1. Criteria for defining problem villages

In the survey conducted prior to 1972, 1.52 lakh villages were identified as problem villages in respect of the availability of safe drinking water in the following categories :—

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(i) having no assured source within a distance of 1 mile (1.6 Km or having no ground-water source within a depth of 50 feet (15 meters).

(ii) the existing source of water supply is susceptible to water-borne diseases like cholera or infested with guineaworms making endemic to these diseases.

(iii) the existing source suffers from excessive salinity, iron or fluorides making them hazardous to health.

When this programme was reveiwed by the Estimates Committee of the Lok Sabha, specific norm for the hilly-tracks was also required to be suggested for the no source villages. The Ministry of Works & Housing accordingly decided that a norm of lift involving not less than 100 meters be specified to define the no-source village in the hilly-tracts. This norm is yet to be accepted.

These norms have been accepted by all the States and are being adopted to categorise the problem villages for inclusion under the RMNP. However, some States like Maharashtra and Gujarat have prescribed on their own a more liberal norm of only 1 Km, instead of 1.6 Km, for defining the no-source village.

The funding of the programme both the State and the Central Sector has been based so far on the three prescribed norms. Based on the figures furnished by Maharashtra and Gujarat, it is estimated that on the basis of the liberalised norms, the number of problem villages would be more than double. The requirement of funds would accordingly go up.

2. Number of Problem Villages

152, 475 problem villages were identified in 1972 and at the end of the Fourth Plan Rs. 653 crores were roughly assessed as the need to cover all those villages during the Fifth Plan Period. The allocations for Rural Water Supply under MNP for the different States during the Fifth Plan discussions were based on the requirements for covering these problem villages only, but in actual practice due to the non-follow-up of this Sector schemes, many States utilised these funds on villages other than those problem villages identified in 1972. Against the initial provision of Rs. 574 crores made in the Fifth Plan (1974-79) only Rs. 272 crores have been utilised during 1974-78 under MNP and Rs. 38 crores during 1977-78 under the Accelerated Rural Water Supply Programmes (ARWSP) initiated during 1977-78.

After the Centrally sponsored ARWSP was started during 1977-78 to supplement the provisions under the MNP and accelerated the covrage of these problem villages, it was observed that 1.13 lakh of these villages were yet to be covered as on 1.4.77 But the State Governments reported that based on their more recent surveys, the number of problem villages to bt covered on 1.4.77 was 3.40 lakhs and funds should be provided for covering these villages. While it is possible in certain cases that this number has inflated to get a larger share of the Central assistance, the possibility of genuine increase cannot be altogether ruled out due to:—

i) genuine commission in the 1972 survey (as in the case of Rajasthan;) where the original list did not include guineaworm infested areas simply because such a list based on medical statistics was not available at that time though, it was well known that Rajasthan was one of the worst affected States with this problem;

ii) gradual depletion of ground-water level due to severe droughts during 1973-78 and consequ-

ently more villages falling into the category of 'problem villages' during the period;

iii) inclusion of the number of hamlets apart from the number of revenue villages as in the case of Tamil Nadu; and

iv) adoption of liberalised norms as in the case of Gujarat and Maharashtra.

The allocations for the different States for the Fifth Plan was based on the figures furnished by the Centrally Sponsored Special Investigation Divisions set up by the State Governments. The guidelines for the MNP also stipulated that these amounts be spent only on these problem villages. However, as this programme was not in the Central Sector, there was not strict adherence to the original list.

However, after the initiation of the ARWSP during 1977-78 concentrated efforts were made by the Ministry of Works & Housing (CPHEEO) to get the base-line data of the problem villages as identtified in 1972 and remained to be covered as on 1.4.77 and on 1.4.78 and after detailed discussions with the State Chief Engineers (PH) and others, it was decided that first-priority villages which should be covered first.

Now that the list of the specific villages are known, it is possible to get at the specific requirements and ensure the coverage of these problem villages on a priority basis and completely cover them before the end of the Plan period 1978-83. It seems necessary to cover the first-priority problem villages first and utilise the funds for the other problem villages (second-priority problem villages, only thereafter).

3. Type of Coverage

The Draft Plan States as under:

Providing adequate water supply to the remaining problem and difficult villages requires huge investment. Low-cost solutions are, therefore essential to spread the investment to as many villages as possible within a given time perspective. The approach should be one well for one village so that the villages are assured of a definite source of water supply. Piped water supply is highly costly and would be adopted only when less expensive measures such as tubewells and sanitary dug wells, are impraeticable on account of geographical and terrain conditions.

Though non-availability of a dependable source within the specific distance was used as criterion for the selection of problem villages, the selected villages are being provided with one source on an average for every 300 population (1971 Census) for the following reasons:

i) many of the problem villages have several hamlets inhabited by scheluled tribes, scheduled castes etc., the State Governments have been pressing for individual sources for the hamlets.

ii) some of the problem villages have high populations as in Madhya Pradesh and Orissa, some of them even exceeding 15,000;

iii) non-provision of a safe source of water within a reasonable distance, catering to a reasonable population, has in the past driven people to resort to unsafe sources, thus defeating the very purpose of the government's undertaking to provide a safe water supply system;

iv) covering one village taking the population base is less expensive if it is done in one go rather than in several instalments;

v) where equipment like well-drilling rigs are to be used, the cost of transportation and

time involved in covering back to the same village for a second time itself would be exhorbitant;

vi) second round of coverage may not physically take place for several decades to cover simply because of the large number of villages involved and

vii) as the single-source coverage will result only in partial satisfaction, results of physical and health impact of the programme will be negligible and the number of problem village continues to be same in spite of the inputs in terms of money. Provision of single-source per village will wipe out the number of no source village in a much smaller time frame and with smaller outlay.

A view is to be taken whether the coverage during the Plan period should be only one source a village irrespective of the population or provide the minimum number of sources in each village depending upon the population as being done at present in most of the States.

4. RMNP Classification

The provisions needed for covering the first priority villages (identified in 1972) be termed as RMNP but the villages which are subsequently identified but according to the same norms as those of the fist priority villages should also be eligible for this classification, only after the priority villages in a particular State are covered. The provision for covering the second-priority villages (after covering the first priority villages) should also be entitled for the same benefits as the RMNP so that the States who have covered the first-priority problem villages faster such as Orissa, are not discriminated against and enable the national objective of covering all villages with a safe water supply is achieved at the earliest.

5. Sources of Supply

Out of the 1 lakh first priority problem villages, about 4000 are in hard-rock areas with heavy overburden and 5000 in mountaneous and boulder formations requiring heavy duty combination rigs. About 50,000 are in hard rock formations with small over burdens and could be tackled by the pneumatic rigs manufactured indigenously. Half of these could be covered before 1983 with the rigs already available with the States. Additional rigs could be imported through the UNICEF or Government funds and all these villages could be covered by 1983 by working the rigs on double shift. About 6000 villages could be served by spring and gravity sources. The balance 35,000 require treated water supply or other types. All the 1 lakh villages could be covered by March 1983 by reorganising the existing State Public Health Engineering Units/Departments and also adding the necessary infrastructural inputs in a few States/Administrations.

The different ways in which all these problem villages could be tackled depending upon the type of source available, the population and the location of villages involved are:

i) Half-covered sanitary wells with pully arrangements,

ii) Fully-covered sanitary wells fitted with handpumps;

iii) Handpumps or power-pumps tubewells; and

iv) Piped water supply.

A properly covered sanitary well fitted with a reliable hand-pump may cost from Rs. 15,000 to Rs. 25,000 depending upon the depth, diameter and type of soil in which it is constructed while a half covered sanitary well with pully arrangement may cost from Rs. 13,000 to Rs. 23,000. They need at least 2 seasons for completion and

invariably need deepending unless they are taken well below the lowest ground-water level of the area and at least below the first impermeable layer. In many States only dug-wells are provided leaving the cover and the handpump (ostensibly to be taken up as a second stage but never done). While mere dugwells may be cheaper and possible in ordinary villages, they are not possible in problem villages (where ground-water level is deeper than 50 feet even according to the very definition and usually get dry in the summer season because of the lowering of the ground-water table. It is presumed that all villages, where such a measure is satisfactory, would have been covered by now under the various normal programmes like the Community Development Programme during the last several decades and they would not fall in the category of problem villages yet to be covered. Another point to be mentioned is that the water from these surface wells is prone to contamination and such waters are unsafe for 95% of the time. However, in exceptional cases of inaccessible hard-rock areas where phenmatic rigs cannot be taken to make drilled tubewells which are cheaper) or where large diameter wells are needed to give the required storage and seepage in the hard-granular consolidated formations without any fissures are weathered layers, covered sanitary wells fitted with handpumps will have to be adopted. 1½" diameter tubewells with handpumps in alluvial areas would cost from Rs. 3000 to Rs. 9000 depending upon the total depth and lowest ground-water level of the area and are very well suited where good ground-water is available and small population are to be covered.

4"/4½"6" diameter tubewells with handpumps in hard-rock areas which could serve as a satisfactory solution in a majority of the problem villages would cost from Rs. 10,000 to Rs. 20,000 depending upon the depth and the terrain of drilling, accessibility of the area and the proximity of the villages needing such bores. A 6" diameter tubewell with powerpumps in hard rock areas would cost from Rs. 15,000 to Rs. 25,000 and would be a better and more economical source in more populated areas with copious ground-water potential.

Where ground-water is not available or not fit for use because it contains excessive chemicals like chlorides, fluorides and iron, water has to be necessarily piped to an individual or group of villages from a distant good ground-water source (including a 6" tubewell with powerpump in a hard rock region or a surface water properly treated), the per capita cost of such schemes varies widely from Rs. 100 to Rs. 400 depending upon the distance accessibility, population, treatment and type of terrain involved. The corresponding figures for alternatives of the sanitary wells and hand-pump tubewells would vary from Rs. 50 to Rs. 100.

Ground-water sources are preferred to surface sources as the latter require treatment and need more capital cost and greater skill in maintenance. Gravity schemes are preferred to pumping schemes as the later involve larger maintenance costs and skilled supervision. Spring sources, windmills, hydraulic rams, storage-catchments are used in specific hilly and other regions where these would prove economical. Main effort is to see that each individual village or group villages should be served most economically both in the first-cost and maintenance and provide such a service as expeditiously as possible, ensuring that provision is made for the realisation of water revenues from the potential beneficiaries where possible, to maintain the services properly without

depending upon the Government grants solely for the purpose. Piped Water Supply is provided only where other measures indicated are either not feasible or found uneconomical.

6. Provision of House Service Connections

In very small villages inhabited fully by poor people, the question of house service connections does not arise. But in large village with at least 15 to 25% of comparatively well-to-do persons who could afford and would go in for house-service connections, such a provision would facilitate :

i) raising some resources to maintain the system properly,

ii) maintenance of the system properly as disruptions are immediately noticed and got attended to promptly; and

iii) the provision of colossal wastage of water through stand-posts.

To cite an instance, in Punjab, the annual maintenance of village water supply costs about Rs. 10,000 and the villagers are prepared to pay Rs. 10 per month per house connection and there are several villages with 150 to 200 house-connections.

7. Rural Water Supply other than RMNP

Due to several considerations, many State Governments want to cover more villages other than the first-priority problem villages even before completely covering these first-priority problem villages leading consideration of another category of "Rural Water Supply other than the RMNP". If this is agreed to, such a provision should exceed a specified percentage, say 10% of the RMNP provision. The purpose of this provision is to meeting any special requirements which the State Governments want to indicate looking to their own special local problems without reducing the resource or priorities needed for covering the first-priority problem villages. Such a programme already exists as "RWS other than RMNP", in certain States even now and the Draft Plan document provides Rs. 90 crores for this item during the Plan period 1978-83.

8. Population

The Manual on Water Supply and Treatment (2nd Edition) published by the Ministry of Works & Housing, Govt. of India recommends that rural water population expected 30 years hence. This applies for generally to all piped water supply schemes to be implemented on routine basis. But in the case of crash programme like the present Accelerated Rural Water Supply Programme, it is remmended that all the new schemes to be included under the programme shall be designed for a future popolation expected at the end of the 10-15 years period but in no case should the increase be more than 30 per cent of the present population to economise the scheme. But very often it was explained by the Chief Engineers that the estimated cost of the scheme while taking a design period of 30 years it makes hardly a difference of 10 to 15% of the total estimated cost. In view of this, it is recommended that the design period should be considered as 30 years keeping in view the escalation of prices of materials in future.

9. Per Capita rate of supply

The rate of 40 lpcd (liters per capita per day) for villages where water is supplied through standposts and 70 lpcd for villages where house service connections are recommended in the Manual of Water Supply and Treatment (2nd Edition) published by the Ministry of Works & Housing, Government of India.

An expert committee set up for the preparation of the above Manual on Water Supply Treatment constandposts hand pump supply. A breakup of the figure of 1pcd for rural water supply schemes with standposts hand pump supply and a breakup of the usage of water in litres per day (1pcd) is given below to clarify the position.

	Rural	
	House service connections	Standposts/ Handpump
1. Drinking	3	3
2. Cooking	5	5
3. Ablution	15	10
4. Bathing	20	15
5. Washing utensils and house	12	7
6. Washing Clothes	—	—
7. Flushing	15	—
TOTAL	70	40

While the population in many western countries do not use water for washing hands after eating, for ablution purposes etc., the Indian community requires a fairly large quantity of water for such needs. It, is therefore, recommended that a design rate of 40 1pcd may be used as maximum for the preparation of rural wat supply schemes with the provision of stndposts/ hand pump supply.

However, for some water scarcity areas like Western Rajasthan where entire economy depends upon the cattle breeding, a suitable decision is to be taken by the competent authority whether provision of supplying drinking water to the cattle can be clubbed with the drinking water supply to the human beings. In this connection, it may be noted that the National Water Supply and Sanitation Committee (1960-61) of the Ministry of Health, Government of India also examined the question of inclusion of cattle with a rural population in the design of rural water supply schemes and the committee felt that the source could no doubt be designed to include the quantity needed for the cattle population where it is feasible and where the source is located near the community, in the shape of impounded lakes conserved tanks, wells and the like. But it is extravagant to design the treatment plant, conveyance and distribution systems so as to provide also for the cattle population. Conveyance of supply of protected water from distant source, the Committee felt that it is uneconomic to make provision for cattle population in such schemes. Local unprotected sources should be made to serve such needs for cattle population. Here again, exceptions may have to be made in special cases, where local sources are not available for human being or cattle and where the population may not care to stay in the village and utilise the scheme unless it met with the water scarcity for the cattle as well Such special cases may have to be dealt with on their merits depending on the special local conditions.

10. Per Capita Cost

Statement B indicates per capita costs of rural water supply schemes which were sanctioned under Central Accelerated Rural Water Supply Programme during 1977-78 at a particular point of time in respect of some States and Union Territories in the Country.

From the Statement it would be seen that even in an individual State the per capita cost

varies from location to location depending upon whether the scheme is based on piped water supply or bore well/hand pump supply depending upon the technical feasibility of the type of scheme suitable for the location. To cover maximum number of rural population with the limited funds made available for rural water supply programme in the country it would be desirable to select the most economical schemes to serve the particular population either in single or in groups giving preference to ground water sources and gravity supplies wherever possible.

The floating (steadily increasing) ceiling of per capita cost is reasonable if all the problem villages in all the States are equally distributed with reference to source availability terrain, population density etc. If a limit based only on hand pump tube wells is kept, the States where such schemes are not possible at all (bulk of problem villages in the hilly States and Rajasthan) would be at a disadvantage and might be complaining of undue discrimination.

Statement A

RURAL WATER SUPPLY PROGRAMME
Requirement to Cover Problem Villages Remaining to be Covered as on 1.4.1978

(Rs. crores)

Sl. No.	State/UT	I-Priorlty problem villages		Requirement to cover problem villages remaining to be covered as on 1.4.78			
				I-Priority (as identified in 1972)			
		No.	Population (lakhs)	Outlay for 78-83 under RMNP as intimated to States	Demand of States	As assessed	I & II priority (as reported in 1978) as estimated.
1	2	3	4	5	6	7	8
1.	Andhra Pradesh	2615	34.81	25.70	143.00	58.70	92.64
2.	Assam	6700	33.81	14.18	122.50	64.70	159.40
3.	Bihar	18050	61.10	46.40	276.00	73.67	107.63
4.	Gujarat	1953	17.59	47.87	100.11	33.50	116.50
5.	Haryana	3233	41.21	26.69	107.50	75.00	75.00
6.	Himachal Pradesh	10245	17.42	19.86	85.00	49.00	49.00
7.	Jammu & Kashmir	3191	22.78	31.50	£	70.00	105.50
8.	Karnataka	4309	17.83	56 15	60.00	6.98	30.53
9.	Kerala	465	65.14	11.23	56.71	31,54	31.54
10.	Madhya Pradesh	7297	21.41	35.46	190.20	90.00	90.00
11.	Maharashtra	3872	64.36	77.40	109.00	75.00	101.50
12.	Manipur	1062	4.71	5.91	23.90	20.75	20.75
13.	Meghalaya	3185	4.72	2.42	26.49	20.66	22.26
14.	Nagaland	694	3.94	4.26	19.86	15.24	15.24
15.	Orissa	1721	10.14	23.64	89.29	7.62	48.50
16.	Punjab	981	10.04	26.60	111.00	40.00	75.50
17.	Rajasthan	3122	16 82	53.90	472.95	60.00	410.50
18.	Sikkim	430	1.96	1.73	8.70	5.59	5.59
19.	Tamil Nadu	1402	20.25	36.05	19.39	13.00	165.50
20.	Tripura	2316	6.73	2.30	£	12.00	15.50
21.	Uttar Pradesh	12711	86.01	88.00	200.00	196.00	474.00
22.	West Bengal	9036	93.25	20.00	80.69	43.97	65.65
	Union Territories						
23.	A & N Islands	57	0.06	1.20	2.14	1.50	7.06 (235v)
24.	Arunachal Pradesh	1423	1.28	3.56	13.81	9.00	11.00
25.	Delhi	125	1.86	2.98	8.25	8.00	8.00
26.	Goa, Daman & Diu	73	1.92	3.32	3.31	1.56	1.56
27.	Mizoram	227	2.62	5.22	12.47	8.48	8.48
28.	Pondicherry	85	0.38	0.42	1.46	0.63	0.63
	Grand Total	100580	664.35	675.00*		1092.09	2314.96

* Inclcudes Rs. 0.30 crores for Dadra & Nagar Haveli.

£ State document (Five Year Plan 1978-83) have not been received yet.

Statement B

RURAL WATER SUPPLY SCHEMES

Per Capita Cost

State	For Piped Water Supply Scheme	For Bore Well/Hand Pumps Water Supply Scheme	Average
	Rs.	Rs.	Rs.
1. Andhra Pradesh	88	32	58
2. Arunachal Pradesh	135	—	135
3. Assam	66	—	66
4. Bihar	—	81	—
5. Gujarat	145	—	145
6. Haryana	217	—	217
7. Himachal Pradesh	180	—	180
8. Jammu & Kashmir	295	—	295
9. Karnataka	—	56	66
10. Kerala	59	—	59
11. Madhya Pradesh	250	82	160
12. Maharashtra	145	91	140
13. Manipur	406	—	406
14. Meghalaya	340	—	340
15. Mizoram	390	—	390
16. Nagaland	397	—	397
17. Orissa	—	54	54
18. Punjab	113	—	113
19. Rajasthan	172	—	172
20. Sikkim	480	—	480
21. Tamil Nadu	135	71	71
22. Tripura	—	66	66
23. Uttar Pradesh	257	—	257
24. West Bengal	140	20	135
25. Andaman	790	—	790
26. Goa, Daman & Diu	76	—	76
27. Pondicherry	65	—	65

Notes : (1) Average based on costs of total schemes sanctioned during 1977-78 at a particular Point of time, and not a weighted average.

(2) In case of Andhra Pradesh, Karnataka and West Bengal, Bores/Hand Pumps are serving population more than 250 persons and hence lower rate/capita.

Quality Water

By

K. Rudrappa* and K.L.L. Narasimhan**

INTRODUCTION

WATER is not technically a food, but it is an essential article of diet. It is required in the body as a solvent and serves to regulate the body temperature. In addition it contributes in a variety of ways to the enjoyment, safety and progress of human existence. Water is required for many purposes in day-to-day life. Important of thtse are :

(i) Drinking; (ii) ablution and washing; (iii) Industries; and (iv) removal of offensive and dangerous household and industrial waste.

Water may create pollution problems and may serve as a medium for transmission of several diseases if not properly collected, treated and distributed. Many water-borne diseases are caused by using unsafe water.

There has been a continuous struggle to get pure and safe water for human consumption. Different methods of water purification used in India in earsy days are described in the medical lore in Sanskrit called "SUSRUTA SAMHITA" and these date back to 2000 BC. Similar efforts were also made in Egypt in early 15th and 16th century. The quest for obtaining pure water has made remarkable progress in the 18th century in Great Britain, France and Germany. However, micro-organisms and sanitary quality of water was identified only in 1853. Many biologists from Europe and America made three more notable contributions in this field.

They are :

1. The rapid sand filter was introduced in 1880 and 1890 and put on a sound engineering basis;
2. Improvements made on studies of slow sand filter;
3. Chlorination was initiated in early 20th century.

The technology on isolation of micro-organisms and virus in water have been perfected in recent years with the result that the pathogenic type of micro-organism and virus and diseases caused by these organisms should be identified with authority.

Sources of Water and Quality

For convenience the sources of water available in hydrological cycle may be classified as (i) rain water; (ii) surface water; and (iii) ground water.

Surface water includes :— (i) Rivers/streams; (ii) Natural ponds, lakes; and (iii) Impounded reservoirs.

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Ground water includts :— springs, shallow wells, unfiltered galleries, tubewells.

The quality of water from these sources vary from acceptable limits to rejection. They generally contain physical impurities, chemical constituents and bacterial organisms. Of immediate concern are the presence of some of the chemicals, toxic substances and bacterial organisms in the water.

Water may contain several bacterial groups such as :

1. Natural water bacteria (non-pathogenic);
2. Soil bacteria (non-pathogenic);
3. Intestinal bacteria (both pathogenic and non-pathogenic).

Important among the "Natural water bacteria" are those of genus of Peraudomonous. The Iron group of bacteria are among the soil bacteria. Among the organisms normally encountered in the internal track of a human being are gram-positive spore-forming anaerobic, gas producing rods of genus Clostorium. These are non-pathogenic in nature. The genus Stimonella and genus Shigella are among the pathogenic species.

Water Relation to Diseases

It has been proved and established that water has an important role in the spread of communicable diseases. The properties which make it important for water to transmit these disease are :

—It is ordinarily consumed as raw :

—In its normal course of circulation, it comes in contact with great variety of polluiants which are spread over in a vast area.

Water has the following factors which influence the transfer of infection agents.

—The quick transfer of infective agents from patient to the source and source to the source and source to the consumer.

—Cold water tends to prolong the period of their survival.

—The dilution ratio of infective excreta to the receiving water is usually very small, so the concentration of micro-organisms is large.

—Surface water source which is most exposed to faecal and industrial contamination are most frequently infected.

Water-borne Diseases

Water-borne diseases may be classified broadly as (i) Specific and (ii) Non-specific.

Specific diseases are caused by bacteria and virus organisms present in the water. Some of the important ones are cholera, typhoid fever, dysentery, gastro-enteritis and virus causing infectious hepatiiis. In addition, water is also responsible for spreading Guinea-worm disease, Ascaris and Schistosomyasis. Some of the non-specific diseases are Dental caries, Methemoglobinemia, lead poisoning, etc.

Sanitary survey which includes a) Sanitary field survey and b) Sanitary defects from source to the consumable stage is listed below. It is believed if these are rigidly observed, safe water quality can be maintained.

A. Ground Water

a) Sanitary Survey

1. Character of local geology, size, topography of catchment area, slope of the ground surface.
2. Nature of soil and sub-strata
3. Slope of water table

4. Extent of drainage area likely to contribute water to the well
5. Nature, distance and direction of local source of pollution.
6. Possibility of surface drainage water entering the supply and the wells taking effluent, methods of protection.
7. Methods used for protecting the supply against pollution by means of providing sewage and industrial waste treatment and proper disposal of treated waste water.
8. Equipment, prevention and laboratory control

b) Sanitary defects

Formation of caves, sink holes, abondoned borings used for surface drainage or sewage disposal near the water source. Defective casings for the wells, wells located near sewers, privies, septic tanks and other source of contamination.

B. Surface Water Supply

a) Sanitary Survey

1. Nature of surface geology and its character
2. Character of vegetation, forest, cultivated land including salinity and effect of irrigation water.
3. Methods of sewage disposal in the vicinty.
4. Character and efficiency of sewage treatment works on watershed or water catchment area.
5. Proximity and source of characteristic of industrial waste
6. Adequacy of supply
7. Character and quality of raw water for coliform, organisms, algae, turbidity; colour and objectionable mineral constituents and toxic chemicals.
8. Measures taken to prevent fishing, boating, swimming.
9. Type of water treatment suggested and their adequacy.
10. Disinfection of water and adequacy of equipment.
11. Plant operation & control.
12. Labortaroy control.

b) Sanitary defects

—Inadequacy of laboratory control;

—Inadequate control of the use of streams for recreational purposes, discharge of untreated domestic and industrial waste water into the streams etc.;

—Improper & inadequate treatment plant capacity;

—Bad plant operation & laboratory control.

C. Pumping Station and Collecting System

Sanitary survey includes:

1. Location and protection with reference to the floods; and
2. Number and types of capacity of pumps including reserve containing all equipments etc.

D. Distribution system

a) Sanitary Survey

1 Adequacy of distribution system with refe-rence to area and population;
2. Type of distribution—gravity or pumping,
3. Materials used in the distribution system;
4. Types of joints and their water-tightness;
5. Safe distance and levels from water mains to sewerage system;
6. Disinfection procedure followed in laying of new mains, repairing.

b) Sanitary defects

1. Cross connection in dual water supply system;
2. Intermittent service resulting in reduced or negative pressures;
3. Lack of adequacy of enforcement of plumbing regulations designed to protect water supply against possibilities of back flow;
4. Leaky pipes.

E. Storage Reservoirs

a) Sanitary Survey

1. Proper protection from trespassers, against source of pollution;
2. Hazards of flood water entering the reservoirs;
3. Providing cover on top of the reservoirs;
4. Disinfection protection on new reservoirs or after cleaning and repairs on existing reservoirs.

b) Sanitary defects

1. Locating the reservoirs on limestone area etc.;
2. Use of unsatisfactory material of construction;
3. Improper arrangement to drain away roof water.

F. Plant Control

The function of modern water purification plant is to produce at all time, under all conditions water which is sanitarily safe, clear and palatable. Water purification requires careful control and supervision by competent personnel. The safety of the whole community depends upon such control and vigilance. It calls for exercise of the ability, knowledge, skill, resourcefullness; integrity and reliability of the personnel. The treatment plant control therefore requires

1. Competent personnel: 2. Standard protection: 3. Plant cleanliness: 4. Analytical control. 5. Measurement of flow and chemical feed: 6. Operation of equipment: 7. The storage and quality of chemicals: 8. Plant maintenance: 9. Plant records: 10. Plant safety.

Water Quality

The earlier standards of water quality were restricted to freedom from turbidity, tastes and odour. The present standards are altogether different for safe water. It should be free from disease-causing group of organisms. It should be physically attractive and must have a final chemical content of such proportion as will be conducive to health It is also necessary to remove or reduce certain metals and salts in water and change their characteristics.

The standards of water quality that are now adopted in different parts of the world, relate to physical and chemical limitations, toxic substances, standards for bacteriological and radio active substances which are given below:

Physical & Chemical Characteristic Effecting Potability

S. No.	Description	Permissible Limit	Excessive Limits
1.	Turbidity	5.0 mg/l	25.0 mg/l
2.	Colour	5 (Units)	25 (units)
3.	Taste & Odour	Not disagreeable	—
4.	Total hardness ($CaCo_3$ mg/l)	300 mg/l)	600mg./l
5.	Sulphate (So_4).	200 ,,	400 ,,
6.	Iron (Fe)	0.3 ,,	1.0 ,,
7.	Manganese (Mn)	0.1 ,,	0.5 ,,
8.	Chloride	250 ,,	600 ,,
9.	Copper (Cu)	1 ,,	3 ,,
10.	Zinc (Zn)	5 ,,	15 ,,
11.	Magnesium (mg)	50 ,,	150 ,,
12.	Calcium (Ca)	75 ,,	200 ,,
13.	Phenolic substance (as phenol)	0.001 ,,	0.005 ,,
14.	*p*H	7-8.5 ,,	6.5 & 9.2

Toxic Substances

S. No.	Substance	Max. allowable concentration in mg/l
1.	Arsenic (As)	0.20
2.	Chromium (Cr)	0.05
3.	Cyanide (Cn)	0.01
4.	Lead (Pb)	0.10
5.	Selenium (Se)	0.05
6.	Fluoride (F)	1.5
7.	Nitrate (No_3)	50

Standard of Bacteriological Quality

Average MPN of Coliform organism should be less than 1 per 100 ml and should be nill in chlorinated water.

Radioactive Substances

1. Alpha emitter — 10^{-9} microgram/ml
2. Beta emitter — 10^{-8} microgram/ml

Conclusion

The study of statistical data on deaths, due to water-borne diseases through various decades in the post independence period is required to be made to establish the relationship between water quality and death rates. This will establish the importance of water quality management.

With the increase of the protected water supply and other public health measures to the public, the general death rate is gradually decreasing. It is, therefore important to provide protected water supply to the community. This measure may, control the mortality rate to a considerable extent.

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International Water and Sanitation Decade: Is it a Dream ? Or a Reality ?

By

Gyan Sagar*

Status of Water Supply & Sanitation In Uttar Pradesh

The progress with regard to the provision of drinking water in rural areas of Uttar Pradesh is quite slow. This is mainly because of our decision to extend only the piped water systems for safe water. Till March 1980, only 1,00,561 villages could be covered out of total number of 1,12,624. As regards rural sanitation, practically nothing has been done so far. The requirement of funds to cover just 50,000 villages with piped water supply works out to Rs. 1600 crores[2] proposed to be spent in the 'International Water Sanitation Decade (1981-90). A provision of 120 crores has been kept under 'sanitation'. But the availability of such huge sums is a big question. In the central sector, provision of only Rs. 88 crores[8] exists for rural water supply in Uttar Pradesh for Sixth Five Year Plan (1978-83). With water supply largely covered, the sanitation is far lagging behind in the urban areas. If our aim is to achieve 100% of water supply & sanitation expeditiously, conventional technology will have to be replaced with more appropriate systems.

Water Quality

Tap water is regarded as the best in the world, at least better than hand pumps and open wells. The argument which is generally put forward is that open wells are subjected to contamination even when sanitary protection is given. This is because the dirty rope and bucket that goes inside the well can impair the bacterial quality of water. As regards the hand pumps, many public health engineers hold the view that they usually draw water from the first layer of acquifer which is generally polluted.

Piped Water

It flows through a closed system and draws water from deep acquifers. In case of surface waters it is drawn after proper treatment. It is therefore argued that it should be safe. But it is not true in general. Take the case of the recent findings from two Prestigious Water Works A & B. These water works supply water from deep tube wells as well as from the river after treatment. Water samples were drawn from the distribution network in Sept. 1980 and Jan. 1981 respectively. In Water Works—A, 222 samples were examined out of which only 10 samples (4.5%) contained residual chlorine. No. of samples falling within excellent and satisfactory ranges were 154 (70%). Total number of unsatisfactory samples reported were 60 (27%). The remaining 8 (3%) samples fall in suspicious catagory. In Water Works B, where efforts were made to carry out E—coli test as well, the situation was still worse. Out of a total of 182 samples examined, only 15 samples (8% contained

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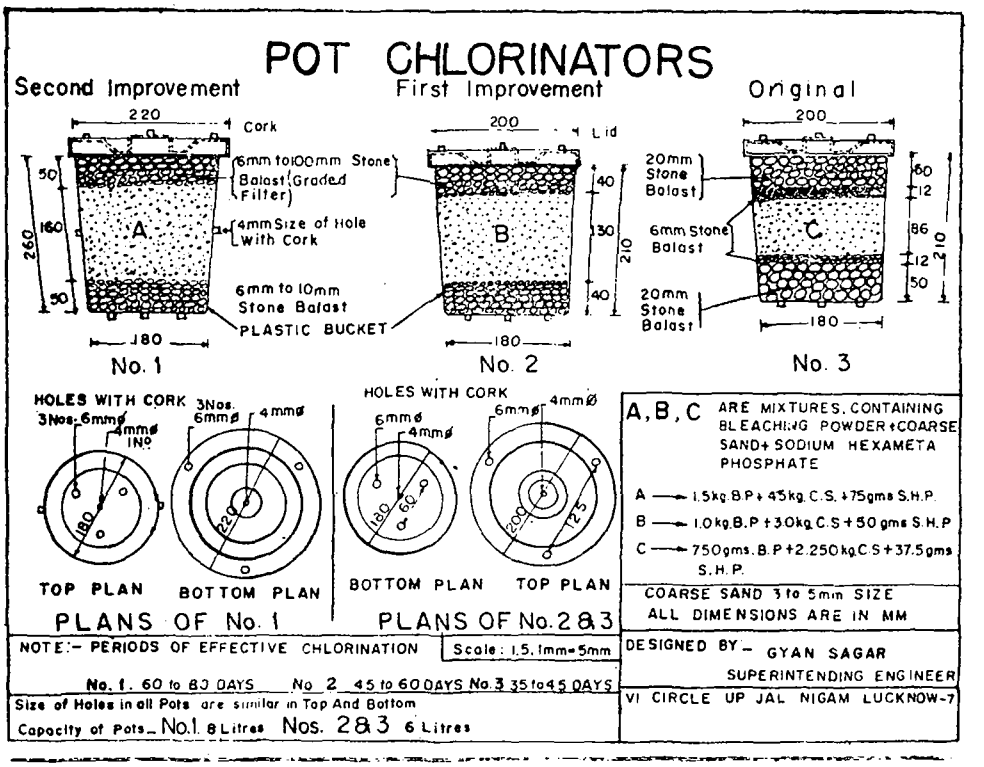
residual chlorine. Satisfactory samples reported were 117 (64%), whereas unsatisfactory samples were as high as 52 (29%). The remaining 13 samples (7%) fall in suspicious category. 38 samples (21%) contained E-coli that confirms faecal contamination. If these results are examined on the basis of the Water Supply Manual, it would be seen that the bacterial quality of water obtained from these Water Works is highly unsatisfactory. According to the recommended norms, 100% of the samples should have residual chlorine of minimum 0.2mg. No sample obtained should be unsatisfactory and at the same time all samples should be E-coli free. It may therefore be pointed out that piped water systems are also liable to high degree of contamination. Mara[6] writes: "Some economists argue that piped supply of water is beneficial, irrespective of its quality. Yet there is evidence that intestinal disease has increased after untreated rural water supplies have been installed". Unfortunately, the supplies drawn even from the purest source such as a deep tube well gets contaminated during its conveyance in the pipe lines. This is mainly because of the leaky joints and the intermittent nature of water supply, sucking in untreated water during sudden interruption in the water supply.

Hand Pumps

In case of hand pumps, water gets percolated to deeper soil layers and thus gets filtered. Safe water can be drawn even from the first layer of acquifer if some minor precautions are taken[7]. These are :

(i) Where sub soil water is subjected to direct contamination such as from the open wells or the bore hole latrines in case of which bottom of the bore hole penetrates the sub soil water level, a minimum distance of 7.5 metres should be kept from the source. (ii) Sanitary protection should be provided consisting of puddle clay lining around



STATEMENT

Results of bacteriological examination of water samples which were received from co-ordinate, P.R.A.I. Scheme, Atari, Block Mall, Distt. Lucknow

Sl. No.	Date of collection	Date of receipt and inocutation	Source of water (Hand Pump)	Colony Court on Agar 6		PRESEMPTIVE COLIFORM COUNT					Probable no. of Coliform organism	Mg./l. free residual chlorine	Remarks
				48 hrs	72 hrs	Quantity of sample in each T.T.	50 ml.	10 ml.	1.0 ml.	0.1 ml.			
				At 37°c	Room temp.	No. of Test tube	1	5	5	5			
408/D	—	8.10.80	H.P. of Raja Balbir Singh, Atari.	10	15	—	0	0	0	—	0	No	Excellent
409/D	7.10.80	8.10.80	H.P. of Pt. Siva Ram, Atari.	Innumerable		—	1	5	1	—	35	No	Unsatisfactory
410/D	7.10.80	8.10.80	H.P. of Raja Ram, S/o Sakhi.	13	20	—	0	0	0	—	0	No	Excellent
411/D	7.10.80	8.10.80	H.P. of Kallu Yadav, Atari.	Innumerable		—	1/0	5/0	5/0	—	180	No	Unsatisfactory
412/D	7.10.80	8.10.80	H.P. of Pt. Ram Shanker S/o Badri Prasad, Atari.	—do—		—	1/0	5/0	5	—	180	No	—do—
413/D	7.10.80	8.10.80	H.P. of Maiku, Atari	—do—		—	1	5	5	—	180	No	—do—
414/D	7.10.80	8.10.80	H.P. of Madari Yadav, S/o Thani, Atari.	—do—		—	1/0	5/0	5	—	160	No	—do—

(Contd. next page)

Sl. No.	Date of collection	Date of receipt and inoculation	Source of water (Hand Pump)	Colony Court on Agar 6 48 hrs | 72 hrs At 37°C Room temp.		PRESEMPTIVE COLIFORM COUFT Quantity of sample in each T.T.	50 ml.	10 ml.	1.0 ml.	0.1 ml.	Probable No. of Coliform organism	Mg./1. free residual chlorine	Remarks
						No. of Test tube	1	5	5	5			
415/D	7.10.80	8.10.80	H.P. of Siya Ram S/o Raja Ram, Atari.	10	15	—	0	0	4	—	0	No	Excellent
416/D	7.10.80	8.10.80	H.P. of Niranjan, Atari.	10	16	—	0	0	0	—	0	No	—do—
417/D	7.10.80	8.10.80	H.P. of Munni Lal S/o Sakhi, Atari.	9	14	—	0	0	0	—	0	No	—do—
418/D	7.10.80	8.10.80	H.P. of Ram Chandra S/o Sakhi, Atari.	Innumerable		—	1/0	5/0	5	—	180	No	Unsatisfactory
419/D	7.10.80	8.10.80	H.P. of Shiv Murti S/o Kanhyalal, Atari.	12	18	—	0	0	0	—	0	No	Excellent

the pipe in top 1.5 metres with the surrounding soil carefully repacked. (iii) A pucca platform should be provided round the hand pumps. (iv) In addition, drainage should be provided. (v) This should consist of a soadage pit located at a minimum distance of one metre from the hand pump. (vi) A minimum cushion of one metre should be kept between bottom of the soak pit and sub soil water level. (vii) For higher sub soil water level, platform may be raised and soak trench may be provided instead of a pit. (viii) Where some sort of drainage system exists, a drain connection may be provided. (ix) In non porous soils, underground drainage may be laid consisting of small bore sewers[8]. This could be more effective and it should precede piped water supply

In village Attari, Lucknow District water samples were tested from 12 hand pumps. (Results at statement A) It may be seen that water from 6 hand pumps is excellent and from the remaining 6 is unsatisfactory. It has been found that unsatisfactory quality of water was mainly due to the direct contamination occurring through the annular opening in between the casing pipe and the bore hole. This is due to the absense of proper sanitary protection.

Open Wells

These wells are no doubt subjected to high contamination through the unprotected rope and bucket system. However, the experiments[9] conducted by the U.P. Jal Nigam with the Pot Chlorinator have shown that with the disinfection of the well water, safe water supply can be achieved even in such cases where adequate measures for drainage and sanitary protection of wells do not exist. Out of 61 water samples examined where the Pot Chlorinator were suspended in wells, in village Kanchanpur-Matiyari, 55 samples (90%) were found to be satisfactory and the remaining 6 samples (10%) were classified as suspicious However, no sample was found unsatisfactory of the well water after chlorinations. The residual chlorine was available in well water at all times. An improved Pot Chlorinator developed as result of further experimentation in UNICEF assisted 'Mali Sanitation Project' Lucknow, can provide effective cholorination for 60-80 days.

Costs

In the plains of Uttar Pradesh the cost of piped water system varies from Rs. 200/- to Rs. 250/- per capita at the present population laid. In the hard-rock and mountaineous regions, it may cost Rs. 400/- to Rs. 600/-. This does not however, include the cost of waste water disposal system. For hand pumps, the cost including the drainage facility varies from Rs. 15/- to Rs. 25/- for plains and Rs. 50/ to Rs. 100/- for hard-rock, areas. The cost has been worked out on the basis of 200 people per hand pump. The capital cost of a Pot Chlorinator programme is negligible. Considering 10% grant for construction, the maintenance cost of a piped water system works out to something like Rs. 7.50 per house hold, per month. In case of hand pumps, Rs. 0.50 to Rs. 2.00 per house hold per month have been reported based on three tier system of maintenance. For Pot Chlorinator programme, the cost per house hold per month may vary from Rs. 1.00 to Rs. 2.00 only.

Uttar Pradesh is the only state that enjoys the legacy of the piped water system. Other states have switched over to hand pump and sanitary dug well construction programme much earlier. Orissa has almost completed the first priority scarcity villages in this way and other states including Bihar and West Bengal are also much ahead.

International Water Decade

If in the International Water Decade, our aim is to provide safe water and its sanitary disposal for all the communities, our priorities need to be redefined. In the first instance Pot Chlorinator should be put to all the existing open wells and spring collecting chambers. In the second place, preference should be given to hand pumps and

sanitary wells particularly in the rural areas. "Piped Water Supply Schemes are highly costly and would be adopted only when less expensive measures such as hand pumps and sanitary dug wells are impracticable on account of geographical and terrain condition" as stated in the Draft Sixth five year plan 1978-83.

Appropriate Technology

India is a vast country with varying culture and topographical features. More practical low-cost, labour intensive, self-reliant technologies with emphasis on maximum use of local resources—both material and labour need be evolved. Our technology policy[10] should largely dwell upon these considerations.

Health Education

Much has been said about health education[11] and human motivation but not all is practiced in the field. In the 'International Water Decade' this has to be pursued vigourously. Public opinion has to be mobilised regarding appropriate procedures to ensure active participation of the communities in the programme.

Conclusion

In the past, great weightage has been given to the safety of drinking water against diseases and thus the piped water systems were recommended in general. A comparative study of piped water supply, hand pumps and open wells shows that the age old belief that the piped water supplies are the safest is only comparatively safer. As for the open wells, its water can be made quite safe with the use of a simple device known as Pot Chlorinator.

If the dream of the 'International water decade' i.e. to provide safe water and sanitation to all the communities by the year 1990, is to be realized, the priorities will have to be redefined and we should take up chlorination of village wells in a big way. Secondly, we should give preference to hand pump and sanitary dug well schemes over piped water supplies which are highly costly. Thirdly, we must also insist on drainage around the wells and hand pumps. Fourthly, we should carry out a programme of health education parallel with the development of community water supply and sanitation in order to highten people's awareness with respect to health, seeking their full support in planning, operation, maintenance and financing of the above services. And lastly but not the least, we should develop appropriate technologies in the context of the existing socio-economic conditions.

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Sewage Treatment and Its Essentials

By

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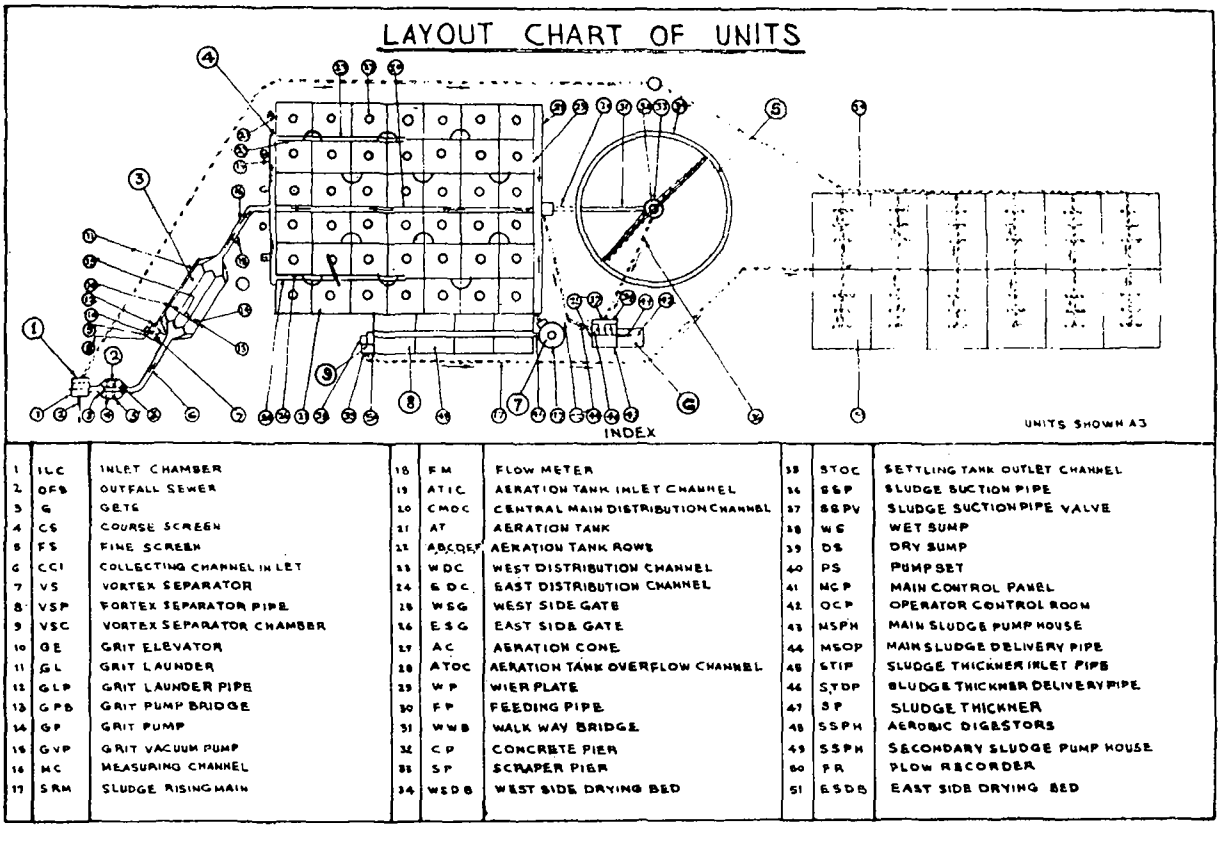
JAIPUR, a city of nations fame and pride, to day envelopes about 10 lacs souls. It is flanked by two major sewerage outfalls (North and South). During the past couple of years it became very essential to treat the sewage and consequently a full proof sewage treatment plant was commissioned in the year 1977. This was implemented to relove risk to Public Health, to avoid foul smells and objectionable sights and to prevent the pollution of streams and wells. This was also the aim to convert this sewage into the water which may not contaminate any of the sources aligning in the vicinity.

In its conceptual design consideration for the first and the new waste water treatment facility,



1	ILC	INLET CHAMBER	18	FM	FLOW METER	35	STOC	SETTLING TANK OUTLET CHANNEL
2	OFS	OUTFALL SEWER	19	ATIC	AERATION TANK INLET CHANNEL	36	SSP	SLUDGE SUCTION PIPE
3	G	GETE	20	CMDC	CENTRAL MAIN DISTRIBUTION CHANNEL	37	SSPV	SLUDGE SUCTION PIPE VALVE
4	CS	COURSE SCREEN	21	AT	AERATION TANK	38	WS	WET SUMP
5	FS	FINE SCREEN	22	ABCDEF	AERATION TANK ROWS	39	DS	DRY SUMP
6	CCI	COLLECTING CHANNEL IN LET	23	WDC	WEST DISTRIBUTION CHANNEL	40	PS	PUMP SET
7	VS	VORTEX SEPARATOR	24	EDC	EAST DISTRIBUTION CHANNEL	41	MCP	MAIN CONTROL PANEL
8	VSP	VORTEX SEPARATOR PIPE	25	WSG	WEST SIDE GATE	42	OCP	OPERATOR CONTROL ROOM
9	VSC	VORTEX SEPARATOR CHAMBER	26	ESG	EAST SIDE GATE	43	MSPH	MAIN SLUDGE PUMP HOUSE
10	GE	GRIT ELEVATOR	27	AC	AERATION CONE	44	MSDP	MAIN SLUDGE DELIVERY PIPE
11	GL	GRIT LAUNDER	28	ATOC	AERATION TANK OVERFLOW CHANNEL	45	STIP	SLUDGE THICKNER INLET PIPE
12	GLP	GRIT LAUNDER PIPE	29	WP	WIER PLATE	46	STDP	SLUDGE THICKNER DELIVERY PIPE
13	GPB	GRIT PUMP BRIDGE	30	FP	FEEDING PIPE	47	SP	SLUDGE THICKNER
14	GP	GRIT PUMP	31	WWB	WALK WAY BRIDGE	48	SSPH	AEROBIC DIGESTORS
15	GVP	GRIT VACUUM PUMP	32	CP	CONCRETE PIER	49	SSPH	SECONDARY SLUDGE PUMP HOUSE
16	MC	MEASURING CHANNEL	33	SP	SCRAPER PIER	50	FR	FLOW RECORDER
17	SRM	SLUDGE RISING MAIN	34	WSDB	WEST SIDE DRYING BED	51	ESDB	EAST SIDE DRYING BED

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PHED, Rajasthan incorporated several innovating features. One of these features was that biological treatment be used with aerobic digestor attached with sludge thickner. This treatment unit has been in full operation for approximately two years and this paper describes the facilities being used and discusses some of the design and basic mechanism involved in every treatment unit.

Figure--1, shows the present plant layout, and reflects the complete sewage treatment and disposal cycle. The present design capacity in use is 3 mgd with the total capacity for 6 mgd and lean hours flow measured was 1 mgd. Sewage receives primary treatment prior to biological treatment process. After biological treatment the affluent is discharged to the Jal Mahal with the excess activated sludge being thickened by gravity. The thickened sludge is digested and passed on to the drying beds for final disposal as manure. The design parameters have been appended as follows :

DESIGN SPECIFICATION

Unit : 1 Inlet Chamber :

Out fall sewer 1200 mm diameter with capacity of average D.W.F. 12 MGD.

Unit : 2 Screen Chamber :

Two chambers of 6 MGD capacity. Velocity of flow: Max. 076 mt/Sec. at peak flow.

Screen size: Coarse screen 3″ opening, fine screen 3/4″ opening.

Unit : 3 Grit removal plant :

Capacity: Ultimate DWF of 6 MGD velo. of flow: 0.772 Mt/Sec.

Specific gravity of grit particles 2: 3 Min. size of grit settling: 0.2 mm settling time: 65 Second.

Grit channels Four sub-channels of parabolic section 2.286 meter wide at top and 0.6m at bottom with depth of 0.85 meter.

Unit : 4 Aeration Tanks (42)

Proposed inlet BOD—450 mg/lit -do- outlet BOD—10 mg/lit (eff.97.8%). Detention time in the tank: 13.28 Hrs. proposed MLVSS concentration: 2520 -do- M/SS -do- :4200 Oxy. capacity 1.15 Kg./Kg. of BOD Oxy. transfer capacity of each 5 aerater 1.3 Kg/HP/Hr.

Capacity of aeration tank : 15.08 Million (358660×42).

Proposed SVI : 50-100.

Volume of surplus sludge 2250 Kg./day.

Proposed A/M ratio 0.1485.

Proposed solid retention time 20-24 day.

Proposed surface loading rate :

525 kg/1000 cum.

Aeration tanks : $10.36 \times 10.36 \times 2.47$ Mt.

Hopper bottom tanks :

$10.36 \times 10.36 + 5.56 \times 5.56 \times$ IM

Aeration cones : 1.8 mt. diameter high intensity cones,

Reduction gear : Weather proof worm reduction gear heads from 960 rpm to 40 rpm.

Motors : 12.5 HP.

Unit : 5 Final Settling Tanks :

Surface overlow rate : 53750 lit/day/sqmt.

Detention period 21/25 Hc.

T. capacity of tank : 5.675 million lt.

Sludge : 400 mm dia working under hydrostatic condition.

Unit : 6 Return Sludge pump house :

Pumping capacity : 6 MGD with 2 MGD stand-by.

Unit : 7 Sludge Thickner :

Capacity : 186140 lit.

Size : RCC 6.1 circular tank with 3.96 meter depth with hopper bottom.

Inlet : 200 mm dia C.I. pipe.

Outlet : 200 mm dia C.I. pipe with valve.

Unit : 8 Aerobic disgestors :

Detention time : 12 days.

Oxy. capacity 0.08 Kg. of Oxy per Kg. of BOD removed.

Aeration tank : $10.97 \times 10.77 \times 2.47$ MT

Hopper bottom tank :

$(10.97 \times 10, 97 + 5.66 \times 5.56) \times 1$ mm

Aeration cone :

Reduction gear :

Motors :

Unit : 9 Secondary sludge Pump House :

Pump capacity : 27.2 cum/Hr.

Rising-main : 150 mm dia CI pipe.

Unit : 10 Sludge drying beds :

Area : 4366 sqm.

Drying time 10 days.

12 Nos. S. drying beds.

size ; 22.87×17.62 meter.

Extended Aeration

Extended aeration is also termed as total oxidation or aerobic digestion. Any treatment in which water borne wastes of domestic or industrial origin are acrated in the presence of flocculent cultures of micro-organisms, the so called activated sludge (activated sludge processes use recyled micro-organisms to oxidize the organic compounds in the presence of molecular oxygen to carbon dioxide, water and new cells) freely suspended in the liquid. Most waste waters amenable to treatment by the process containing in inoculum of micro organisms and on aeration, those adopted to the prevailing environmental conditions will grow. A proportion these organisms will usually be found to clump together and the flocculated mass can be separated by sedimentation. Quantities of the waste water then can further be added, and the procedure is repeated until a sufficient concentration of flocculant activated sludge has been built up to permit operation under continuous flow conditions. The concentration usually required in the mixture of sludge and waste water is within the range of 3500 to 5000 mg/1, A high mixed liquor suspended solids (MISS) concentration and extended period of the aerations are essentials of this process to seek a reduction of BOD over 98 percent. This reduction is brought about by two fold conversions of organic matters. A part of it, is rendered into biological sludge and a part is also converted into carbon dioxide and water. Long period of aeration leads to further mineralisation of biological sludge by endogenous respiration and, therefore, it does not require any more treatment. The essentials in this process are :

Sludge Age (days)	10
Residence time (Hrs)	15-30
Removal efficiency (%)	85-98
Reactor solid concentration (Mg ML SS/1)	3500-5000
Recyle Ratio	0.7-1.5
Lb BOD (Loading) Ft 3 days	0.025

Sewage purification and sewage works

Sewage is a water borne waste which contains enormous variety of waste products of human, animal, vegetable or mineral origin in dissolved and undissolved form. A sewage contains solids those sink, those float and those which neither sink nor float. Efficient and successful sewage treatment involves the healthy and proper functioning of all operations. Each unit of treatment plant ralies on the harmonious functioning of the previous one. Two treatment units are not alike. Every unit differs in design, strength and quantity (bow) of sewage it receives and the time period of contact.

Preliminary Treatment

The sewage from the half of the city Jaipur is led to this treatment plant by a 1200 mm dia. Masonary sewer. The total quantity of the sewage received by the treatment plant is about 3 mgd with a maximum flow in the morning/evening hours and minimum flow occurs during the lean hours. Sewage carries with it papers, rags, sticks, coarse, grit and other objects. If they are left to pass to other units they could cause great deal of trouble by blocking pumps, choking pipes, valves and the desired oxidation of the organic matters. The first step, therefore, is the removal of these objects by screens of size 3" and 3/4". The bar screen has been set with the bars sloping in the direction of the flow, and the angle with the horizontal is 60°. Bar screens are cleaned by hand. Alternatively, the cleaning of screens is also done by substituting another set of screens of the same size.

Grit Removal plant

Even where the sewerage system is nominally separate, it is prudent to make provision for the removal of grit, from the matter, though it is composed of sand, brokenglass, cinders crockery and occasional small fragments of metal. Removal of grit is based on the fact that grit is heavier than the organic solids present in the sewage. The specific gravity of quartz material (sand) is about 2.65 and of organic matter ranges from 1.0 to 1.2. Practically, a detention period of 1 minute and a velocity of about 1fps. have been found to be most effective in removal of grit. Theoretically this unit should eliminate inorganic material larger than about 0.2mm. This removal is effected by means of a small settlement tank from which the grit is removed by pump. The specific gravity of the grit material though may vary but precisely it comes to 2.6. The four parabolic channels with a depth 2.286 mater, top width 0.6m and 0.85 m at bottom also play vital role in removing the grit from sewage. This unit is equipped with mechanical device for removing the grit and washing it. The unit makes a use of small detention tank (grit collector and washer) where after being washed, the grit is discharged by a conveyor. The so conveyed material is dumped into the trolly standing just below it for final disposal.

Aeration tanks

This sewage is led through the channels to the surface aeration system in which the surface of the sewage in the aeration tank is agitated as to encourage solution of oxygen from the air. The reason and the advantage of agitation is that when the water is comparatively quiescent, the surface film exposed to the air becomes saturated with oxygen but this oxygen is not transferred to the body of the liquid, whereas when the water is agitated the surface film is rapidly replaced with deoxygenated sewage, so that the process of aeration, is greatly increased. This is similar to that phenomenon of heart exchange where heat is transferred rapidly through the surface if the liquid is in motion. This whole of the process (aeration) in this sewage treatment plant is accomplished in aeration tanks.

The system of aeration in this plant involves the latest technology. The mechanical aeration system introduces oxygen into the liquid and the activated sludge is kept in suspension by an agitator rotating at or near the surface of the aeration tank. Aeration cone consists of an inverted rotating funnel (aerating wheel or one) shaped agitator equipped with vanes on its upper surface, surmounting on masonary uptake tube, situated in the centre of each aeration pocket, circulation and aeration are produced by the aeration cones drawing liquid from the draught tube and spraying (the effect of spraying also damps down foaming which in some other processes has become a serious problem) over the tank surface, entraining

and dissolving oxygen in the process. In this manner the liquid in the tank is kept in motion sludge is prevented from settling and the agitation of the surface effects aeration. The intensity of aeration can be controlled by varying either or both the rotation speed of the cone and its degree of imersion in the liquid. The rate of oxygen transfer is affected by the nature of aeration device, depth of submergence, temperature turbulance in the tank, depth of the tank and the chemical character of sewage. The concentration of activated sludge in the mixed liquor has to be kept 3000-5000 mg/1. (suspended solids) and is so adjusted that dissolved oxygen remains 2-3 mg/1. The advantage claimed for this system are :

1. Low horse power requirement
2. Low maintenance
3. Low cost.

The very important part of this unit is the maintenance of recirculation ratio. The ratio of re-circulation represents the volume or re-circulated flow to the raw sewage flow. 0.5 to 1.5 are common in treating domestic sewage but ratios upto 10 are employed to the strong industrial waste. The re-circulation is from the under-flow of the final settling tank.

Final Settling Tank

From the aeration tank the sewage flows to a final circular settling tank whose storage capacity is 5675000 lit. The detention time allowed is 2.3 hours. Sedimentation is employed to remove the smaller organic solids in the sewage. The aerated sewage enters at the centre and flows to the periphery to form a sort of influent wall at the centre by means of a pipe through the body of the tank or more appropriately it is more or less an upward flow through a central riser from a pipe entering under the tank. A circular baffle provides a satisfactory distribution to the flow. This baffle is perforated. Machanical equipment for sludge removal, scraper has been provided to concentrate the sludge to hopper. Sludge is removed from the tank by pumping.

Sludge Thickener

Twenty percent of the settled sludge is pumped to a gravitional thickner while about eighty percent of the same meets the sewage entering aeration tanks. The unit operates very much like a settling tank. The feed solids entering in the middle are distributed radially and the sludge solids are collected as under flow. There are three zones in such a thickner. Clear zone: Top liquid escaping over the weirs. Feed zone: Uniform solid concentration to the point of sludgt. By thickening the volume of sludge going to the aerobic digestor is reduced and the thickner over flow is returned to the f.s.t. inlet. Here thickening means the concentration of solids to less than 15 per cent solids. It is practical to produce the sludge with 6 to 10 percent of solids by thickening.

This sludge is then onwards passed on to the aerobic digestor.

Aerobic digestors

Waste biological sludge so produced is stabilised by simply reserving aeration in four aeration basins. The basic reaction of the aerobic sludge stabilisation is :—

$$\text{Complex organics} = \frac{\text{Aerobic}}{\text{organisms}} \; CO_2, \; H_2O$$

This aerobic stabilization process has the advantage of a complete food chain and a very mixed and varied ecology including some anaero-

This aerobic stabilization process has the advantage of a complete food chain and a very mixed and varied ecology including some anaerobic and facultative organisms. This results in a very non-fragile ecology and thus the aerobic stabilization process is less susceptible to be upset than the other processes. These have been designed to eliminate all sludge disposal problems and to allow only inert solids to escape

over the drying beds. Deweterability is tremendously effected by it.

Drying Beds

The ultimate disposal of sludge is often facilitated by removing enough of the liquid portion so that the sludge behaves as a solid. The removal of water from sludge in drying beds takes places in two steps. The water drains out of the sludge into the sand and accumulates into the drains to out. A considerable fraction of the water is drained by settling of the solid and general compaction followed by the formation of channels that further the process of dewatering. Further dewatering occurs by evaporation. This is accomplished by 13 drying beds. They consist simply of shallow ponds with sand bottoms and tile drains. Sludge is pumped to these beds at a depth of 6-12 inches and the time required for the sludge to dewater to a liftable consistency ranges from 10-15 days. The drying beds are rectangular in shape with low surrounding walls. The design specifications have been laid by WPCF 1959 as 1.75-2.5 square feet per capita, while British experience dictates bed area between 3.5 to 5.5 sq ft./capita. More adequately it is considered to be 0.84 sqm of drying bed for every 7 persons of contributory population.

The physico chemical character of Raw sewage, effluent and sludge :

TABLE—I

The composition of Raw sewage, effluent and sludge given in the table. The values recorded for sludge composition include five years observations from the year 1976 to 1981.

Particulars	Minimum	Maximum
Colour Order	Brown-gray Little	Very seldom Offensive
p	7.3	8.2
Total Alkalinity (as caco) mg/l	488	716
Chloride (pascl) mg/l	192	336
Total settleable solids (30 mts.) ml/l	2	10
Total solids mg/l	1270	2225
Total volatile solids mg/l	390	1015
Total desolved solids mg/l	910	1310
Total suspended solids mg/l	340	900
$BOD_5 mg_5/l$	250	600
COOmg/l	680	1540
D.O.mg/l	0.1	0.0

TABLE—II

Percentage purification efficiency of the plant

Particulars	Influent Min.	Influent Max.	Effluent Min.	Effluent Max.	ISS	Design specification
BOD_5 mg/l	250	600	7	15	20	20450 (influent & 10 for effluent)
Suspended solids Mg/l	340	900	15	30	30	—

Percentage Reduction in BOD_5 is of theorder of 95% to 97.5%

TABLE—III

Fertilizing Value of Sewage Sludge in Comparision to the Detailed and other Indian Manures

Per cent by weight on dry basis.	Sewage sludge Desired value	Actual values	FM**	Compost
Total Nitrogen	5-7	3.5-4.0	0.5	1.2-1.5
	3.0-4.3*			
Total Phosphorus	2-4	1.5-2.5	-.2	1.0-1.2
Total Potassium	0.1-0.6	0.3-0.6	0.5	1.4-1.6
			EPA-1959 Farm yard Manure.	

The plant has been in operation since September, 1978. On the basis of the operating experience today, it is intersting to examine that the obtained results confirm the design specifications. BOD removal is to the extent of 95 to 97.5% (Table-II) The effluent is more of exceilent quality with a minimum and maximum BOD_5 7 and 15 respectively. Though design requirement is 10 against the influent BOD_5 450 mg/l. The maximum BOD_5 is obiviously an overloading of the plant but substantial lover effluent BOD_5 value is achieved. The final product, sewage sludge dried on the beds contains substances of considerable fertilizing value such as nitrogen, phosphorous, potassium, Hunus, and organic growth producing substances. As is known that it conditions the soil and helps to retain moisture, it can be used as a filler for true fertilizer, as a compost too. From Table III, it is revealed that sewage sludge provides maximum and potant portion of nitrogen to the farm. The cost evaluation so far made comes to be about Rs. 80 per tonne.

on the basis of the nutrients it possesses, but may be more if blended with other soil conditioner. Gypsum, which is the requirement of most of the Rajasthani soils may one of the blender. Farm yard manure (Gobar Khad) and compost (stabilized soid waste) contain very less nitrogen and phosporus in comparison to sewage sludge. Fortification with phosphoric acid and ammonia may result into more economic returns. The resulting product is yet to be assessed. It has been experienced that people line-up to purchase sewage sludge to truck it at their own during the seasons. As such it is beneficial.

Maintenance Cost

The expenses incurred annually in the maintenance of sewage treatment plant are given here as under :

Electricity charges	Rs. 4,80,000/-
Labour salary & Wages	Rs. 3,00,000/-
Miscellaneous expenses	Rs. 60,000/-
Total annual maintenance cost :—	Rs. 8,40,000/-

Revenue Return

Revenue return of sewage sludge has been evaluated to not only to give a coverage to the ex penses incurred in maintaining the plant but proves to be an asset to the income. Annually the production of sewage sludge is about 10,000 cum which @ Rs. 80 per cum yields Rs. 8,00,000 annually.

Effluent which is 2.9 mgd and is passed on to Jalmahal for onwards use as irrigation water, economically adds about Rs. 96,000 per annum. In total the revenue return comes to be Rs. 8,96,000/-. The total maintenance costs Rs. 8,40,000/- per annum can be very well met within the returned assets.

The economic use shall be furthered when the plant runs to its full capacity of 6mgd. The revenue shall just be doubled to estimated and even if electricity charges are substracted, the net benefit accounts for a gross saving of Rs. 4,80,000 annually.

The economic use shall be furthered when the with the invaluable efforts to safe guard the nation's health and therefore, bulk of domestic waste water which was once held responsible to cause lot of nuisance and hazard to public health and its environ, to day is free from any danger. But conversely for a state which is already under so many economic strains this facility with returns is of vital importance. Therefore, the contribution in the field of public health & hygience rendered through this venture is of course far beyond the limitations of any enonmic computation.

CONCLUSION

The system to date has been capable of meeting a process effluent guarantee of 10 mg/1, BOD_5. There was no evidence of filamentous growth and associated problems and no major system design problem could be noticed. Efficiency determining factors have revealed that there is no undue economic penalty and rather number of benefits can be ascribed to the operation of this plant.

Social and Epidemiological Issues in Rural Water Supply Programme

By

D. Banerji*

Introduction

WATER supply programmes involve considerable investment of resources. Allocations of invostment in such programmes are determined by three major considerations:

1. Improving access of people to water and improving the quantum of water supply for drinking, cooking, washing, etc.

2. Offering water to people which is perceived by them as cleaner or esthetically better than what they have been getting earlier.

3. As a measure to reduce the incidence of water-borne diseases in the community.

Much remains to be done in determining a rational basis for allocation for rural water supply programme on the basis of assessment of the above types of considerations. Because of such shortcomings, it has also not been possible to relate allocations for rural (or for that matter urban) water supply programmes with other sectors of plans for social and economic development. More often than not, allocation of resources for community water supply schemes are made on an ad hoc basis. The need for access to water and the need for getting esthetically clean water supply have to be determined for individual communities on the basis of the weightage given by these communities to such needs.

Even if one keeps aside the question of the value attached to the access, the quantity and the esthetic aspects of water supply to a community, one has to contend with important epidemiological, ecological and sociological issues related to community water supply in rural India. These are very briefly discussed in the subsequent paragraphs.

Social Issues

It is always assumed that a water supply system that is offered to a community by government or other agencies from outside is good. So confident are the personnel of these agencies about the "superiority" of their programme that they have often ignored even to study the system which had been existing earlier. To make matter worse, they also let loose hordes of "educators" to educate people to accept what is handed down to them by these agencies. Improvement of the health status is a major argument given by such educators in favour of acceptance of a new water supply scheme. Often this is the case and often there is little problem in getting acceptance of a scheme within a community. Sometimes, even if there is no actual improvement in health status, people accept the new scheme on the basis of the "education" given to them by educators. On occasions, however, some people stick to the old system because they have problems with the new scheme. For instance in the course of a nine-year study of nineteen villages (1), it was observed that many villagers did not like the taste of the water from the shallow tubewells and so they used water from these tubewells only for drinking purposes and they continued to use water from the village ponds for cooking and washing utencils and clothes. This example is being given here to underline two issues:

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1. That there ought to have been community studies about social perception and social values about water use before implementing another water supply scheme .

2. Before people are "educated" or forced to give up use of pond water, the agency concerned should have convincing data to show superiority of using water from shallow tubewells.

Another set of social issues concerning a water supply scheme relates to the distribution of water outlets (taps), quantity of the water supplied and regularity of water supply. In the sharply stratified rural society, the lower classes often get fewer taps, often at the fag end of the supply system. The queues at these taps are much longer and this generates various kinds of social tensions, sometimes culminating in fights. Worse still, when the supply system breaks down due to various reasons (e.g. failure of electricity supply), these people have to fall back on the old source of water supply. As these sources get further contaminated because of even greater neglect, drinking of water from such sources exposes the people to even greater health hazards.

Eqidemiological Issues

Public health engineers are familiar with the ecological consequences of not having an adequate drainage system along with a potable water supply system. How this deterioration of the environment affects the health status have not been adequately studied by epidemiologists

When even giant municipal corporations of the metropolitan cities of India are unable to provide protected water supply in adequate quantity to the cities, it is reasonable to assume that the conditions are much worse when it comes to supplying protected water to rural populations. Further, even if it is assumed that the water supplied by a rural water supply system is "protected", the epidemiological impact of such schemes on incidence of water-borne diseases of various kinds has not been systematically studied. For example, how far has the provision of protected water supply to urban slum populations influenced the incidence of water-borne diseases? Even if a villager gets adequate amount of protected water supply for his various uses, how does that influence the disease incidence in an environment of filth, dirt, flies and insects and under appalling conditions of personal hygiene and housing? The matter becomes even more complicated when the water supplied is only "partially" protected or when the quantity of water supplied is limited and is erratic in frequency.

Most often epidemiologists have failed to answer such questions, yet, huge investments are being made on water supply schemes of various kinds. It may, however, be emphasised that it is not being argued that there should be no rural water supply programmes. It is being argued that allocation for water supply would be made on the basis of a better understanding of sociological issues and on the basis of a better appreciation of the health outputs of the investment along with the output in terms of limiting the needs of a community for water for various domestic purposes.

Reference

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Rural Drinking Water Strategy

By

Col. B.L. VERMA*

THE International Water & Sanitation Decade will see an outlay of around 12,000 crores in the coming 10 years. The United Nations have pledged to provide safe drinking water to every man, woman and child by 1990 (for some odd reasons cattle have been left out). The provision of water in the rural areas, according to established UNICEF philosophy will be through a hand pump programme. At the rate of at least one hand pump per village, the programme will require an outlay of 1,500 crores. The Programme is well conceived and on the face of it a genuine solution to the problem of provision of safe drinking water. It, however, suffers from a few shortcomings:

(a) The programme is being carried out in isolation, independent of other development programmes, thereby raising the overall cost of the programme;

(b) It cuts across the grains of integrated rural development;

(c) It siphons all the money spent on the programme into urban economy;

(d) It generates no employment potential in the rural areas;

(e) It has an adverse cost benefit ratio.

Water is a commodity that is required to support any process of devlopmnt of human activity. Water is required for drinking, bathing, washing, sanitation, cattle, industry, agriculture, horticulture, sericulture, aquaculture, or name any other culture. Let us then work on the following lines:

Develop water resources in totality

Consider various demands on this commodity

Allot priorities of necessity the first priority has to be drinking water.

It will be seen that in this programme, water is not being fragmented. Once resource is developed, the water will be distributed according to priorities. This will bring down the cost on drinking water programme and make the money for rural development last longer.

The water resources development may take the shape of surface water harnessing mini reservoirs, tanks, dug wells, or bore wells for harnessing ground water. In fact, more often than not it will be conjunctive use of water

Presently most of the funds set apart for rural development are being spent to support the infra-structure of the agencies created to work in the rural areas. If the concept of integrated rural development is accepted in principle, the entire working in the rural areas must be integrated and be achieved through a common development agency, and multiple rural development agencies all trying to work in isloation and at cross purposes generally be dismantled.

What we need for the programme of drinking water in the rural areas is a fresh look, an integrated look, of which this programme forms a component in total development.

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Water Supply in Mewat Region of Haryana

By

Subhan Khan*, R.K. Punjia**
M.L. Sharma***

TECHNICALLY water is not a food but an essential component of diet. Its supply has become a critical factor in public health and economic development in most parts of the world, as water and health are closely connected. World Health Organiation has estimated that 80 per cent of the world diseases and illness is due to contaminated water. Contaminated drinking water can cause intestinal and parasite infection directly. Stagnation of water can provide an environment for the carriers of these diseases. Lack of water results in a poor standard of personal hygene which in turn leads to the transmission of infection by means of unwashed hands, crockery, dirty clothes etc. etc. Much of the water associated diseases in India are related to polluted drinking water.

The global significance of water found expression in the United Nations Water Conference in March, 1977 and by the Thirtieth World Health Assembly in May, 1977 which proposed that the Decade 1981-1990 be celebrated as the International Drinking Water Supply and Sanitation Decade. It is hoped that every body will be provided with safe drinking water and sanitation facilities by the end of decade.

Mewat Region in Haryana

Mewat region in Haryana forms the southern tip of Haryana state bordering Rajasthan and bounded by Gurgaon tehsil on north, Alwar district on west, Bharatpur district of Rajasthan on south and Palwal tehsil of Faridabad district on east. This is a triangular area divided into four NES blocks, i.e. Nuh, Ferozepur Jhirka, Hathin and Punhana. These blocks fall in tehsil Ferozepur Jhirka and Nuh of old district Gurgaon. The area is inhabited predominantly by Meos, an agricultural Hindu caste converted into Mohammadons.

Hydrological Aspects of the Region

In Mewat region two types of alluvium i.e. clayey and sandy, are found extensively. The Aravali ridges divides this two types of alluvium. Clayey on the western side and sandy on the eastern side. These are wide spread pans of Kankar which occurs at various depths ranging between 2.4-3 meter and 42 to 97 meters i.e. shales and quartizes. In most of the area, the underground water is saline at shallow depth. However, at the foot of hills certain sweet water pockets are available. The spring level varies from 40 to 80 feet. The discharge of tubewells is between 5000 to 8000 gallons per hour.

Sources of Water in the Region

There are 531 villages in the region. Out of which 490 villages are inhabited with population of 4,05,701 persons as per 1971 census. According to the Government of India in the year 1972 all the villages were problem villages in respect of the availability of safe drinking water in the following categories

(i) having no assured source within a distance of 1.6 km or having no groundwater source within depth of 15 metres.

(ii) the existing source of water supply is susceptible to water borne diseases like cholera or infested with guinea- worms making endemic to these diseases.

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(iii) the existing source suffers from excessive salinity, iron or fluorides making them hazardous to health.

Hydrological aspects discussed earlier reveal the state of affairs. The position has improved over the time. Piped water supply facilities have been provided in 62 villages by the year 1971. By the end of March, 1980 the number of villages having facility of piped water supply increased to 113 i.e. 23.06 per cent of total inhabited villages with population of 85964 persons i.e. 21.19 per cent of the total population of region under reference. Wells constituted the only source of drinking water for inhabitants of 421 villages upto 1977 (statement A). Still this source is most commonly used for the purposes of drinking water, even in majority of villages of the water is brakish. As there is no potential canal in the area, ponds are the main sources of water supply to six of the villages.

Condition of Sources of Water in the Region

Community wells are the main source of drinking water supply. These wells are built nearby the villages by the village community or philan-throps. Almost all the wells are uncovered and majority of them are in bad shape. It was observed during the survey that in 75 per cent of the village wells birds and lizards have dug their holes in the side walls. Many a time the decomposed body of these birds and reptiles are being taken out in the drawing bucket/pot. There is no protection from dirt and dust. Even instances were quoted by the villagers about falling of small domestic animals in the wells. The only way of cleaning the water of well, in case an animal falls or any person commits suicide by jumping in well, is to pluck the water outlet in the well and draw out whole water. Use of Potassium permagnate or any other Chemical is not liked by the villagers.

STATEMENT A

Distribution of Villages of Mewat Region by distance from the drinking water source: 1977.*

Tehsil	Distance in Kms.	Sources									
		Tap		Well		Tubewell		Other		Total	
		No.	%	No.	%	No.	%	No.	%	No.	
Nuh	Within village	23	8.9	214	82.6	1	0.4	5	1.9	243	93.8
	1-2	5	1.9	9	3.5	—	—	1	0.4	15	5.8
	3-5	1	0.4	—	—	—	—	—	—	1	0.4
	Total	29	11.2	223	86.1	1	0.4	6	2.3	259	100
Fero-zepur Jhirka	Within village	33	14.3	185	80.1	—	—	—	—	218	94.4
	1-2	—	—	13	5.6	—	—	—	—	13	5.6
	3-5	—	—	—	—	—	—	—	—	—	—
	Total	33	14.3	198	85.7	—	—	—	—	231	100
Total		62		421		1		6		490	100

*Source: Economic Census 1977, Village Amenities, District Gurgaon, pp. 28-29.

Condition of ponds is much deteriorated. None of the ponds is cemented and has proper sanitation measures. Animals and men are very closely associated as far as the drinking water for both is concerned in six villages. In half of the villages, drinking for animals and bathing for men is from the pond itself. Water catchment area of the ponds is village common land or water from village area or both. Rain is the main source of pond water. Only in acute scarcity times water is diverted from distant places to this region for meeting the demand of drinking water for both men and animals.

Socio-economic and Cultural Aspects of Sanitation and Hygiene

Contamination begins from the source of water itself. Village wells are mostly in bad condition not because the people are poor but because of lack of sense of common responsibility. Common man does not feel involved in community works.

People use buckets, mudpots and leather containers for drawing water from well. They use sunhemp or coconut rope for drawing water. Both the drawing pot and rope are not seen from hygeine point of view. Ladies generally rub the soil on the drawing pot and do not wash it before lowering in the well. The nearby soil rubbed on pot, if it does not contain fecal material, it certainly contains dung contents. Similarly the rope takes inert material with it and pours it in the well water.

The most dangerous common practice in rural areas is to ease near by the source of water. They clean their hands either on the bank of pond or near the village well. The disease parasites and germs are introduced very frequently in the water source. In case of pond the water catchment area is washed off in rainy season and contaminated water accumulates in it. Washing of clothes and bathing on bank of water source is another insanitary habit of people. In some villages the community has practised social ostracism for such actions and village factions fade away the community efforts.

As animal has been the backbone of rural economy in rural community, both, man and animal, live in close association. Animals are taken to pond for watering. They deficate and urinate in pond water. Thus water is polluted heavily. Children take bath in ponds along with animals and are subjected to many communicable diseases. Situation is worst in the villages where pond water is being used for drinking and household purposes. Population of such villages is subjected to zoonotic diseases.

Personal hygiene is least attended to by rural people. Traditional moorings, like, 'Sher Ke Mauh Kisne Dhoia', are very much prevalent. Not to talk of bathing and cleaning clothes, majority of the children do not wash their face. Parents are unaware of personal hygiene which lead to many diseases and thereby occurs economic as well as health loss. The vicious circle of, poor hygeine-ill health and economic loss-poor work efficiency-lesser production-lesser money for development, is a common phenomena in this region.

Remedy of the problem lies in various aspects but the most important is the supply of safe drinking water through piped water supply.

Status of Water Supply in Mewat Region

Water supply is a state subject. Government of Haryana has made concerted efforts in achieving the objective of 'safe drinking water for all'. But the existing status of water supply in this region warrants for acceleration of the programmes Statement-B clearly reveals that with the completion of water supply projects in execution, 43.29 per cent of villages with 48.87 per cent of population would get safe drinking water. State Public Health Engineering Department has prepared estimates for rest of the villages under the auspices of Mewat Development Board.

Financial Requirements

Supply of piped water is a costly affair. Although the state is spending a good amount for this purpose, the financial resources are meager in comparison to the need of hour.

Per capita cost of schemes is Rs. 274/- and Rs. 285/- for Nuh and Ferozepur Jhirka tehsils respectively. Projects under execution need financial resources amounting to Rs. 194.60

STATEMENT B

STATUS OF WATER SUPPLY IN MEWAT REGION*

Sr. No.	Description	Nuh Tehsil	Ferozepur Jhirka Tehsil	Total
1.	Total number of villages.	289	242	531
2.	Inhabited villages	261	230	491 (100)
3.	Population (1971)	2,25,933	1,79,768	4,05,701 (100)
4.	Number of villages provided with water supply (31.3.1980)	65 (13.30)	48 (9.80)	113
5.	Population provided with water supply (1971)	68,882 (16.97)	43,277 (10.66)	1,12,159
6.	Number of villages for which water supply schemes are in progress (1.5.1980)	53 (10.79)	46 (9.40)	99
7.	Population to be covered by water supply projects in progress (1971)	52,909 (13.10)	33,055 (8.14)	85,964
8.	Number of villages for which estimates have been prepared.	31 (6.32)	52 (10.79)	83
9.	Population for which water supply estimates have been prepared.	25,384 (6.26)	46,743 (11.52)	72,127
10.	Unattended villages	112 (22.90)	84 (17.20)	196
11.	Unattended population	78,758 (19.41)	56,693 (13.97)	1,35,451

Figures in parentheses denotes per-centages to total number of unhabited villages and total population of the region.

*Source: Statistical Abstract of Haryona, 1979-80 Public Health Engineering Department, and Rural Water Supply Project of Mewat Area, Haryana.

lacs besides Rs. 99.37 lacs already allotted for the purpose (Statement-C). State is the only funding agency. The beneficiaries contribution has been discouraging. As the majority of the people are below poverty line, their contribution is only in giving 'Samlat' (common) land for the purpose. It is also difficult to make rural water supply self supporting as the tariff structure cannot be drastically increased due to the people's inability to pay. State is facing financial difficulties in providing safe drinking water to all Mewaties by 1990 as the financial resources needed amount to Rs. 10 crores.

Conclusion and Suggestions

Progress made in the region is quite satisfactory. The region under reference is the most backward region in the state. Natural biases in terms of brakish under ground water and kankar in the soil have contributed much to the problem. Sanitation and hygiene aspects are being neglected because of the ignorance,

illiteracy and traditionalism. Major problem being faced by the state is financial shortage to meet the expenditure, besides materials. It is hoped that State would achieve the traget set for the Decade to provide everyone with safe drinking water and sanitation by 1990.

1. International organizations like UN WHO UNICEF etc. should come forward to help the developing countries.

2. A comprehensive survey of the socio-cultural and economic conditions of the people must be carried out before defining the overall policies and plans.

3. Local government and community participation in programme is essential. It may need increased investment in terms of preparatory time and costs but would lead to success and long lasting effects.

4. Need to include women in decision making related to site and nature of source to be developed. They bear the direct burden of collecting water and often have the responsibility of maintaining sanitary facilities and household environment.

5. Imparting sanitation education, related to the dissatisfaction in the community with present conditions and its motivation to improve the quality of life; arguments relevant to their frame of reference; integrating message with folk lores and local proverbs and; use of common-sense arguments.

6. Upgrading the present sources of drinking water supply by improving their structure appropriately.

7. Developing appropriate technology and undertaking the national production of equipment.

STATEMENT C

FINANCIAL OUTLAY AND REQUIREMENTS*

Sr. No.	Description	Nuh Tehsil	Ferozepur Jhirka Tehsil	Total
1.	Estimated cost of projects in progress with number of villages	Rs. 191.95 lacs No. 53	Rs. 102.02 lacs No. 46	Rs. 293.97 lacs No. 99
2.	Funds allocated to projects at Sr. No. 1	Rs. 60.13 lacs	Rs. 39.24 lacs	Rs. 99.37 lacs
3.	Funds required for completion of projects at Sr. No. 1	Rs. 131.82 lacs	Rs. 62.78 lacs	Rs. 194.60 lacs
4.	Estimated cost and number of villages to be served by water supply.	Rs. 74.43 lacs No. 31	Rs. 142.43 lacs No. 52	Rs. 216.86 lacs No. 83
5.	Per capita cost of schemes as given in Sr. No. 1	Rs. 274/-	Rs.285/-	
6.	Estimated cost and number of villages to be served by water supply.	Rs. 265.43 lacs No. 112	Rs. 198.74 lacs No. 84	Rs. 464.17 lacs No. 196

*Source: Public Health Engineering Department, Haryana.

Rural Water Supply in India

By

Bhanu Pratap Singh*

UNTIL the advent of independence (1947), rural water supply was a neglected subject. The villagers had to depend on tanks, ponds and open wells for all their water supply needs and where no source of water supply existed, they had to trek long distance in search of water. After the attainment of independence some state governments initiated a programme of rural water supply and achieved a small measure of success.

During the initial stages of the first Five Year Plan, provision of water supply and sanitation schemes in the states was met out of the funds provided for community development works. It was in 1954 that the central government stepped in by providing some funds for aiding the states in the execution of rural water supply and sanitation schemes. The new programme, captioned "National Water Supply and Sanitation Programme" was launched in 1954 under which 50 per cent grant-in-aid was given by the central government for implementation of rural water supply schemes. The other 50 per cent of the cost of the schemes was met by the state governments with some nominal contribution by the local beneficiaries.

In the early sixties, the Government of India realised the needs for making correct assessment of the problem of rural water supply and as a prerequisite for plannig, set up special investigation divisions in every state. These divisions were assigned the task of investigating and preparing a list of problem villages in respect of drinking water supply. The final compilation of the results of the survey indicated that there were about 1.53 lakh villages in the 'problem' category where water supply schemes had to be taken up on priority basis. The 'problem' villages come under the following categories:

(i) villages which have no source of water supply within a mile radius or within a depth of 50' from ground level;

(ii) villages in cholera endemic areas; and

(iii) guinea-worm infested areas, and where water supply has high content of chlorides, fluorides, iron, etc.

The emphasis on rural water supply programme underwent radical change with the commencement of the fourth Five Year Plan (1969-74). On the basis of assessment report of 1972 indicating that the 'problem' villages were around 1.53 lakhs, rural water supply was taken to be one of the components of 'Minimum Needs Programme' in the Plan. The Government of India launched a programme, called 'Accelerated Rural Water Supply Programme' in 1972 with a view to providing speedy relief to the people living in 'problem' villages. Under this special programme, around Rs. 40 crores were spent during 1972-74 and cent-per-cent grant-in-aid was given by the Central Government for rural water supply schemes executed in 'problem' villages.

During the fifth Five Year Plan (1974-79), attempts were made to provide a source of safe water in the problem villages already identified by the states. It was estimated that about 40,000 'problem' villages were provided with water supply by March 1979 under the National Water Supply and Sanitation Programme. This meant that 1.13 lakh villages had yet to be lifted out of the category of 'problem' villages. Therefore, the Government of India launched the Accelerated Rural Water Supply Programme for the second time in 1977 under which about Rs. 100 crores were distributed as grant-in-aid

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during the years 1977 to 1979. Under this central sector programme, a sum of Rs. 60 crores has been allocated during the year, 1979-80. It has been reported that around 43,000 villeges have been provided with safe water supply during 1977-79 and it has been estimated that around 33,000 villages would have water supply facilities during the current financial year. It will thus be seen that from 1951 to 1979, investment to the tune of Rs. 650 crores has been made for rural water supply.

The declared policy of the Government is to provide complete coverage with the scheme of safe water supply in all the problem villages before the end of the Sixth Five Year Plan. With the present rate of investment in the rural water supply sector, both by the Centre and the States, it will be possible to achieve this goal by March, 1983.

With the completion of rural water supply schemes in problem villages in 1983, it would be government's endeavour to provide each and every village with protected water supply by 1990. The United Nations have declared 1981-90 as 'International Decade on Water Supply and Sanitation' and the Government of India, like other developing countries, have agreed to achieve the goal which has been set by the United Nations in their conference held in Mar Del Plata in 1977. It is estimated that around Rs. 6.000 crores would be required to provide complete coverage to all the villages by 1990. Appropriate measures will have to be taken to muster resources to this extent by the cooperation of the government and the people.

Plan Outlays On Rural Water Supply (1951-79)

		Rs. in (millions)
First Plan	—	60 (only NWSSP)
Second Plan	—	280 "
Third Plan	—	670* (including all programmes)
Annual Plan 1966-67	—	121.5**
Annual Plan 1967-68	—	90.8
Annual Plan 1968-69	—	100.3***
Fourth Plan 1969-74	—	1645****
Fifth Plan 1974-79	—	5740 (a)
Sixth Plan 1978-83	—	14580 (b)

REFERENCE

*Out of this, Rs. 163.3 millions was allocated to NWSS

** " Rs. 66 2 " "

*** " Rs. 62 8 " "

****State Plan — Rs. 1250 million

Centrally sponsored accelerated rural W.S. Programme; — Rs. 340 million

Central assistance — Rs. 55 million

(a) The Fifth Plan ended in March 1978 and the Sixth Five Year Plan sarted in April 1978. During 1977-78, a sum of Rs. 40 crores was allotted for the central scheme of Accelerated Rural Water Supply Programme.

(b) A provision of Rs. 326 crores in the central sector, viz. Accelerated Rural Water Supply Programme is also included in this amount. A sum of Rs. 60 crores was allotted in 1978-79, and another Rs. 60 crores have been provided for expenditure during 1979-80.

State-wise position

Andhra Pradesh

By

U.R.K. Murthi*

Introduction

INDIA is mainly an agricultural country. Majority of people live in villages. According to 1971 census, roughly 82% of the total population live in Rural Areas.

Andhra Pradesh is one of the major states of the Union having an area of nearly 2.77 lakh sq. kms. with a total population of 43.50 millions (1971 Census). About 81% of the entire state population i.e., about 35.10 millions live in Rural area. There are 27,221 Revenue Villages. According to a survey conducted prior to 1971, there are 63,801 villages including settlements, hamlets, Harijanwadas and colonies. The average rainfall in the State is 92 cms. It is normally above average in Coastal Districts and below average in Rayalaseema and part of the Telengana Regions.

Area Under Study:

The State can be divided into 3 main regions namely:

1. Coastal Belt consisting of (9) Districts.
2. Rocky Region of Rayalaseema consisting of (4) Districts.
2. Deccan Plateau of Telengana Consisting of (10) Districts.

The table given below gives the trend in growth of population in the State.

Year	1951	1961	1971	1981
Rural in Lakhs	256.95	297.09	351.00	417.68
Urban in Lakhs	54.20	62.74	84.03	96.78
TOTAL (in Lakhs)	311.15	359.83	435.03	514.46

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It is estimated that about 25% of the Urban population in our country are provided with Protected Water Supply facilities.

Provision of safe and adequate drinking water to Rural Areas is given considerable priority and importance by the Government of Andhra Pradesh for over a decade and a half now. The programme of providing drinking water facilities to villages by means of open wells and protected water supply schemes was started in the year 1962-63.

During the early stage of the programme i.e., upto 1968 Rural Water Supply Schemes consisted mainly of Open Wells. Due to failure of monsoon for consecutive seasons and due to drought conditions that prevailed in the State, the water table has gone down considerably resulting in drying up of a number of Open Wells. So in the later years, the other two varieties of schemes viz., Bore Wells and P.W.S. Schemes have been given priority for solving the rural drinking water problems.

Out of the above, 63,801 villages, etc., indicated in the 2nd para, 51850 villages including settlements etc., have been provided with minimum drinking water facilities by the end of 5th Five Year Plan i.e. 31.3.1978.

The average is as follows:

By P. W. S. Schemes	...	561
By Bore Wells	...	14601
By Open Wells	...	36688
Total	...	51850

Thus, there are still 11,951 villages which are yet to be provided with drinking water facilities at the begining of VIth Plan. It is proposed to provide at least 2 bore wells/open wells

per village as minimum drinking water facilities for all the above villages during the subsequent Plan Periods.

PROBLEM VILLAGES:

Government of India have formulated an accelerated Rural Water Supply Programme under Central Assistance with the objective of providing Drinking Water to all the needy villages (Problem Villages). Certain guidelines were formulated by the Ministry of Works & Housing (G.O.I.) to identify the problem villages. According to those guidelines, the number of problem villages identified upto 1972 were 2893. A further number of 2849 problem villages including settlement were identified in the re-survey conducted during the year 1977. Thus, the total number of problem villages (including settlements) stands as on 1.4.1977 at 5742.

During 1977-78, 569 villages were taken up for execution at an estimated cost of Rs. 334 lakhs, for which an amount of Rs. 150,00 lakhs was allocated by Government of India. Out of the 569 villages, 281 villages were covered during that year. Bore wells utilised the entire amount of Rs. 150.00 lakhs. In addition to this A.R.W.S.P., 60 villages were covered under State R.W.S.P.

As on 1.4.1978 the number of problem villages (including settlements) comes to 3,464. During 1978-79, 577 problem villages were proposed in addition 351 spillover villages of 1977-78 programme. The estimated cost of the schemes for these 928 villages is Rs. 1019 lakhs. An amount of Rs. 347.00 lakhs was provided by Government of India. The entire amount was spent covering 198 villages (28 villages with M.P.W.S. Schemes, 10 villages with P.W.S. Schemes, 160 villages with 4 Bores) Thus, remaining villages to be covered as on 1.4.1979 are 5,266.

Bore Well Programme:

The programme of drilling of bore wells for providing drinking water to Rural Areas was started in the year '68 initially with 4 fast drilling rigs supplied by UNICEF in Anantapur District. Later on it has been increased to 26 UNICEF Rigs. The department has got 64 Nos., of Rigs today.

During this year 126 Taluks in the State have been affected badly under Drought Conditions and requires immediate provision of drinking water facilities. Hence it is proposed to engage private rigs also to tackle the situation. These private agencies can drill about 1650 bores per month which requires about Rs. 1.00 crores per month.

ACHIEVEMENTS
CUMULATIVE FIGURES

Year Plan Period	No. of succesful bore wells	Financial outlay (in lakhs)	Population covered (in lakhs)	Villages covered
1968-72	1,880	...	4.7	
1972-73	4,485	315.63	11.21	
1973-74	8,219	416.13	20.54	
1974-75	12,320	643.99	30.08	17,000
1975-76	16,301	699.44	40.75	
1976-77	19,041	1173.28	47.60	
1977-78	21.981	1490.26	54.95	
1978-79	27,371	1885.45	68.02	
1979-83	44,880	3115.45	112.29	

*** Programme**

**All the remaining villages/hamlets with minimum drinking water facilities i.e., 2 bores wells/open wells per each village.

TASK AHEAD:

Bore Wells with Hand Pumps:

In respect of bore wells a target was fixed to drill about 6,000 bore wells during 1979-80 (including under C.A.P.) with an estimated cost of Rs. 4.30 crores covering about 3,000 villages benefiting population of about 15 lakhs. During 1979-80 i.e., from 1.1.79 to 31.8.1979, 1934 bores have been drilled with departmental Rigs out of which 1717 are successful and 217 are unsuccessful. (As on 31.8.1979, 31443 drilled out of which 26754 successful and 4674 unsuccessful) in addition to the above 1300 bore wells have been drilled by Private Agencies (from 1.4.79 to 31.8.79).

In the remaining plan period i.e., 1980-83 it is proposed to drill about 12,000 bore wells in the remaining villages with an aim of providing minimum drinking water facilities at an estimated cost of Rs. 9.00 crores benefiting a population of 29 lakhs.

Maintenance :

The deep well hand pumps are provided for the bore wells from the drilling is completed. In the beginning double guide hand pumps were provided. Since its performance was found to be very poor, the subsequent development of "SHOLARPUR TYRES" pumps were introduced in the year 1975. The results of this type also found to be not fruitful, and as such another improved variety called "INDIA MARK II" Hand Pumps was introduced in the year 1977 and the same is being used at present which is functioning well.

According to the orders of the Government the Gram Panchayats were made responsible for maintenance of bore wells. This arrangement did not work out well as there used to be repeated complaints that most of the bore wells went out of order as the Gram Panchayats were unable to attend to the repairs for one reason or other. As such, the Government examined the issue broadly, and decided that the maintenance be attended departmentally. Accordingly orders were issued entrusting the maintenance of hand pumps to the Rigs Organisations who are incharge of drilling programme also. The department has taken up the maintenance programme with effect from 1.10.1976 with UNICEF assistance.

Under this arrangement, there is one Junior Engineer in every district exclusively incharge of maintenance programme with an assistant in the cadre of "Hand Pumps Mechanic". At Block level one pump mechanic is there for every 50 pumps. It was also decided by the Government to bear 50% of the maintenance cost and to recover the balance 50% cost from the concerned Gram Panchayat at the rate of Rs. 100/- per annum per bore well and deduct it at source from the enhanced per capita grants to the Gram Panchayat and the same is to be adjusted to the concerned Zilla Parishad. The following amounts were provided so far on this programme.

1.	1976-77	Rs. 20.00	lakhs
2.	1977-78	Rs. 37.57	,,
3.	1978-79	Rs. 37.57	,,
4.	1979-80	Rs. 57.930	,,

The UNICEF was approached for the following assistance :

1. 10,000 Sholapur Design conversion heads.
2. 500 complete pumps incorporating the Sholapur Design with improved cylinder.
3. 20 Diesel Pick-up vans for Mobile Units.
4. 120 Motor Cycles.
5. 300 Bicycles.

But in the plan of action, it was agreed upon by the UNICEF for supply of the following :

1. 13 Nos. Jeep P.C. 260 D (Diesel Pick Ups).
2. 500 Pumps (India Mark II) complete.
3. 2,000 pumpheads.
4. 4,000 conversion heads.
5. 13 sets of tools for mobile terms.
6. 13 sets of tools for district level work shop.

The following is the statement of supplies so far effected by the UNICEF (By 31.8.1979).

1. 13 Sec. Jeep P.C. 260 D (Diesel Pick Ups).
2. (a) 200 Nos. Pumps (India Mark II) complete with G.I. Pipe connecting roads and cylinders.
   (b) 505 Nos. Pumps (complete).
3. 3676 Nos. Pump Heads (India Mark II).
4. 1,000 Nos. Sholapur conversion heads.
5. 13 sets of tools kits.
6. 13 sets of tools for district level workshops.
7. 13 sets of special tools.

PROTECTED WATER SUPPLY SCHEME :

Protected Water Supply Schemes are those in which treated water is pumped to an elevated reservoir and from where distribution to various

parts of the villages is done through pipe by gravity. These were originally taken up under the State Plan only since 1963-64 to 1978-79. 305 schemes were sanctioned so far. Out of which 42 schemes are continued under S.P.F. Programme leaving the balance of 263 schemes. During 1973-74 172 PFS schemes were sanctioned. During 1974-75, under Accelerated Rural Water Supply in backward areas, 418 PWS Schemes including 42 spill over schemes of Normal Plan were sanctioned at an estimated cost of Rs. 372.04 lakhs.

During 1977-78, Government of India have given an assistance of Rs. 1.50 crores with which 82 schemes approved under other programmes, which could not be completed for want of funds, and 121 Mini P.W.S. Schemes which supply Protected water at a single point in the village, were sanctioned. During the year 1978-79, Rs 3.49 crores have been allotted by Government of India. 135 PWS Schmes costing Rs. 5.08 crores and 200 Mini P.W.S. Schemes costing Rs. 1.60 crores have been cleared.

PWS Schemes costing Rs. 5.08 crores and 200 Mini P.W.S. Schemes costing Rs. 1.60 crores have been cleared.

The total No. of PWS Schemes sanctioned under various programmes i.e., Nomal/LIC/ SPF/CAP upto 1978-79 is 1007 of which 618 schemes were completed as on 31.3.1979 leaving 388 schemes as spill over schemes as on 1.4.1979. During 1979-80, 1738 schemes (100 mm and Mini PWS—PWS) to a tune of Rs. 1.23 crores covering 1356 villages have been finalised and forwarded to the GOI for approval. An amount of Rs. 1.25 crores has been released to the state during 1979-80.

Netherlands Government agreed to give assistance to provide protected water supply schemes to 171 Fluoride Affected villages at a cost of Rs. 11.55 crores the execution of which will be taken up during 1979-80. Excess Fluoride in drinking water will cause disease which causes the people to be physically handicapped and hence, there is need for protected water supply in these villages. These schemes will be completed by 1982-83.

A Master plan for providing drinking water to all the vilages in the state has been prepared with a total cost of Rs. 450.00 crores. This Master Plan is programmed to be executed in a span of 10 years under two phases of five years each as follows.

Master Plan for Providing Water Supply to Rural Areas in A. P. Phase A : During Sixth Five Year Plan (1978-83).

	Rs. in crores
1. State Plan	
1. Providing 2 bore wells or open wells to 11.951 villages and hamlets	16.00
2. To provide water supply to 2,615 problem villages and their hamlets.	
a) 220 villages (537 including hamlets) fed by canal water to be provided with PWS Schemes	7.00
b) 1008 problem villages to be provided with full pledged PWS Schemes	53.00
c) 721 problem villages to be providde with Mini P.W.S. Schemes.	6.00
d) 666 problem village to be provided with drinking water supply by means of bore wells or open wells.	10.00
3. a) 736 villages in Coastal Areas to be provided with PWS Schemes.	12.75
b) 76 villages to be provided with the PWS Schemes under M.N.P.	2.25
Grand Total	107.00
II Foreign Aid :	
324 villages having population more than 5000 and annual income more than Rs. 50,000/- to be provided with full fledged PWS Schemes with World Bank Loan.	27.00 27.00

(See page 76)

Haryana

By

M.M. Datta*

THERE are 6731 inhabited villages in the State of Haryana with a population of 82.64 lacs according to 1971 census. Out of these 4180 villages with a population of about 56 lacs are identified in 1972 as problem villages.

The problem villages are defined as under:

(i) having no assured source within a distance of 1 mile (1.6 km) or having no ground-water source within a depth of 50 feet (15 meters).

(ii) the existing source of water supply is susceptible to water-borne diseases like cholera or infested with guineaworms making endemic to these diseases.

(iii) the existing source suffers from excessive salinity, iron or fluorides making them hazardous to health.

National Water Supply and Sanitation Programme for providing safe drinking water supply and sanitation in the rural areas in the country was launched during the year 1954. In the beginning, all rural water schemes were designed for a supply rate of 5 gallons per head per day. From 1962 onwards this norm has been changed and water supply scheme in rural areas in the State is provided at the rate of 10 gallons per head per day.

Piped water supply facilities were provided in 921 villages including 50 hamlets with a 1971 census population of 14 lacs upto 1976-77. During the year 1977-78 water supply facilities were extended to another 111 villages with a population of 1.54 lacs (1971 census) and during 1978-79, 123 villages were provided with water supply benefiting a population of 1.35 lacs (1971 census). During the year 1979-80 (upto 30.9.79) another 64 villages were provided with water supply benefiting a population of 0.78 lacs (1971 census). Thus upto 30.9.79, 1219 vilages with a 1971 census population with 17.67 lacs were provided with drinking water supply facilities in the State.

Progress of allocation and expenditure on rural water supply schemes under Central Accelerated Rural Water Supply Programme and

TABLE 1

Central Accelerated Rural Water Supply Programme

Rs in Lacs

Year	Allocated			Released			Expenditure Incurred		
	Works	Monitoring & Investigation Units	Total	Works	Monitoring & Investigation Units	Total	Works	M & I Units	Total
1977-78	140.00	5.00	145.00	140.00	5.00	145.00	142.31	0.89	143.20
1978-79	197.00	5.00	202.00	197.00	5.00	202.00	220.27	2.19	222.46
1979-80 (upto 30.9.79)	211.89	—	211.89	85.00	—	85.00	87.32	—	87.32

* Assistant Adviser (PHE) Ministry of Works & Housing, New Delhi 110011.

Minimum Needs Programme during 1977-78, 1978-79 and 1979-80 (upto 30.9.79) is shown in Table 1 and Table 2.

TABLE 2

Rs. in lacs

Year	Minimum Needs Programme Allocated	Expenditure Incurred
1977-78	200.00	225.65
1978-79	45.00	433.39
1079-80 (upto 30.9.79)	600.00	248.17

Five drilling rigs are available with the State Government for drinking water supply arrangements. An additional drilling is in the pipeline of supply under UNICEF Programme.

One World Bank assisted scheme entitled "Haryana Irrigation and CAD Project (WB) including Village Water Supply Component" is in operation in the State.

Village W/S Component under this project has an estimated cost of Rs. 10.06 crores and covers 175 problem villages under 25 schemes. Out of these, 42 schemes, covering 112 villages are based on Canal water source and 10 schemes, covering 63 villages are based on a tubewell source. The population (as per 1971 Census) covered under this project is 3,13,000. The project was started in Dec., 1978 and is scheduled to be completed by August, 1982, So far, Rs. 4.50 crores have been allotted to these schemes and 36 problem villages have been provided with drinking water supply. Under this project the W/S schemes have been designed for a W/S allowance of 10 gallons/capita/day and there is no provision for private connections and internal distribution system.

The project has well defined physical and financial targets spread over a span of 4 years and these are closely monitored by the review units.

Haryana Irrigation and CAD Project, Phase II is under finalisation as reported by the State Public Health Engineering Department. This Phase II project is contemplated to be taken up under external assistance from World Bank/ Bilateral Assistance Programme as intimated by the State Public Health Department.

This Project is under consideration. This project will include a village W/S Component of Rs. 15.50 crores. In this Project 175 problem villages are envisaged to be covered. This project is likely to be taken up during 1982 and likely to be completed in a period of 4 years.

Phase B : To be taken up during seventh Plan (1984-89).

I State Plan :

1.	Provision of bores for failure & collapsed bores during five years (5 500 25,000)	18.00
2.	Provision of PWS Schemes to 2500 villages having population more than 2000	126.00
3.	Providing 4000 bores to cover balance one million population.	3.00
4.	Fluctuation of rates.	23.00
	Total	170.00

II. Foreign Aid :

1.	Providing PWS Schemes to 2402 villages having popultion more than 2,000	115.00
2.	Fluctuation of rates.	15.00
	Total	130.00

GENERAL ABSTRACT

Phase A :

During Sixth Plan Period (1978-83)

I	State plan	107.00
II	Foreign Aid (World Bank Assistance)	27.00
III	Fluctuation of rates	16.00
	Total :	150.00

Phase B :

During Seventh Plan Period 1983-88)

I	State Plan	170.00
II	Foreign Aid	130.00
	Total :	300.00

Grand Total of Phase A and Phase B 450.00

Jammu & Kashmir

By

G.M. Kanth*

TO many people it may appear that the State of Jammu and Kashmir, the northern-most state of the country, has no particular rural water supply problems, blessed as it is known to be with numerous rivers, snow-fed nullahs, springs etc. This proves a misnomer to a large extent to those who have studied the problem in greater depth.

The State can be divided into three distinct physical regions:

(i) The Jammu region towards the south which has, besides certain plain stretches, extremely inaccessible and remote hilly areas criss-crossed by broken country.

(ii) The valley of Kashmir which of course offers abundant surface sources (in some areas) during the summer months but where it is an agonizing problem for the rural population to fetch even meagre requirements of water in extreme and inclement weather conditions during winter months when all paths become slippery because of snow and frost, the problem being worst in respect of population perched on hilly and sloping areas.

(iii) The scarcely-populated but extremely rugged terrain of the Ladakh area towards the extreme north.

The rural population of the State in the three regions (excluding the areas under the illegal occupation of Pakistan and China) and spread over 6,715 villages, as per 1971 census, was as under:

		Villages	Population	(Rural)
(i)	Jammu	3540	17.89	lacs
(ii)	Kashmir	2940	19.70	"
(iii)	Ladakh	235	0.97	"
	Total	6,710	38.56	Lacs

Hardly any attention was paid to the provision of protected drinking water supply in rural areas of the State prior to independence and subsequently even during the period ending the 4th Five Year Plan. The total plan allocations on this sector during the entire plan period ending 3/1974 was of the order of Rs. 10.20 crores. The corresponding figures of coverage ending the above period were 725 villages (10.80%) with a population of 7.74 lacs (20.07%).

A lot of emphasis was, however, paid to the rural water supply programme during the 5th Five Year Plan beginning from 1974-75 onwards and an amount of Rs. 17.46 crores was spent on this sector during the plan ending March, 1978. This excludes the assistance amounting to Rs. 152.80 lacs (1977-78) and Rs. 200.00 lacs (1978-79) under the Centrally-sponsored accelerated rural water supply programme (ARP) which was revived by the Government of India in the year 1977-78, and subsequent financial outlays during the 6th Plan. This enabled the Department to achieve an additional coverage of 790 villages with a population of 6.35 lac souls ending 3/79. The cumulative coverage ending

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March, 1979 is thus 1515 villages (22.58%) with a population of 14.09 (36.54%), related to 1971 census.

The proposed outlay on the rural water supply sector during the 6th plan period is proposed as Rs. 25.00 crores (excluding assistance under the ARP) which would take the cumulative coverage ending 6th plan period to 2,149 villages with a population of 15.79 lac souls (related to 1971 Census) i.e. 32.0% and 40.95% respectively.

The above figures indicate that a lot of ground has yet to be covered under the programme even though the allocations have been substantially increased during the recent years. A rough estimate indicates that as much as Rs. 171.00 crores would be required to cover the remaining villages at the 1978 price level. The problem is thus of gigantic proportions keeping in view the limited resources of the State Government.

During the Year 1976-77, the State Government introduced a new system of "District Line Administration" under whihc the priorities of taking up new schemes have been entrusted to the District Development Boards. All engineering development activities in the districts are controlled by the District Superintending Engineers at the district level who work in close coordination with the District Development Commissioner (the Deputy Commissioner). The District Superintending Engineer also looks after the three disciplines of civil engineering viz. Roads and Buildings, Irrigation and Public Health Engineering, but is, however, answerable to the respective Chief Engineers for technical guidance, plan formulation and monitoring. The idea is to introduce planning at the grass root level and ensure effective participation of the people's representatives.

The people do not, however, contribute any thing either in terms of money or labour towards the implementation of the drinking water supply programme in the state. The entire programme is being executed by the State Government through the aegis of the Public Health Engineering Department. All the schemes are being improved from time to timt and maintained by the Deptt. itself. Even the nominal revenue levied from the limited private pipe connections in the rural areas is being collected by the Department. The maintenance charges are being heavily subsidised by the State Government out of its revenue grants at present. This is because of the economic status of the rural people coupled by the age-old tradition of water not having been ever charged during the period the State was under the Maharaja's rule. This thinking is, however, fast changing with the passage of time and Government is eager to enhance the water tariff both in the urban and rural areas in a phased and gradual manner.

While formulating the schemes, preference is given to perennial surface sources like springs, nullahs and rivers. Spring waters do not normally need any treatment but surface waters are generally treated by adopting conventional methods of treatment including coagulation, filtration and disinfection, adopting regional gravity schemes wherever possible. Tube wells serve as a primary source for water supply in the boulder-rich strata in the Jammu region. On the other hand, harnessing of ground water has been hampered in some areas of the Kashmir valley because of the presence of marshy and methane gases imparting taste and odour problems to the ground water. Accordingly the provision of water through installation of hand pumps has not found much favour with the rural communities.

The supplies in rural areas are regulated at the Service Reservoirs where from the pipe distribution system emanates to carry water to the village population, usually on intermittent basis by adopting 2 to 4 hours supply in the mornings and in the evenings, mostly through public stand posts. Water supply is not normally metered in the rural areas.

Karnataka

By

P.R. Bellubbi* and M.V. Ramaswamy**

WATER IS ESSENTIAL FOR LIFE.

It is abundant and yet frequently scarce.

Water supply has become a critical factor in public health and economic development in most parts of the world, particularly in the developing countries. The global significance of water found expression in the United Nations Water Conference in March 1977 in Mardel Plata, Argentina where delegates from about 135 countries discussed the role of water in the world.

This conference unanimously adopted a resolution recommending "that where human needs have not yet been satisfied, National Development policies and plans should give priority to the supplying of drinking water for the entire population and the final disposal of water etc."

The above resoultion was endorsed by the Thirtieth World Health Assembly in May 1977 which proposed that the Decade 1980-1990 be designated as the International Drinking Water Supply and Sanitation Decade.

Karnataka State is situated in the southern part of Indian Peninsula and predominantly located between the latitude 12°—38 to 18°—30″ and longitude 74°—3 to 78°—32″. It has an area of 1,92,203 sq. kilometres. Its average population density is 182 persons per sq. kilometre. The State is having a moderate climate with maximum temperature 40° C minimum 15 C.

The State is broadly classified into the Maidan (plain area), the Malnad (Hilly area in Western) Ghats) where rainfall is more than 60" and the narrow strip of coastal area. The rainfall is mainly from the South West monsoon from June to September and a small portion from North East monsoon in October and November.

The major rivers in the State are Cauvery, Hemavathy, Shimsha, Tungabhadra, Krishna, Ghataprabha, Malaprabha, Arkavathi and Kabini. The ground water situation is almost satisfactory and this provides the main source of domestic supply in most parts of the State. In areas where river water sources are not available ground waters have been tapped through lakes, open wells, dug wells and bore wells. The yield from bore wells are good in most areas. The quality of ground water is generally good except in certain areas.

The Karnataka State has a population of 29.23 million according to 1971 census and its corresponding urban population is 7.10 million including Bangalore City. The projected urban population excluding Bangalore City in 1981 is 6.73 million and in the year 2001 it will be 10.09 million.

POSITION OF WATER SUPPLY IN THE STATE IN THE PAST

In the Karnataka State, previously the Minor Irrigation and Public Health Engineering Branch of the Karnataka Pubic Works Department was promarily responsible for planning and execution of Urban and Rural Water Supply and Sewerage Scheme on behalf of the local authorities. The responsibility for the operation and maintenance of the Urban systems was however vested in the Municipal Committees.

Among the cities in the State, Bangalore City having developed into a metropolis, an auto-

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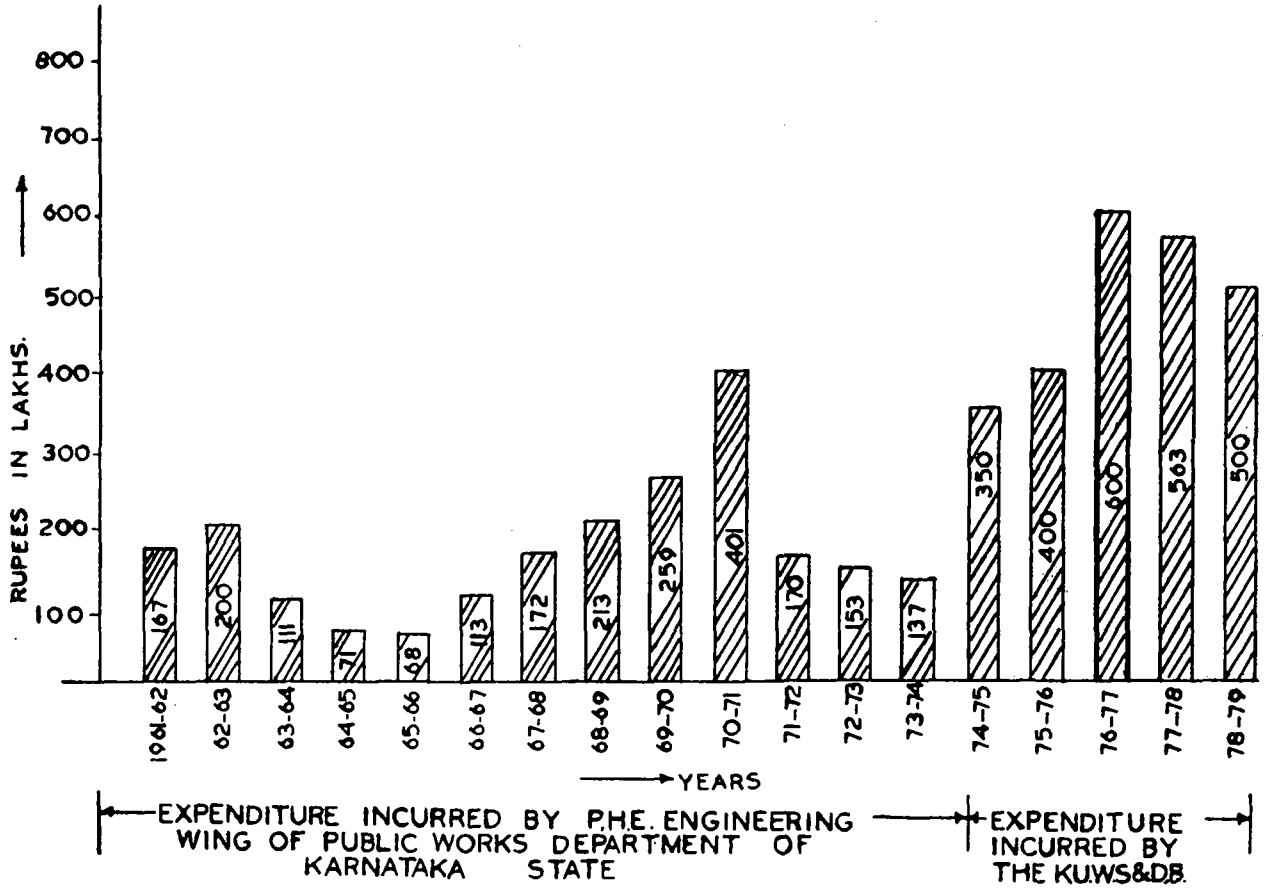


Bar diagram showing the expenditure on Urban Water Supply & Sewerage (1961 to 1979)

nomous body was established during 1964 called Bangalore Water Supply and Sewerage Board exclusively to look after the increased demands of water supply and sewerage facilities to the citizens of Bangalore metropolitan area. This Board has already constructed and commissioned the Cauvery Water Supply Scheme Stage I (30 MGD) during 1974. It has now taken up the construction of Cauvery Water Supply Scheme Stage II, which caters additional 30 MGD of water to the Bangalore City. In addition, the Board is maintaining the Arkavathi Scheme i.e., Thippagondanahalli and Hesaragatta reservoirs. The total supply to the city at present is of the order of 64 MGD for assessed population of about 20 lakhs. This Board is also incharge of waste water collection through a net work of sewers, its treatment and disposal to the environment.

The population has been increasing steadily due to improved economic and ndustrial conditions while provision of basic amenities like water supply and waste water disposal is not keeping pace with the population explosion. The enoromous task of providing water supply and sewerage facility to all the areas of the State, was vested with the Public Health Engineering wing of State P.W.D. The cost of schemes has to be met in proportion by the concerned local body and Government. The financing of these huge schemes could not be met out of general finances of the State only. It was found necessary to obtain financial assistance from Public by floating debentures, raising loans from financing bodies like L. I. C., HUDCO, etc.

Bar diagram showing the expenditure on urban water supply and sewerage for the years 1961 to 1979 is depicted above.

Attempts by the Civic authorities individually to raise loans in the open market to finance local water supply projects did not attract encouraging responses. This necessitated the for-

mation of an autonomous water supply and sewerage Board in the State. Hence the Karnataka Urban Water Supply and Drainage Board was established during 1975.

The Board is attached to the Housing and Urban Development Department of Government of Karnataka. The Karnataka Urban Water Supply and Drainage Board is responsible for planning, design and execution of water supply and sewerage works in all the urban areas of the State excepting Bangalore Metropolitan Area.

In addition, the Board is also executing deposit contribution works of the civic bodies and Industrial Complexes for which the entire cost of the schemes are met by the respective agencies. At present there are 44 such schemes (each scheme estimated to cost more than Rs. 50,000) costing Rs. 55.3 million. They are under various stages of progress.

The Karnataka Urban Water Supply and Drainage Board has at present jurisdiction over 242 towns and cities covering a population of 5.56 million (excluding Bangalore City).

STATUS OF URBAN WATER SUPPLY

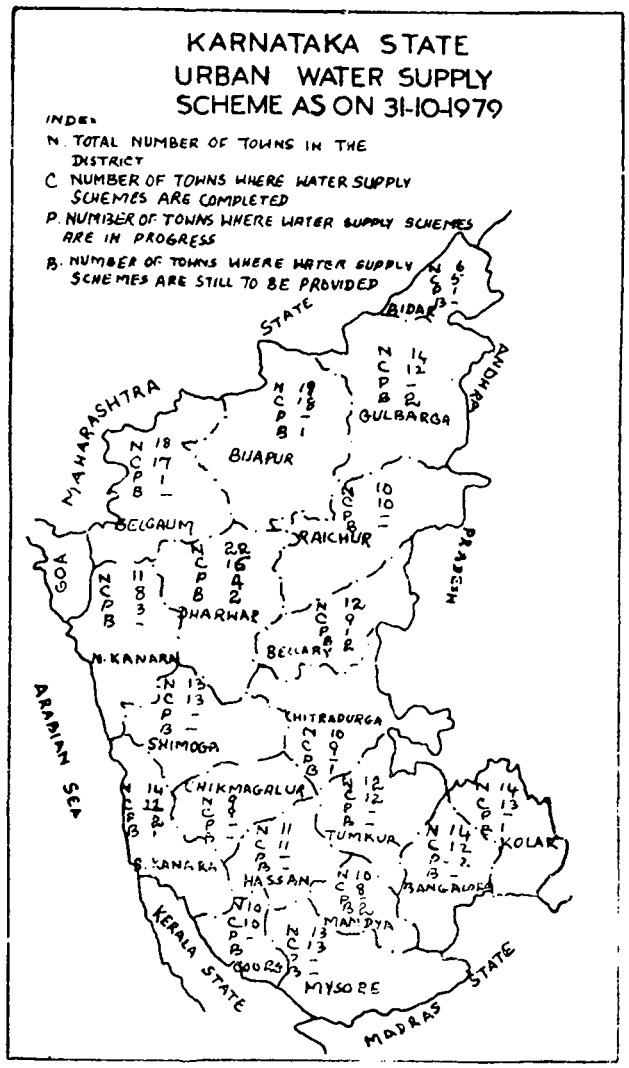
Water Supply has been provided to 216 local authorities out of 242 under the jurisdiction of the Board covering a population of 52.21 lakhs i.e., 94.46% of population is covered.

During the seven year period (1971-78) the the percentage increase in urban population is about 30%. Under Urban Water Supply there are two categories of works:

(i) Piped Water Supply for Towns with population of less than 20,000

This category of schemes are being executed with 10 percent local contribution and 90 percent State funds.

There are 181 towns with population of 1.90 million under this category of which protected water supply has been provided to 151 towns, covering a population of 1.54 million. 26 water supply schemes are under progress.



Also 35 water supply Improvement schemes are under progress. In addition, augmentation of water supply to 108 local authorities have to be taken up as the per capita supply has dwindled due to considerable growth of the population.

During 6th Plan period 73 schemes for augmentation are proposed to be taken up.

(ii) Water Supply for Towns and Cities with a population above 20,000

For these schemes 2/3rds of the estimated cost will be given as loan by L.I.C., to the local body and the remaining 1/3rd of the cost is financed by the State Government as loan.

There are 61 local authorities under this category, 59 local authorities have been provided with water supply facilities covering a population of 3.64 million. The water supply scheme for remaining 2 local authorities have been taken up for execution and are in prograss. 25 water supply schemes for augmentation of water supply covering a population of 1.437 million, out of which 25 towns, are proposed to be augmented during 6th plan period.

The expenditure on Urban Water Supply and Sewerage for the year 1975-1978 incurred by the Board is Rs. 150.50 million.

The supply of water per capita per day varies generally according to the population and importance of towns. The present per capita supply of water per day is on an average about 25 to 50 litres, 50 to 100 litres, 100 to 125 litres and 125 to 150 litres in towns/cities with population ranges, below 5,000, 5,000 to 20,000, 20,0000 to 1,00,000 and above 1,00,000 respectively. The per capita supply from stand posts are generally not more than the average per capita supply from house connection. In practice however the per capita consumption will be lower due to losses, such as leakage, wastage and squanderage. As most of the connections are unmetered, the unaccounted percentage loss of water is also found to be generally high. The average pressure maintained in the distribution system varies between 3 meters to 7 meters and more, depending upon the class of town and the type of water supply system. The supply is largely intermittent in all the towns. Absence of wholesale metering and low rates are the principle cause for the high wastage resulting in a heavy deficit in the undertakings. Surveys are being taken up for leak detection or to control the leakage in the mains. In major cities, there are more number of house connections and a few stand posts. In many towns, due to deficiency of distribution net work, high cost of internal plumbing and poor economic conditions, the growth of house connections are slow.

PRESENT PLANS AND PROGRAMMES:

The development plans of the Board are interlinked with the overall development programme of the State which in turn is regulated by the National Five Year Plans. The Sixth Five Year Plan is from 1978 to 1983. Programme of proposed investments for water supply through 6th 5 year plan will be Rs. 622.6 million.

Based on the request received by the local authorities the State Government provides separate outlays in the State Plan for the development of Urban Communities. The outlay finally incurred in the water supply of the State plan is decided on the discussions between the State Government, CPHEEO, and the Planning Commission. There is already a Statewise plan on water supply. Master plans of water supply for individual urban town/cities are under preparation.

The service goal envisaged as per present planned programme is to provide for all 242 towns/cities, with water supply in adequate measure to the standard level of supply as prescribed by the Government of India Manual on water supply, for each category of town on population basis for which water supply systems are already in existence. For the towns which are yet to be provided with water supply, the aim is to provide minimum water supply immediately.

To provide the above services, the Board will require Rs. 3025.25 million.

As the International Drinking Water Supply and Sanitation Decade is to commence in 1981, the Board aims to provide the above levels of service to all the towns/cities in the Decade. To achieve the above goal, in addition to obtaining part of finance from the State Government, L.I.C., and floating debentures, the Board will require a large amount of money possibly as foreign aid.

In the five year plans, there will be allocation of funds for this sector but these are subjected to change and review every year. As urban projects are financed entirely on a loan basis, the capacity of local authorities for servicing the loan and the contributions from their own resources become the most important factors in taking any decision in such maters. Thus in practice it has been found difficult to decide on

a long term goal for development of the sector in the urban areas.

Due to financial constraints for the programming of urban schemes, the Karnataka Urban Water Supply and Drainage Board is endeavouring to obtain funds as external borrowings from World Bank specifically from the I.D.A., loan assistance.

OPERATION AND MAINTENANCE OF WATER SUPPLY SCHEMES

The Board is maintaining 11 water supply works and have also fixed water rates to 7 major water supply works in the State on the basis of 'No Profit No Loss' for efficient operation and maintenance of the systems. The remaining works in the State are maintained by the respective local authorities. As the local bodies are not having fully qualified environmental setup and due to meagre financial resources, they are not in a position to operate and maintain urban water supply systems to the standard level of public Health Engineering practice. The Board has proposed to take over the operation and maintenance of all the water works in the State in a phased programme and the subject has been forwarded to State Government for a decision on the subject, and the same is awaited. After taking over the water works for operation and maintenance, it will also be responsible for fixing levy and collection of water rates. As present, the Board is finding difficulty in enforcing revised water rates on the consumers. It has now come to a stage where water supply undertaking will not be treated merely as service organisation to the community but as an undertaking based on a sound financing policy and a self supporting one. To start with, it is interested in installing meters on all water supply connections in cities towns where there are more than 1 lakh population. This may bring in better revenue for supporting the operation and maintenace of several water works to the standard level of acceptance.

The Board is endeavouring to arouse public conscience that every drop of water that is being supplied at the consumer end has cost money and it is a burden on the water supply undertaking, unless the same is reimbursed by the community in terms of 'Water Rates Fixed' to run the establishment on 'No Loss No Profit' basis, in this connection, the Board is requesting the Government, to give suitable direction to local authorities concerned for implementation and enforcing the revised water rates as and when fixed by the Board and to be given effect to.

In almost all the works, the local materials for construction purposes and local available labour are made use of. For specialised machinery equipments and other store items which are not available locally are procured within the country from the firms of repute, conforming to Indian standard specifications. For efficient management of the system the Board is thinking of setting up an Inventory control and Material management setup in the Board.

PROSPECTS AND CONSTRAINTS

As the main task of the Board is to execute water supply works of all local bodies, the representation of civic authorities in the activities of the Board is a necessity. For any scheme of a town/city from the stage of investigation upto completion, commissioning and handing over the system for maintenance to the respective civic bodies. the liasion, co-ordination and participation of such public bodies with the Board are found to be vital for implementation of projected programmes of works. The Karnataka Urban Water Supply and Drainage Board is equipped to meet this task.

The Board in its constitution, is having 5 directors who are the representatives of various local bodies, in addition to other Ex officio Government directors. The Board is at presen arranging public relations campaign with the existing staff of the Board wherever necessary.

The supply of potable water to a community is a basic need and the responsibility of the respective civic authority and Government. The main hurlde in implementation of schemes is the non-availability of required funds to cope

Punjab

By
Bhupinder Singh*

A vendor washes vegetables in polluted water

AS a result of the reorganisation of Punjab, Chandigarh along with 21 villages was regarded as a Union Territory. Out of these, four villages namely Attawa, Burail, Badheri and Buterla were in the Master Plan of Chandigarh and the remaining villages form the green belt of Chandigarh. All these villages were not initially covered with water supply system, and therefore a scheme for the augmentation of water supply to various villages of the Union Territory was prepared. This amounted to Rs. 8.5 lacs to cover the 17 villages at 10 gallons per head per day, but later on it was decided to supply water at 25 gallons per head per day with estimated cost of Rs. 8.76 lacs. The work has already been completed in all the villages and the villages are now getting individual water connection in all the above villages. This rate of water supply in the rural area is the highest in the country. The water is supplied to these villages from the tubewells meant for Chandigarh city water supply system.

It was not originally planned to provide water suuply system to the villages falling in the Master Plan of Chandigarh city, but subsequently it was decided by the Union Territory authorities to cover these villages also with the water supply system. As these villages will be shifted sooner or later, it has been considered worth-while to provide water supply to them through stand-posts only. A Accordingly an estimate amounting to Rs. 4,80,420/- was made for these villages. The work has already been taken in hand, and the major portion of the work stands completed. With the completion of this work, almost the whole of the rural area of the Union Territory of Chandigarh will be covered with modern water supply system.

No problem has been faced as regards organisation, management and finances while executing the rural water supply programme. The whole of the area was taken on a priority basis.

Local labour was employed on daily wage basis but the public did not participate in this work.

The water being supplied to these villages is potable water. There is no need for any treatment to be given as it is neither brackish nor saline.

*Superintending Engineer, Chandigarh.

The Decade in Tamilnadu

By

R. Krishnaswamy*
and S.A. Jagadeesan**

The Organisation

THE Tamilnadu Water Supply and Drainage (TWAD) Board is the organization in Tamilnadu State created by an act of the State Legislature as an autonomous body on a statutory footing vested with the powers for provision of water supply and sewerage facilities in the entire State of Tamilnadu excepting the Madras Metropolitan Area. The T.W.A.D. Board came into existence on April 14, 1971 and took over the duties and responsibilties of the erstwhile Public Health Engineering and Municipal Works Department, of the Tamilnadu Government.

For attending exclusively to the growing needs and planned development of water supply and sewerage services in the Madras Metropolitan Area, another Board styled Madras Metropolitan Water Supply and Sewerage Board was formed effective from August 1,1978. This Board is also a statutory organization created by an act of the State Legislature and took over the entire services relating to Water Supply and Sewerage from the Madras Corpoartion.

Demographic distribution

Tamilnadu is one of the 22 States in India with a population of 41.20 millions as per 1971 census figures. Of this, 15.50 million live in 740 towns comprising the two Corporation cities of Madras and Madurai, 99 Municipalities, 8 Municipal townships, 13 Panchayat townships and 618 town panchayats. The rural population of 25.70 million is scattered in about 13000 village panchayats and hamlets comprising about 47000 habitations in 376 Panchayat Unions.

The Madras Metropolitan Area consists of Madras City, 4 Municipalities, 4 Municipal townships and 22 Panchayats.

The population distribution and projections between Urban and Rural areas in Tamilnadu are tabulated below:

		1971	1981	1991
MMA	Madras City	2.47	3.34	4.32
	Madras Urban	0.70	0.92	1.15
	Madras Rural	0.30	0.20	0.18
Tamilnaudu Other than MMA	Urban	12.33	15.97	19.36
	Rural	25.40	26.87	27.99
	Total	41.20	47.30	53.00

(Population figures in millions)

Present Status Of Water Supply and Sewerage Schemes

A. Urban Water Supply

A Statement showing the present position of Water Supply schemes in the State of Tamilnadu is given on page 86:

*Chief Engineer (Gen & Constn)
**Superintending Engineer Designs TWS & D Board Madras.

Status of Urban Water Supply Schemes
(including Madras Metropolitan Area)

Grade	No.	Population (1971) (million)	Covered or in progress			Not yet covered		
			No.	Population (million)	%	No.	Population (million)	%
Corporation	2	3.020	2	3.020	100.0	—	—	—
Municipality	99	5.901	94	5.799	98.3	5	0.102	1.7
Municipal Township	8	0.220	5	0.137	62.3	3	0.083	37.7
Panchayat Township	13	0.246	8	0.204	83.0	5	0.042	17.0
Town Panchayat	618	6.113	183	2.265	37.0	435	3.848	63.0
Total	740	15.500	292	11.425	73.7	448	4.075	26.3

Out of 740 Towns in the State, 222 towns have been provided with water supply and works relating to provision of water supply to another 70 towns are in progress. Thus 448 towns with a population of 4.08 million (1971) remain to be provided with water Supply. Augmentation of water Supply in respect of 72 towns is also to be taken up.

Regarding the capital city, augmenting the water supply to the City of Madras as well as the Metropolitian area and reinforcing the existing water supply to handle the additional water is necessary. Maintaining the existing system to its optimum utility by carrying out timely replacements and improvements is also called for. A coverage of 100% in urban water supply for the entire state is programmed for the Decade.

B. Urban Sewerage

A statement showing the present position of sewerage schemes in the State of Tamilnadu is given below:

Status of Urban Sewerage Schemes
(including Madras Metropolitan Area)

Grade	No.	Population (1971) (million)	Covered or in progress			Not yet Covered		
			No.	Population (million)	%	No.	Population (million)	%
Corporation	2	3.020	2	3.020				
Municipality	99	5.901	*14	1.525	25.8	85	4.376	74.2
Municipal Townships	8	0.220	1	0.338	17.3	7	0.182	82.7
Panchayat Township	13	0.246	1	0.058	23.6	12	0.188	76.4
Town Panchayat	618	6.113	1	0.008	0.13	617	6.105	99.87
Total	740	15.500	19	4.949	30.0	721	10.851	70.0

*Of these, the number of Class I towns is 8

From the statement it may be seen that 721 towns are yet to be provided with sewerage facilities. It is proposed to take up underground sewerage scheme in the case of Class I town (towns with a population of over one lakh) in the first instance. There are 17 such Class I towns (including Singanallur since merged with Coimbatore) in the State. Of these, sewerage schemes have been completed or works are in progress in respect of 8 Class I towns. Hence provision of underground sewerage facilities in respect of the remaining 9 Class I towns (including Singanallur since merged with Coimbatore) is contemplated during the decade. Regarding the remaining towns, low cost sanitation facilities are proposed for about 145 towns under Class II, III and IV categories so as to achieve a total coverage of 80% under urabn sewerage as per the target fixed. The report of the studies conducted by UNDP Units Global Project is expected shortly and the technical aspect of the low cost sanitation will mainly be based on the result of studies of Global Project team.

Regarding the capital city, extension of the sewerage system for unserved areas inside and outside the city, reinforcement of the system inside the city and provision of additional treatment works inside the city are contemplated.

C. Rural Water Supply

The rural habitations in the State of Tamilnadu are categorised under the following six types.

Classification	Definition	No. of habitations	Population (1981) in million
Type 1	Habitations with no source within the habitations	3,454	0.98
Type 2	Habitations where the source yield only non-potable water	1,966	1.02
		5,420	2.00
Type 3	Habitation where water is potable, but source is not perennial	6,487	2.28
Type 4	Habitations where water is potable and perennial but the source is either privately owned or unprotected	4,955	2.17
Type 5	Habitations where there is no good source within the habitations but an alternative good source is available within 1 km	1,107	0.36
		12,549	4.81
Type 6	Habitations where there is a good source avaiable	29,106	20.06
		47,075	26.87

Of the 47075 habitations, 5420 habitations come under Types 1&2 and 12549 habitations come under types 3,4,5, and the rest come under type 6. A beginning has been already made to provide water supply to all the habitations under types 1&2 and these are proposed to be completed within this calendar year.

A statement showing the habitations to be covered population wise is given below:

	Less than 300	300 to 500	500 to 1000	1000 to 2000	2000 to 5000	5000 to 10000	More than 10000	Total
Habitations	11049	3405	11183	4712	1462	93	53	1909
Population (1991) in (million)	2.08	1.36	7.60	6.59	4.39	0.65	0.08	22.75

As per the target fixed for the Decade, 100% coverage for Rural Water Supply for the entire State is contemplated.

D. Rural Sanitation

The present coverage under Rural Sanitation is practically nil. At present their is no coordinated rural latrine programme. The target fixed under Rural Sanitation during the Decade is 25% coverage by sanitary toilets in rural areas. Regarding rural sanitation, setting up of an agency solely responsible for tackling the problems in this sector has to be the main objective during the preparatory period. Planning programming and implementation of the facility will have to be geared up during the Decade.

The habitations proposed to be covered and the population are tabulated below:

	Less than 300	300 to 500	500 to 1000	1000 to 2000	2000 to 5000	5000 to 10000	More than 10000	Total
Habitations	1105	341	1118	2127	731	93	5	5520
Population (1991) in million	0.20	0.14	0.76	2.98	2.19	0.65	0.08	7.00

Requiremetns to achieve the goal
Financial

The projected requirements of funds for achieving the targets set for the Decade for the State of Tamilnadu is as follows:

		Amount required Rs. in Crores
i)	Urban Water Supply	— 471
	For MMA	— 276
	For Tamilnadu (Other than MMA)	— 276
ii)	Urban Sewerage (For MMA)	— 184
	For Tamilnadu (Other than MMA)	— 246
iii)	Rural Water Supply	— 515
iv)	Rural Sanitation	— 70
	Total	— 1762

Thus the total requirement of funds for Tamil Nadu State during the Decade is exepected to be in the order of Rs. 1762 crores for both Urban and Rural Sector including Madras Metropolitan area. This works out to about Rs. 180 crores/annum as against an investment of Rs. 35 crores for 1979-80. With the existing pattern of funding from the State Government, the Central Government and other International agencies, it will be very difficult to achieve the target of providing good water supply and better sanitation to all the people in Tamilnadu before 1990. Hence it is necessary to generate a major portion of the funds required for these programme from International agencies.

Material Resources

Among materials, the most important are and Sewerage Schemes will be represented by 'Materials' such as pipes, specials, valves, pumps, jointing materials, etc. The experience in the State is that more that 70 percent of the cost of any such scheme is accounted for by materials used therein. On this basis, the cost of materials required for the Decade programme will be in order of Rs. 1250 crores.

Among materials, the most important are pipes like Cast Iron, Asbestos Cement, Prestressed Concrete, Reinforced Cement Concrete, Poly Vinyle Chloride, etc. The expenditure to be incurred on these will be about Rs. 900 crores. Stoneware pipes will be required in sewerage schemes. The cost of these pipes will be around Rs. 150 crores. Other materials required for the programme will cost about Rs. 200 crores. The procuring of these materials itself is a challenging task under present con-

ditions and in the quantities involved. To achieve some stability in prices, long term contracts or arrangements may be necessary covering part of the requirements, as this would at the same time, retain latitude for change and conversion in the balance of the requirements, wherever necessitated by circumstances. The Central Purchase and Stores Organisation (C.P.S.O.) now in existence in T.W.A.D. Board will be able to meet this challenge. The State and Central Government may endeavour to set up factories to meet the demand. Also action may be taken to increase the production capacities of the existing factories.

Man Power

The Personnel available at preent at the top and middle levels may be sufficient to manage the programme (for 1981-90. But the lack of trained personnel in the lower cadre is a constraint that has to be overcome. For this the inputs to Technical Institutions have to be increased and junior level personnel subjects and accounting during their recruitment. It is also found important to disseminate the knowledge gained during implementation of the programme to the top and middle level personnel who have to play a major role in the successful implementation of these programmes.

Conclusion

India is the first among the developing nations which has made an impressive beginning to tackle the problem immediately after the resolution by the United Nations. A rapid assessment of the situation was undertaken by the World Health Organisation with the help of Government of India for a clear picture to emerge in respect of the problems.

The sector study in the field of Water-Supply and Sanitation was also carried out by Tamilnadu :

1. to evaluate our preparedness with the pace of development
2. to assess constraints
3. to take action for the preparation of plans before the decade starts (the preparatory phase)
4. to assess the overall needs and
5. to explore the total funding sources.

It may be of interest to note that a total sum of Rs. 18 crores only was provided during the First Five Year Plan for the sector activities under Water Supply and Sanitation in India. As compared to this, the sector outlay for the Sixth Five Year Plan is expected to be around Rs. 3500 crores. (Rs. 2500 crores of Rural and Rs. 1000 crores for Urban Sectors. The figures given here are tentative). In the case of Tamilnadu State, a sum of Rs. 240 crores for Urban sector (Rs. 162 Crores for Water Supply and Rs. 78 crores for sewerage) and a sum of Rs. 220 crores for Rural sector (Rs. 208 crores for Water Supply and Rs. 12 crores for Sanitation) have been proposed under the Sixth Five Year Plan. The corresponding provision for the Madras Metropolitan Area is Rs. 277 crores, of which Rs. 209/- crores will be towards Water Supply and 68 crores will be towards Sewerage.

The All India picture is that, in respect of physical coverage, water supply has been provided to about 82% of the Urban population. Regarding Rural Water Supply, the coverage is about 30%. In the field of Urban Sewerage and Rural Sanitation very little has been done in the last 25 years. It is expected that this will get greater attention during the decade.

To fulfil the ambitious programme of providing adtquate access to reasonably safe drinking water to every individual of the urban and rural community, the following items need immediate attention :

(i) The present annual allocation of Funds both by the State Government and the Government of India under Rural Sector is only in the order of Rs. 12 to 15 crores. This allocation has to be trebled to achieve the objective of covering all rural habitations within the decade (1981-1990).

(ii) Sufficient trained personnel at all levels and marginal restructuring of the organisation is necessary.

(iii) The Government of India should come forward to help in procuring the pipes espicially

PVC either from within the country or by importing from other countries.

(vi) The availability of essential materials like Cement and Steel is a pre-requisite. The State Government and Central Government should give priority in allocating these material required for the Urban and Rural Water Supply programme.

(v) At present, objections are raised by the ryots in certain parts for tapping underground water for Rural Water Supply Programme stating that this will affect their agriculture. As the quantity of water tapped for drinking water purpose is very small compared to the water requirements for Agricultural purpose, it is essential that a legislation is brought to permit the Government to tap underground water for the Rural Water Supply Programme. This is more essential, in the case of comprehensive rural water supply schemes where in a single scheme may cover a large number of habitations.

Fulfilment of the target set during the Decade by investment in Water Supply and Sanitation Sector will contribute not only in the reduction of mortality and morbidity but also increase productivity alround, provide employment to a significant portion of the population and will benefit all sections of the society. Besides, it will bring about social transfiguration as the weaker section of the society is freed from the clutches of the elite when public community Water Supply is popularised.

The preparatory phase for assessing the financial, manpower and material resources has to be completed in time for launching the International Drinking Water Supply and Sanitation Decade Programme in our Country on 1st April 1981 successfully.

A Global effort to bring safe water and sanitation to all people in developing countries within the next 10 years was launched by the U.N. General Assembly on 10-11-80 when it adopted unanimously a resolution.

The resolution proclaimed 1981-1990 as "the International Drinking Water Supply and Sanitation Decade" and called upon member-States to commit themselves to improve substantially the standards of drinking water supply and sanitation by 1990 to rid the world of waterborne diseases that claim millions of lives.

Three U.N. agencies—the U.N. Children's Fund, the World Health Organisation and the U.N. Development Programme—affirmed they would cooperate in making the decade purposeful.

The Minister of Works and Housing and Parliamentary affairs has pledged the country's full support to the aims of the International decade (1981-90) for Drinking Water Supply and Sanitation Decade launched by the United Nations on 10th November 1980.

The general goal of the decade is to greatly improve the water sanitation services enjoyed by the population of the developing countries. The particular goal (ratified at United Nations World Water Conference at Mar del Plata in 1977) is to provide all the world's population with adequate access to safe water and to hygienic latrines by 1990. The Indian goal will be to provide adequate access to reasonably safe water to all its population and easy access to reasonably safe water to all its popultion and easy access to sanitary toilets to sizeable portion of its population.

Targets and Constraints in West Bengal

By

S.K. Das Gupta*

India is one of the signatories to the resolution of the United Nations Water Conference at Mar-del-Plata, Argentina, in the March 1977, and hence committed to the objectives and goals as outlined in the resolution. The resolutions and recommendations of the United Nations Water Conference envisaged that during the year 1981-90, designated as the International Drinking Water Supply and Sanitation Decade, the global goal of access to safe water and sanitation for all should be ensured by the acceleration of plans and programme of the signatory countries. To achieve the target the conference recommended closer collaboration among the various organisations of the United Nations and increased technical and financial co-operation from external agencies. According to the World Health Organisations, 80% of all sicknes in the Third World is attributed to contaminated water, which is why, safe water supply and sanitary disposal of waste-water are considered all the more necessary.

The present level of coverage of population (as of 1st April, 1980) in the water supply and sanitation section in India and the targets set for 1990 as well as the estimated requirement of fund for achieving the 1990 targets are submitted as hereunder :

As far as India is concerned it is propsed to launch the Decade Plan from the 1st April, 1981 to coincide with the beginning of the next financial year. Consequently the Decade Programme in this country will extend from the 1st April, 1981 to the 31st March, 1991.

Although the 'drinking water supply' and 'sanitation' are subjects in the State Sector, the dimension of the programme is so large as to necessiate a closer co-operation and co-ordination between the Union Govt. and State Governments. The programme will involve sizeable step-up in the financial institutions, World Bank etc. Besides the programme will generate additional demand on cement, steel, cast iron, asbestos cement, and other pipe materials in adequate measure and the country's production of such materials is to be geared up substantially. To this end in view co-ordinated action amongst the central Ministries will be necessary.

Recognising the depth and dimension of the problem, the Union Govt. has decided to set up an Apex Committee under the Chairmanship of

	As Obtained in 1980	Targets set for 1990	Rs in millions Estimated requirement for funds
Urban Water Supply	82%	100%	24750
Rural Water Supply	20%	100%	25900
Urban Sanitation	27%	80%	42280
Rural Sanitation	2%	25%	15840
		Total	108,770

*Chief Engineer-I (PHED) West Bengal

the Secretary, Ministry of Works and Housing. The Apex Committee will be responsible for national policy formulation and guidance and review the programme and intimate actions to achieve the objective of the decade programme. The following organisations Ministries/Departments will be represented on the Apex Committee :

1. Planning Commission
2. Ministry of Finance (Deptt. of Economic Affairs)
3. Ministry of Finance (Deptt. Expenditure—Plan Finance)
4. Ministry of Health and Family Welfare (Deptt. of Health)
5. Ministry of Industry (Dept. of Industrial Development.
6. Ministry of Steel and Mines
7. Ministry of Social Welfare
8. Ministry of Rural Reconstruction
9. Adviser, Central Public Health and Environmental Engineering Organisation, Ministry of Works and Housing-Member-Secretary

The state of West Bengal-along with the other States is preparing to meet the challenge of the decade. The task is uphill which is evident from the present state of things is respect of Water Supply and Sanitation in this problem state. The present level of coverage of population (as of 1st April, 1980) in the Water Supply and Sanitation sector in the State of West Bengal and the targets set for 1990 as well as the estimated requirement of fund for achieveing the targets are submitted in the following table.

The magniture of the problem in the State can very well be understood from the difference between the target and the situation as obtaining today. Sectorwise discussion will elaborate the problem in further details.

Urban Water Supply

In West Bengal, we have 134 nos, of Urban communities. Some of these are provided with piped water supply system but with inadequate level of supply. We have proposed elevation of service levels as per recommendation of the CPHEEO. Those not provided with piped water supply at all shall be covered on a priority basis. It has been estimated that an amount of Rs. 264.0 crores will have to be spent within the Decade to achieve the target.

Rural Water Supply

In West Bengal, rural population is around 75% of the total population of the State. Thus, full coverage of the population by 31st March, 1991, is a tremendous task and will cost around Rs. 501.0 crore. We have propsed coverage of 1st priority problem villages (i.e. where no source exists at present), numbering 13663, within the VI plan period along with some 2nd priority and non-problem villages. A vast part of the State does not have adequate ground water reserve and costlier surface water supply system has to be adopted there.

Urban Sanitation

It is well understood that much more attention has to be given to Urban Sanitation Services. We contemplate to cover 33 urban communities with such services within the Decade at an estimated cost of Rs. 640.00 crore. We propose to provide sewerage and sewage treatment facilities in all the ten nos. of prospective Class I Urban communities. We also propose to provide sewerage and sewage treatment facilities in Industrial towns located on the river Bhagirathi belonging to class-II category for avoiding perpetual water pollution by industrial and domestic waste. We have also proposed extension and reorientation of sewerage and treatment facili-

	As obtaining in 1980	Targets Set for 1990	Funds (Rs. in million)
Urban Water Supply	39%	100%	2640
Rural Water Supply	17%	100%	5010
Urban Sanitation	15%	80%	6400
Rural Sanitation	Nil	25%	1200
Total	15250	Total	15250

ties for the three hill stations at Darjeeling, Kalimpong and Kurseong to encourage-tourism.

We have proposed low cost sanitation with septic tanks in 14 class-II towns.

RURAL SANITATION

No work in this field has so far been undertaken. We intend to provide low cost water seal latrines to 25% of our rural population by the end of the Decade at an estimated cost of Rs. 126.00 crores. Due consideration will be given to the soil condition, habits and socio-economic condition of the people.

Catchment areas of hill springs and streams are vulnerable to human waste pollution and hill diarrhoea is endemic. In alluvial areas, soil transmitted diseases are endemic, particularly where water logging is freequent.

As indicated above we shall require a fund of around Rs. 1531.0 crores within the Decade for achieving the target coverages. The State Government intends to finance the self paying projects from loan obtained from different financial institutions within the country and also from World Bank subject to approval of the Central Govt. Internal generation of funds has to be encouraged by extensive new and higher tariffs for services created within the Decade.

Requirement of materials would be around four times of what we are using now. New industries have to be set up to cope with the increased requiremnt. We have to choose materials that can be produced quickly and at comparatively low cost. For this, research oriented progammes have to be undertaken in consultation with similar national organisations. An estimate for materials and equipment required for the Decade is below.

Extensive re-organisation and strengthning of the management have to be made in order to develop projects, execute, and maintain the services. Training facilities in India and abroad have to be arranged. Co-ordination with various technical institutions within the country will be helpful.

Constraints are many, their solution is difficult. Yet we hope, with our all efforts, we shall be able to provide for our people, better services in respect of water supply and sanitation, within the ensuring Decade.

Materials required for Water Supply Construction for the Decade 1981-1990

	Materials	Unit	Urban	Rural	
1	Cement	Tons	1,12,000	97,500	
2. (a)	Mild Steel bars	"	25,000	42,500	
(b)	Mild Steel Plate	"	11,000	—	
3.	Pumps				
(a)	Hand Pumps	No	—	1,01,750	Ord. 61050 D.W. 40700
(b)	Borehold (BHP)				
	0—5	"	—	40	
	5—10	"	191	40	
	10—20	"	269	785	
	20—50	"	50	270	
	above 50	"	—	—	
(c)	Vertical Pumps (BHP)				
	0—5	"	—	—	
	5—10	"	—	—	
	10—20	"	—	—	
	20—50	"	—	—	
	above 50	"	10	—	
(d)	Horizontal Pumps (BHP)				
	0—5	"	—	40	
	5—10	"	233	20	
	10—20	"	163	3000	
	20—50	"	40	618	
	above 50	"	56	57	

Supplies and Equipment for Water Supply & Sanitation Facilities

Supplies and Equipment	Unit	Water Supply		Sanitation	
		Urban	Rural	Urban	Rural
Drilling Equipments and accessories of various types and classes with spares etc.					
Rig type					
1. Pure D.T.H. (3 tons supporting truck)	No	—	9		
2. Rotary+D.T.H. Combination ($7\frac{1}{2}$ tons supporting truck)	"	—	7		
3. Direct Rotary Rig (6 in.) ($7\frac{1}{2}$ tons supporting truck)	"	—	100		
4. Direct Rotary Rig ($7\frac{1}{2}$ tons supporting truck)	"	1	3		
5. Reserve Rotary Rig ($7\frac{1}{2}$ tons supporting truck)	"	1	3		
6. Cable Tool Rig ($7\frac{1}{2}$ tons supporting truck)	"	—	8		
7. Road Rollers of Sizes					
(a) 10 tons	"	21	1	40	
(b) .8 tons	"	9	1	20	
8. Concrete mixers					
(a) 10/7 (cft)	"	280	20	100	
(b) 7/5 (cft)	"	130			
9. Diesel Generators for Power of capacities					
(a) 0—10	"	10	10	—	
(b) 10—25	"	145	107	—	
(c) 25—50	"	8	3	100	
(d) above 50	"	35	—	19	
10. Vibrators (HP)					
Diesel operator 4.2		205	10	40	
6.5		205	10	60	
11. Trucks of sizes					
(a) 90—125 (HP)		29	102	64	4
(b) 60— 70 "	"	8	123	75	—
(c) 14— 35 "	"	10	17	—	—
12. Trailers of sizes					
(a) 0.05 (CM)		34	153	94	54
(b) 0.50 "	"	34	153	94	54
(c) 3.00 "	"	6	—	50	—
13. Mobile vehicles of sizes					
(a) Jeep 26 (HP)		138	325	238	108
(b) Pick-ups 30 "	"	52	79	106	—
(c) Cars 14 "	"	64	90	130	17
(d) Mini Buses 40 "	"	6	336	10	—

Andamans

Andaman & Nicobar Islands in the Bay of Bengal is an isolated group of islands from the Mainland by long stretches of open sea. Port Blair Town, the Capital of these Islands is located at a distance of 1255 Km., from Calcutta and 1133 Km., from Madras Ports. There are about 361 Islands in all, covering an area of 8293 Sq. Km. The total population as per 1971 census is 1,15,133.

Andaman and Nicobar Islands receive rainfall from both South West and North East monsoons. The major portion of the rainfall is from the South West monsoon. There are numerous streams/rivers but most of them flow towards East or West having a short run and draining into the Sea. Acute shortage of water is felt in summer with the result that various methods to tackle this problem are evolved every year. The ground water resources of these Islands have not been systematically assessed. The soils do not have capacity to absorb the rain water and retain it for long periods. This, in turn, causes the failure of wells during summer. There are natural springs in various Islands. Some of them are perennial.

There are several schemes to cover the 57 problem villages in the year 1972 survey, and 107 in the year 1978. The schemes are basically in the rural areas by

1. Collection of rain water in the Giant RCC overhead tanks and distribution by gravity through pipes;

2. Collection of water from the existing natural springs;

3. Collection of water from the dug wells. Safe drinking piped water supply is provided to 9 villages and a further additional 39 villages by the end of 1979-80. The Government of India is very keen to provide water supply in all the 57 problem villages as surveyed in 1972 by the end of 1980-81.

The urban water supply requirement of Port Blair inclusive of the adjoining areas of rural population is being fed by Dhanikari Dam storage which was constructed by MES during 1973.

The settlements are scattered in various Islands and the only means of communication is water transport. This requires improvement to speed up the execution of schemes in time.

The materials required for the execution of projects are to come from the mainland and the expansion of water transport goes a long way in implementing projects according to schedule.

KARNATAKA

(from page 83)

up with the cost of the projects for completion in a stipulated period.

The Governments both at State and Centre is to give priority for allocation of funds to this sector (water supply) at least in the International Water Supply and Sanitation Decade by special provision in the budget and necessary plan allocations by mobilisation of funds either indigenously or by obtaining assistance through the World Bank and International Development Agencies from the foreign countries.

The Decade in Meghalaya

By

P. Arunachalam*

Introduction

BETTER late than never. In the thirty-fourth year of Independence a realization has come that a healthy nation is a wealthy nation. It is a wellknown fact that water-borne diseases outnumber all othtr diseases put together and in India one person out of every two of the population drinks polluted water. According to a WHO survey 80% of the diseases are caused by polluted water and the amount spent by Governments on health care and suffering caused by these diseases for a poor country like us is truly collosal. The most pragmatic approach to this baffling problem is: "Prevention is better than cure and the eariler the better". During the decade 1981-1990 India is going to lay the basic infrastructure by providing pure drinking water supply and sanitation for total eradication of all water-obrne diseases and to achieve the social goal of health by the year 2000. The solution to the problem of drinking water supply to one and all looks very simple in theory but poses very formidable problems in its implementation. This can only be achieved by a formidable will. Where there is a will there is a way.

On 10th November 1980 the United Nations General Assembly, at its special session, formally launched the "International Water Supply & Sanitation Decade" (IWS & SD) 1981-1990. However, the Government of India without waiting for the U.N. resolution, on its own made a modest beginning even in earlier years. On 10th November 1980, Mr Bhishma Narain Singh, India's Minister for Works & Housing, in a broadcast reaffirmed the government's decision to achieve the tragets set forth in the U.N. Decade as expeditiously as possible. The Government of India has already held a number of conferences with the U.N. agencies like WHO, UNICEF, UNDP, World Bank etc., in which various State Governments have participated. It has been now decided that the Government of India, with the cooperation of various State Governments, would endeavour to achieve the

A tribal woman filling a pitcher from a public fountain at her door step in Garo Hill District.

*Chief Public Health Engineer, Meghalaya, Shillong.

following targets by the year 1990.

Targets

(1) Urban Water Supply: 100% of the urban population to be covered with basic minimum needs of safe water supply.

(2) Urban Sewerage: 80% of the urban population to be covered with either sewerage system or sanitary toilets connected to safe disposal system.

(3) Rural Water Supply: 100% of the rural population to be covered with basic minimum needs of safe water supply.

(4) Rural Sanitation: 25% or more of the population to be covered with sanitary toilets in the Rural and semi-urban areas.

Any programme for providing water facilities in Meghalaya will meet with instantaneous response from the public, but the same is not true in respect of urban sanitation and rural sanitation.

Depending upon the past experience and the social acceptance very high priority has been laid in Meghalaya for rural and urban water supply, especially public stand post water supply schemes with house conenctions in rural areas and in urban areas with water supply with household storage tanks and domestic and industrial connections. The level of industrialization is very low in Meghalaya compared with rest of India and the targets for the International Water Supply and Sanitation Decade are rather drawn up on a very modest scale, keping in view the eradication of water-borne diseases and to mitigate the hardship of carrying drinking water by people over long distances and to provide for infrastructure facilities for industrialization.

Unfortunately a vast number of people living in small villages situated on hilltops, and lacking road communications do not have access to safe and convenient source of water nor do they have sanitation system. However, with the growing awareness of rural communities the benefits of water supply and good communications the PHE and PWD have to satisfy the ever-increasing demands of the masses, and the period of 10 years (1981-1990) is too long a period to phase out to extend the benefits of safe drinkink water and sanitation facilities to all the people of Meghalaya. Had there been no constraints like the men material and money, we can at least cover all the remaining 40,000 problem villages as on 1-4-80 by 31-3-1985 out of a total of 1.53,000 villages. Even this seems to be a remote possibility.

Financing

According to a survey undertaken by the States and Union Territories during the year 1971-72 there are about 5.76 lakh villages in the country, out of which 1.53 lakhs are problem villages.

Some state Governments have repotred that the earlier survey was incomplete and that due to natural causes the water table had subsequently gone down in some areas or the sources had dried up or the earlier sources had dried up thereby increasing the number of problem villages. The list of problem villages still remain inconclusive. The target for sixth plan is to cover all problem villages by the year 1985. It is estimated that the requirements of funds will be of the order of 15,000 crores for the Water Supply & Sanitation Decade (1981-1990).

Plan for Meghalaya

Meghalaya is a tiny state situated in the N.E. India. Meghalaya is a land of great scenic beauty with verdant hills and fast-flowing streams. Meghalaya has about 400 Km of International boundary with Bangladesh 90% area of the state is mainly inhabited by tribal population. Shillong is the Capital of the state and is accessible from Gauhati by a 100 Km long motorable road.

The population of the state as per 1971 Census is 10,11,699. The state consists of five districts. The terrain is mostly hilly and undulating. Most of the villages are situated on the top of the hills and the sources like streams and rivers flow at the bottom of the hills. In some places springs at higher altitude are available, but due to vagaries of rainfall and deforestation in the catchment area as also due to shifting cultivation (Jhum cultivation) the yield of springs is decreasing gradually. Ring-wells or shallow wells are not successful in hill areas. A

few deep tube wells, and hand tube-wells sunk along the plain areas adjoining Assam and Bangladesh border were found to be successful. Till 31.3.80, 379 problem villages have been covered out of 4,583 villages with pipe-water supply schemes. 75% of the remaining 4,204 villages in Meghalaya, included in the decade plan, are at a lower level than the villages. These sources require pumping and treatment of water, storage and distribution through street taps.

Social Acceptability

No programmes and planning will be successful which are not socially acceptable and without public participation. In the six urban towns, there are either municipalities or town committees which have elected rtpresentatives on their boards and run by Civil Service Officers as chief executives. In the board meetings the plans and programmes are discussed and a close watch is kept on their implementation. Revenue and tax collection and maintenance of water supply and sanitation schemes are carried out by and large to the satisfaction of the tax payers.

In rural areas the set-up is highly democratic. The entire adult population, both male and female, constitute the village durbar. The durbar elects its leader known as a headman. All routine matters like collection of house taxes, distribution of land for shifting cultivation, allotment of land required for developmental schemes, e.g. water supply, electricity, hospitals, roads buildings, etc.; are done by the headman in consultation with the village durbar. The P.H.E. officers in charge of water supply schemes first consults the headman of the village and informs him of certain conditions that require to be fulfilled befort any water supply scheme can be undertaken for the village. The headman summons the village durbar by beating of drums and in the gathering informs the people of the proposals for water supply scheme, the benefits that will accrue by regular water supply and the taxes that are required to be paid for, and other connected matters like free gift of land, preservation of catchment areas, prevention of cattle and human beings from polluting the sources, repairs and maintenance of the water supply schme, etc. After the deliberations are completed to the satisfaction of all involved, an agreement is drawn up between PHE Department and the village durbar incorporating all the clauses mentioned above, and work is commenced. The Government bears the 100% capital cost, and first 5 years after completion of the rural water supply scheme, the State Government bears 100% of the maintenance and repair costs. At the end of the fifth year only the scheme is handed over to the local committee/headman of the village for maintenance.

URBAN WATER SUPPLY SCHEMES

Greater Shillong Water Supply Scheme

Estimated to cost Rs. 239.5 mililon. The project is financed by L.I.C. to the extent of Rs. 50 million and rest by State Plan funds. This project covers four towns, viz. Shillong Municipality, Shillong Cantonment, Nongthymmai, and Mawlai and about eleven villages. The per capita supply of water to urban areas is 157 lpcd and for rural areas at 70 lpcd. An urban population of 2,40,000 people will be served for the next thirty years. The project commenced on 3.3.1979 and is expected to be completed by March 1985. The project will operate on cost recovery basis.

Tura Phase II

This project is estimated to cost Rs. 22.8 million and will augment the existing Tura Phase I water supply scheme and in addition it will serve 26,000 people in the continuous urban areas of Tura Town at 115 lpcd. The construction work on the project will commence shortly. The project will operate on cost recovery basis.

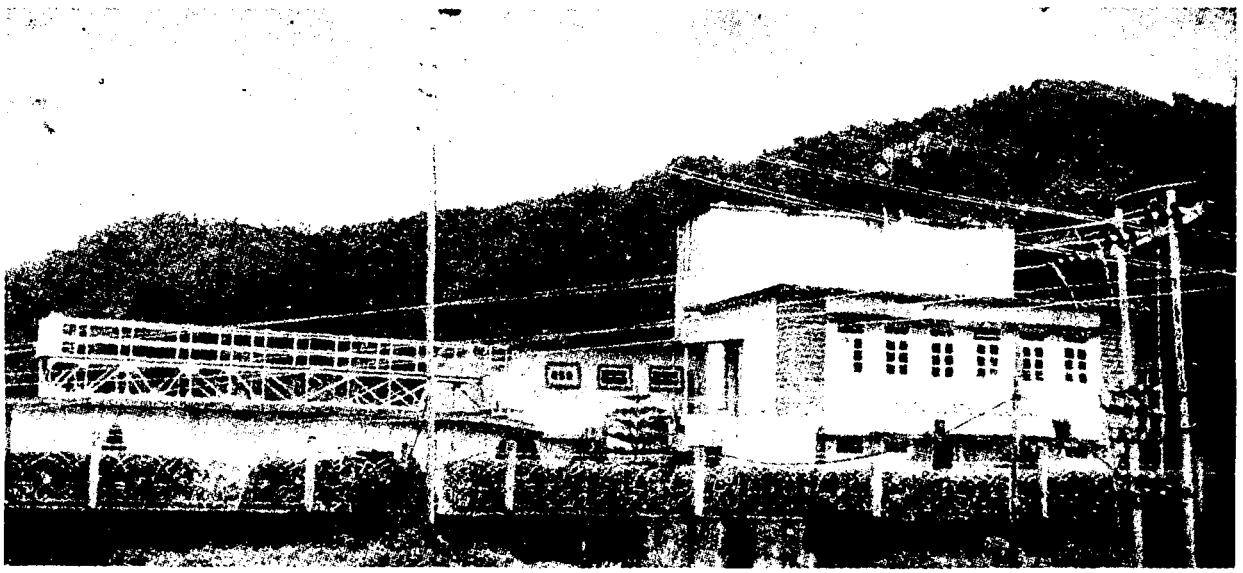
Jowai Phase II

This project will cover the contiguous suburban and newly developed localities of Jowai town and is expected to cost Rs. 2.5 million.

RURAL WATER SUPPLY SCHEMES

Combined Water Supply Scheme

This rural water supply scheme covers 21 villages in Mynso Raliang tribal development block in Jaintia Hills, covering the present population of 30,000. At present there is no protected supply in this area and serious water scarcity prevails during the dry season. The villagers drink polluted water from streams and rivers. Water-borne diseases like stomach ailments, typhoid and jaundice are prevalant in this area.



A view of the Tura Water Works, Garo Hills.

Also some influx of population is expected shortly due to submergence of other villages in the vicinity after the completion of Kopili Hydro-electric Project by 1985. The estimated cost of the scheme is Rs. 67.50 million and the project could not be commenced due to shortage of funds.

This scheme benefits 18 villages under the Nayabunglow tribal deevlopment block in East Khasi Hills distict of Meghalaya, covering the present population of 10,000. The people of the area are affected by leprosy and other skin diseases. Acute water scarcity prevalis in the dry season. The villagers are used to drink polluted water from streams, rivers and water-borne diseases like cholera, typhoid, dysentery and jaundice are prevalent in this area. The estimated cost is Rs. 43 million and the benefits expected are cleanlines and personal hygiene, and better health facilities.

There are other similar groups of problem villages, which are in various stages of survey and investigation.

Sanitation

The Shillong sewage disposal system will cover the entire Shillong Municipal area covering 27 wards of the town and consists of (i) Laying of Sewers, (ii) Treatment Plant; and (iii) Effluent disposal. The rainy season in Shillong extends over a spell of six months in a year between April and October. In winter the discharge in the upland streams becomes very small and receive big quantity of sewage or wage affluent. The schme is expected to cost about Rs. 99 million. In addition sewerage and sewage disposal facilities will be provided to two more town viz. Tura (Class III town) and jowai (Class IV town) respectively, at a cost of Rs. 38 million.

Rural Sanitation

It is also proposed to provide low-cost sanitation facilities on the guidelines provided by the UNDP global project for a rural population of 0.38 million which is approximately 25% of the total population of Meghalaya. This project greatly improves the sanitary conditions in villages, wherein defecation in open areas is widely practised and reduces mosquito breeding and the spread of endemic diseases like malaria and filariasis.

Estimate of Cost for the International Water Supply and Sanitation Decade (1981-1990) Meghalaya

(1) Proposed urban W/S facilities during the decade	Rs.	2,462,00,000,00
(2) Proposed urban sanitation facilities during the decade	Rs.	1,358,00,000,00
(3) Proposed rural W/S facilities during the decade	Rs.	80,53,85,000,00
(4) Proposed rural santitation facilities during the decade	Rs.	7,60,00,000,00
Total	Rs.	12,633,85,000,00

Resources

Financing for Rural Water Supply and Tariff Policy

By

Khizr R. Qureshi*

Introduction

THERE is an increasing realization now in the developing countries that access of safe water supply to a large number of people must be provided. The economic benefits from improving the quantity and quality of village water supplies is generally being accepted. Moreover, it is also appreciated that provision of safe water is of prime importance to public health, and, in combination with other sanitary measures, is an essential prerequisite to eradicate many epidemic diseases.

Cost of Water Schemes

The investment costs of the water supply schemes, however, are substantial. Depending on the level of service provided, and technology adopted in different countries these costs vary greatly. Wide differences between systems and between countries make it difficult to make any generalizations for all countries. In many cases the per capita construction cost may be US $ 4 to US $ 15 for shallow wells and US $ 30 to 100 for piped systems. Additional money is required annually for operation, maintenance, training and administration.

The emphasis on imported technology has been the dominant aspect of water supply system in these countries. The result is that per capita costs are high, and operation and maintenance is difficult and costly.

Financing of Water Schemes

Major financing for the rural schemes is done through the government budget. At the national, regional or local level increasing amounts are being allocated for water development. But these government finances have to compete with other needs equally important and significant like education, health, roads, etc. Foreign aid has become significant and important, too, in the last decade in water development and constitues now 30 to 40 percent of the total expenditure in developing nations. In many countries, capital equipment has been provided and technical assistance made available to cover a segment of rural population. In many of these aid programmes, the emphasis has been to put the equipment and technology of the donor countries. The amounts of funds allocated to village water supply from these two sources are usually determined by the Government on the basis of national priorities and the needs of other sectors of the economy.

Payments by the Users

Some part of the finances is made available by the villagers to meet initial and recurring cost. In many countries, the villagers contribute a part of the capital cost so that the water system may be established in their villages. They may contribute labour or local material instead of capital cost. In the case of operation, the Government may subsidise the operation costs; but in many countries, the emphasis is that the rural communities meet the full operation and maintenance costs. This emphasis on payment for water is based on the principle that the beneficiaries should contribute towards the cost of the service they receive. Many countries, however, do not consistently enforce charging policies and arrears are heavy.

This is due to the fact that villagers are generally so poor that they are unable to pay any-

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thing towards the cost of water. In fact, the Governments may not have been clear in their minds whether to charge or not. Even with the decision in principle that villagers should meet part of the cost, it is a problem to determine their ability and willingness to pay. The matter is complicated by the fact that it is very difficult to estimate the average real income of the people and to determine their ability to pay. There is insufficient data available on real income of rural popu lation. Even if real income is estimated, it should be necessary to find the relationship between the cost of water and income in cash. When people have little income in cash, it would be difficult for them to pay water charges.

Financial institutions have not been very active in providing funds for rural water supply. The urban water supply systems have their own financial problems, and generally there is little subsidisation from urban to rural systems.

Water Development and Traiff Policy

The fact that rural people have less income has generally been conceded. Water should therefore be made available free to these communities. But free water supplies will increase the Government's financial obligations. If a widespread rural water programme is to be successfully implemented, the Government's annual expenditure would go on increasing. An attempt is being made in this paper to study various implications of alternative policies and a rational water tariff policy is being suggested.

Free Water Supply

Provision of free water is one of the demands of the population in the developing countries.

Realizing that there are wide differences in income between the urban and rural people, the Government is always working to narrow this gap. This may take a long time to achieve, but certain steps may be taken immediately, and provision of water free of charge is one way towards income redistribution. This implies a continuous subsidy for water use, and a change in resources allocation through public funds to the rural areas in the form of investment and operation expenditure.

If one considers rural development, in general, water supply should be a part of it. In fact the aim should be a comprehensive development approach for any community or area, and may include health, sanitation, rural industries, roads, agricultural improvement and adult education. Moreover, water in rural areas is being provided on humanitarian motives of relieving hardship, and so the financial aspect should be considered as secondary. In many countries, the investment made in the water supply is not being effectively utilized due to the practice of charging. During the dry period; a minimum amount of water is purchased; and if the system is to be improved or expanded to provide better service, then the price of water becomes a constraint. In the wet season, few people make use of it since rain water is available.

The Government may be concentrating its efforts in providing the water supply in the poorer parts of the country. These may be areas, where people are not able to pay for it. At times when there are cash difficulties, people are not in a position to purchase water, and may have to borrow or have to use polluted water. This creates unnecessary hardship and, by taking into account the general low level of income, a case exists for free water.

Increased health benefits may be achieved from a water supply if it is provided free. Many people use poor quality water during the rainy season, mainly because of the price factor. As the traditional sources are available in this season, people may use polluted water, and do not care to walk to the water supply point. As stated earlier, use is also minimum during the dry period—not much for washing and bathing. It is possible that there may be greater health benefits if rural people can use good quality of water throughout the year and it may be that free supply of water is the way to achieve it.

In many countries the expenditure on rural health facilities and on treatment of water-borne diseases is considerable. If safe water is freely available, this expenditure would be very much reduced, and health of the rural people would be improved. If the suffering due to water-borne diseases and death in the rural areas is weighted against the cost of free water supply, it would be found that these costs are very small.

The case against Free Water Supply

The major argument against free water is that if financial aspects are ignored, the Governments will be faced with a large financial obligation. Government only has limited funds, and so a large share for one sector means less for others. Thus if the Government is not prepared to cut expenditure elsewhere, it may cut water development.

The case against free water is based on the argument that water supplies must continue to be regarded as a public utility. Water is seldom considered or regarded in the same light as schools or hospitals.

It has been argued subsidisation of water supplies in developing countries inhibits financing and is a major cause of the critical and worsening shortages. Rates being unrelated to costs means, subsidies are necessary, subsidies are frequently too small, so the service deteriorates.

In general, the argument in favour of recovering the cost from the users is based chiefly on the consideration that, if water is free or is heavily subsidised, sufficient amount of money may not be made available by the Government for efficient operation and construction of other schemes. Similarly, due to uncertain economic situation faced by the country in some years, financial allocations may not be made adequately for major replacements and additions, with the result that water services go from bad to worse and the system deteriorates rapidly losing its public health significance.

The main argument for financial considerations centres on the experience of most of the underdeveloped countries, that they can get funds for the construction of water supplies, but this is not the case for the ever-increasing maintenance and operating costs, future extensions, replacements and for administration expenses.

It is true that free water supplies will increase the Government's financial obligation. In a country with a high population rate, to carry out successfully a widespread rural water supply programme would mean that the annual subsidy ondrinking water would be enormous. Government have to provide high annual investment, and would have to meet the annual operation and maintenance cost.

But it is a fact that whatever pricing policies are adopted, village water supply programmes are likely to require financial support, and subsidies from the national revenue would be necessary. It may be necessary to consider here the various functions of water rates.

Rating Function

There are various functions of rates, and these functions frequently conflict. These functions are economic, social and financial. The economic function is to ensure that resources are used efficiently, i.e. price equals marginal cost. If prices exceed marginal costs the resources will be under-utilized. If marginal costs exceed prices, capacities may quickly become a constraint.

With rural supply marginal cost will frequently be near zero, and any rating policy other than free water lead to under utilization. With urban supplies, rates are usually related to historical costs. These are normally less than long-run marginal costs due to the cheapest sources being used first and due to inflation.

It is possible that rates are less than short-term marginal costs due to inflation and the political difficulties associated with increasing water rates. Hence water could be cheaper to the consumer than the real cost. This may lead to demand exceeding supply at the current price and to a need for even higher cost augmentation.

The financial function is that the revenue of the water supply organization meets all its costs capital, operation, maintenance and collection.

The social function is subjective but would generally be considered to include efforts to relieve poverty, redistribute income and develop backward areas.

Thus the economic and social functions of rate is the same, i.e. low water rates; but the financial function is in conflict with them.

Alternative Tariff Policies

A major policy decision is whether to regard water supplies as public utility or social service. There is a strong case for regarding rural supplies as a social service, like schools and hospitals. If this new status of public service is accepted, the obligation of the Government will be fully recognised and understood.

The possibility of free rural water supply should be seriously considered. This policy can be justified on social and economic grounds. In this way the Government would be subsidizing the poorer section of the community, the income distribution effect of which would be socially desirable.

If provision of free water is not possible, then low water rates should be charged. Efforts should be made to recover only the operation and maintenance expenses.

In fact, the villagers should participate with the concerned authorities in planning, construction, operation and maintenance of water systems. For this purpose water committees can be established where water supply system is in existence or is to be constructed. An agreement may be laid down specifying the duties and responsibilities of the Government and the Water Committee. The basis of this agreement could be :

(i) The water system is to be constructed by the Government in co-operation and consultation with the Water Committee. A system of categorization has to be established based on the economic status of the region and sub-region on the report of the local administration. Then the capital cost is determined, and recovered over a period of time from the community. Depending on the economic status of the area where the system is to be installed, it has to be decided whether full cost be charged, or the cost be subsidised, or the system be installed free.

Only the local cost of construction should be charged, and people should not be asked to pay for the assistance received under foreign grants. Similarly, the cost of administration of construction, training, etc., should not be recovered from the people, and these expenses may be put under the general development budget.

(ii) The operation should be arranged by the community. Once the system is established it should be handed over to the community. All expenses of operation, thus, would have to be arranged by the Water Committee and recovered from the members.

(iii) Maintenance should be organised by the Government. It should be realised that a large number of these schemes would be in communities, possessing limited mechanical skill. Therefore, Government should be responsible for all maintenance, and charge for it.

The whole charging has to be reviewed periodically and adjustments, made from time to time in the light of prevailing economic situation. As the income and productivity increase in various regions and sub-regions, where water is subsidised or provided free, the community should be asked to pay for it.

Provision of Basic Servicies for the Urban Poor*

An Overview for the State of Gujarat

By

D.N. Basu**, C.V. Vaidya**, J.D. Maskara**

Introduction

BOTH in national and regional context, provision of basic services for the poor is one of the fundamental planning goals. In an extended sense, basic services would tend to include the entire domain of services which have direct or indirect bearing on the quality of life. However, the definition of basic services is limited to what may be called **Urban Civic Services** and that too only the more important of them like water supply, drainage and sewerage. This definition is chosen because, in terms of immediate priorities for urban planning, such services appear more prominent.

Before presenting an overview of this problem of providing such services to the urban poor with particular reference to Gujarat, it would be better to have a perspective of the factors relevant to this issue. In otherwords, we should ascertain the context or the groups of factors which tend to make the problem of providing basic services as they are presented to be. Such groups of factors are prima facie identified as follows

(i) Who or which agency are responsible for the provision of such services?

(ii) What is the financial and institutional resource base, existing and potential, which such agencies have, to tackle the problem?

(iii) What is the current status of such services in quantitative and qualitative sense?

(iv) What it costs to the system to provide the basic services to the target population now and in future at a desired level of consumption?

(v) What is the affordability index of the target group of the urban poor to pay for such services?

(vi) Who are the groups or users of such services, which can be tapped for the purpose of subsidising the poorer consumer groups?

Against this set of factors, an attempt is made in this paper to present a few facts about the provision of civic services in **urban Gujarat, particularly water supply and sewerage** and suggest some alterntives. The example of water supply and sewerage as the basic service is probably the most appropriate one in the context of **future urban perspective** as provision of such service is directly identified with the consumer group (i.e. target group of beneficiaries) and represents the most essential service with an increasing marginal cost. Any effective solution to the problem of providing such civic service can be extended to other similar services, provided the future cost of the system and the beneficiaries can be identified and estimated.

Urban Population in Gujarat

In 1971, recorded urban population of Gujarat was 7.69 million, which constituted about 28%

*The authors are grateful to the officials of Gujarat Water Supply and Sewerage Board as well as different Municipalities in obtaining the required information and clarifications at different stages. The views expressed in the paper are those of the authors and not necessarily of the Organisation.

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of the total population compared to about 20% of the country as a whole. Gujarat ranks third in the country in terms of proportion of urban population. **The distribution of urban population by size class of towns is given in Table I.** The seven cities of Gujarat (urban centres having one lac population or more) account for little less than 45% of the total urban population of the State living in 216 small, medium and large towns. Both in terms of resource base and provision of civic services, the cities are likely to exhibit better situation compared to small and medium towns. Any scheme of provision of services to the latter group of towns often poses more difficulties in view of their largeness of number, geographical spread and larger proportion of the poorer segment of population.

TABLE I

Distribution of Urban Population in Gujarat by Population size class — 1971

Size Class		No. of centres	Population
More than	10,00,000	1	15,86,000
More than	1,00,000	6	17,95,000
More than	50,000	18	11,74,000
More than	20,000	42	13,28,000
More than	10,000	73	10,53,000
More than	5,000	71	5,40,000
Less than	5,000	5	2,10,000
	Total	216	76,86,000

A recent All India Survey by ORG presents some approximate estimate of the household income distribution by size class of towns in Gujarat (Table II) which, in absence of more sophisticated indicator of poverty, has been used to identify the 'Urban Poor'. As expected, the cities have significantly lower proportion of the poor and higher proportion of the rich. The estimated proportion of households having monthly income upto Rs. 350 will be about one-third of the total population in cities compared to about 50% for the smaller towns. In the State as a whole, percentage of this group, who may be identified as the **urban poor** will be about 40% **(Table III)**. The affluent group or the **urban rich** defined to include households with monthly income above Rs. 1500 will be little over 8% in cities compared to 3.7% in smaller towns. The estimated absolute number of **households** in the urban poor and the affluent groups in the State in 1981 are respectively 7.6 and 1.1 lakh. The estimated decadal growth between 1971-81 is worked out at 40% and the average household size is estimated at 5.75.

TABLE II

Income Distribution of Urban Households in Gujarat — 1978-79*

Household Income class (Rs./month)	Population Size-class Over 10 lakhs	1 lakh to 10 lakhs	Below 1 lakh	Total
0-250	13.44	16.80	32.08	23.81
251-500	42.47	40.22	39.20	40.25
501-1000	29.84	27.27	20.83	24.60
1001-1500	6.18	6.89	4.14	5.31
Above 1500	8.07	8.82	3.75	6.03
Total	100.00	100.00	100.0	100.00

The significance of providing an indicative estimate of the absolute number of 'urban poor' and 'urban rich' households lies in the feasibility of **cross subsidy,** which provides the key to the **pricing strategy** for the basic urban services like water supply and sewerage. Given an operationally feasible machinery, the larger the proportion of urban rich household, the less difficult it is to evolve a price structure commensurate with the cost of providing such services. As can be seen from **TABLE III** above, on an average, there is one rich household for every 7 poor households. The ratio is more unfavourable for small and medium towns.

The concept of cross subsidy could be extended to encompass **inter-use** price differential. For example, non-domestic users of urban services

*Source: ORG/IMRB/National Readership Survey (second) in Urban India, 1978.

TABLE III

Estimated 'Urban Poor' and 'Urban Rich' in Gujarat — 1981

	Population	Households	Urban Poor Households (Monthly Income upto Rs. 350)	Urban Rich Households (Monthly Income Rs. 1500 & above)
Cities	4732000	860400	282200 (32.8)	75700 (8.8)
Small and Medium Towns	6018000	1003000	478400 (47.7)	38100 (3.8)
Total	10750000	1863400	760600 (40.1)	113800 (6.1)

Note:- Figures in the bracket indicate percentage to total.

could be expected to pay at much higher rate than the domestic users. Here it would appear that the larger cities are much better placed because the proportion of industrial and commercial establishments in such cities is much more than in small and medium towns. Although no precise estimate has been attempted, it would be logical to assume that the employment in the manufacturing sector and large trade and services in the seven cities of Gujarat would account for a much higher proportion (in relation to its population size) than that of the smaller urban centres.

With this background of the size and composition of urban population in Gujarat, an attempt is made below to illustrate the problem and prospects of providing urban services with particular reference to **water supply and sewerage.** The selection of water supply as an example of the basic urban services throws up certain interesting issues because the pricing of water embodies a combination of the usual principles of commodity pricing with welfare criteria.

A Review of the Present System of Water Supply and Sewerage Services:

In the first place, it should be recognised that traditionally provision of basic services like water supply and sewerage has been the responsibility of urban local government namely, Municipality and Municipal Corporation. While the provision of water supply and sewerage service is the basic functional responsibility of the urban local body, the revenue system has not been, in general, linked up with the provision of such services.

An analysis of the annual revenue expenditure pattern of any urban local body would suggest that for right or wrong reasons, there has been no apparent synchronisation between the functions carried out by the local government and the revenue generated. For example, the main sources of revenue for the urban local bodies in Gujarat are Property Tax and Octroi, which represent a general instrument of taxation rather than specific function-oriented revenue base. Such revenue system has, however, several advantages because such an instrument of taxation reflect more composite and operationally simplified mode of revenue generation. This method, on the other hand, suffers from the important demerits like absence of any yardstick to reflect directly the cost of providing services and affordability of the beneficiaries.

TABLE IV

Per Capita Revenue by Source 1979-80 — Urban Local Bodies in Gujarat (Rs)*

Town	Tax Revenue				Non-Tax				
	Property Tax	Octroi	Total Tax	Water Charges	Other Non-Tax	Total	Assigned	Grants	Total Revenue
Bhavnagar	5.89	31.96	50.81	4.76	9.19	13.95	0.29	27.8	92.80
Rajkot	13.94	62.11	77.5	6.16	2.80	8.96	0.93	9.58	96.90
Nadiad	21.28	25.47	60.44	5.50	9.51	15.01	0.47	46.42	122.40
Savarkundla	5.31	41.45	46.85	1.88	3.94	5.82	0.85	5.52	58.30
Godhra	16.78	19.21	36.67	5.55	1.69	7.25	0.41	29.82	74.16
Anand	14.28	33.85	67.82	4.97	16.36	21.34	0.34	50.37	139.80

TABLE IV presents a summary picture of the revenue source of selected towns and cities representing both medium size towns and large cities. The significance of Property Tax and Octroi is evident from this. Excluding grants from the State or Central Government ,those two sources would account for between 60% and 85% of total current revenue. Water charges, which is the unique example of **function-oriented revenue base** is gaining significance in the revenue system of urban local bodies. However, as it would appear from the following discussions, this method of revenue generation, even with some moderate increase in rate structure, would fall short of the requirement if the water supply project is considered to be as a cent percent **self financing** scheme.

In addition to the above understanding of the revenue system of the urban local body, which is responsible for provision of water supply and sewerage services, the next aspect to be examined is the **present status,** particularly with respect to water supply. Most of the cities and towns have evolved, over a period of time, varying water supply systems and consequently the quantity and quality of supply, on per capita basis, significantly vary from one area to another. TABLE V presents a general picture of the water supply and sewerage services in selected cities and towns in Gujarat. The per capita daily consumption (domestic) is much less than 100 litres (except for a couple of cities) which is considered as the minimum desired level of consumption for an urban dweller. In general, it can be said that the water supply situation on per capita basis, is worse in smaller towns. The situation with regard to sewerage services is still worse for smaller towns. A more elaborate analysis of water supply and sewerage facilities in cities and class II towns groups can be obtained from Prof. R.S. Mehta's Paper on 'Housing and Urban Development in Gujarat' incorporated in the special issue (January 1980) of the Journal of the Institute of Town Planners in India.

Apart from the observed phenomenon of deficiency in the level of per capita consumption, the more important aspect to be considered in understanding the **future** problem of providing such basic services like water supply is **what it would cost to the system to augment the source and distribution of water supply.** In general, it can be argued that most of the urban local bodies have already tapped the cheaper sources of water supply and any augmentation of future water supply would imply substantially higher capital and operating cost compared to the present level of operation. **This should imply that the average real cost of supplying a given quantity of water in future would be significantly higher than the present one.** While the marginal cost of additional water supply would be different in different urban areas depending on the source of supply of existing system, any new scheme to provide

*Source: 1. Statistics of Municipal Towns and Cities in Gujarat.
2. Annual Reports/Budgets of Individual Municipal Authorities.

TABLE V

Present Status of Water Supply and Sewerage in Urban Gujarat

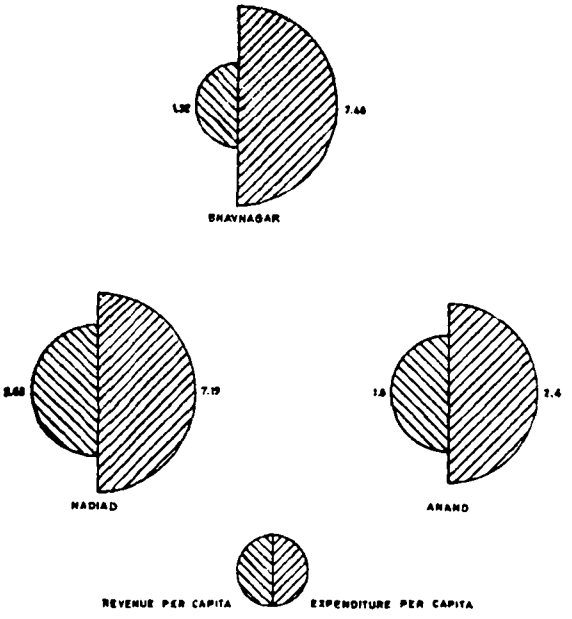
Town	Population 1971	Water Supply: Per Capita Water Supply+ lpcd Total	Water Supply: Filtered Water Supply+ lpcd Domestic	Source of Water Supply	Sewerage++: Whether sewerage system exists?	Sewerage++: Fraction covered by sewerage
Ahmedabad	1585544	60	*	Tube well & Surface	Yes	95
Bhavnagar	225358	135	128	Lakes	Yes	75
Rajkot	300612	85	65	Lakes	No	—
Nadiad	108269	119	82	Tube well	Yes	75
Savarkundla	37957	47	47	Surface	Yes	10
Godhra	66403	53	47	River, Tank & Well	No	—
Anand	59155	122	74	Tube well	Yes	55

* Not Available

Source + Statistics of Municipal Towns and Cities, Gujarat (1976-77)

++ Report on Small and Medium Towns of Gujarat, and Journal of the Institute of Town Planners, India, January, 1981.

increasing **per capita consumption** for the growing urban population would impose a financial burden on the urban local bodies several times higher than the present system. The increase would be both on capital repayment account and on operating and maintenance account. For example, the present expenses on water supply account on per capita basis vary between Rs. 6/- and Rs. 15/- per year **(TABLE VI.)** Translating in terms of cost per 1000 litres of supply (excluding depreciation), it would be, in general, between 25ps. and 35ps. Even this relatively inexpensive system is not self-financing for most of the urban local bodies. Per capita revenue from water supply account is significantly smaller than the per capita expenditure, particularly so for smaller towns where the property valuations are low and non-domestic users contribute much less significantly to the exchequer of the urban local government.



Per capita Revenue and Expenditure several (Rs) 1979-80

Over and above the two problems of low per capita consumption and the higher cost of the future water supply schemes, the third dimension of the problem is **distribution of available water.** Given the estimates of the production (varying between 45 to 75% of total households) of household connections of municipal water (TABLE VII), it would be logical to expect that large proportion of urban poor households would be consuming not only much less than the average per capita supply (of municipal water) at

TABLE VI

Revenue from and Expenditure on Water Supply and Sewerage in Urban Gujarat

Town	Water Supply		Sewerage	
	Per Capita Revenue	Per Capita Expenditure	Per Capita Revenue (Drainage Tax)	Per Capita Expenditure
Ahmedabad	5.20	8.24	N.A.	N.A.
Bhavnagar	4.76	12.41	1.32	7.46
Rajkot	6.16	8.52	—	—
Nadiad	5.50	15.43	3.62	7.19
Savarkundla	1.88	9.18	—	2.48
Godhra	5.55	6.41	—	—

Source : Annual Reports of the Municipalities/Corporations except Ahmedabad), 1979-80.
For Ahmedabad — Statistics for Municipal Towns in Gujarat, 1976-77.

city level, but also the **quality** of water consumed by them would be far from satisfactory. These households will be mostly depending on free supply of water like standpost or unfiltered sources like tanks and open wells.

TABLE VII

Source of Water in Selected Cities/Towns in Gujarat.

City/Town	% of Household having house connection (Municipal supply)	% of Household getting water from outside
Bhavnagar	73	26
Nadiad	43	25
Rajkot	77	17
Anand	49	39
Godhra	55	34
Savarkundla	35	60

Source : ORG Sample Surveys.
Note :- Other sources include private well/tank etc.

Thus the **two basic problems** of providing higher level of water consumption (with acceptable quality) would appear to be

How to generate adequate revenue to meet significant higher average expenditure per unit supply if desired level of per capita consumption is to be met?

How to distribute more equitably the avilable water supply between those who can afford to pay for it and those who cannot?

An attempt is made below to quantify some of the aspects discussed above with respect to **Gujarat urban as a whole as also separately for cities (above 1 lakh population) and smaller town groups.** The exercise is illustrative in nature in the sense that the magnitude of the problem is indicated using crude or hypothetical parameters and variables e.g. desired level of per capita consumption, affordability index of different income groups to pay for water, annual cost of the augmented water supply system.

The Scenarios for Urban Gujarat

The three basic premises on the basis of which the scenarios have been worked out in the present exercises are:—

Desired level of per capita consumption from protected sources with acceptable quality of water should be significantly higher than the present level of consumption.

Any future scheme of water supply and sewerage costs, at constant prices, much more than the present system to supply a **given quantity of water,** taking into account both capital and operating expenses*.

The principle of **cross subsidy** (among different income groups of consumers) is applicable in evolving an appropriate tariff structure for water supply.

Given the validity of the above premises, an exercise is presented below to indicate the **household water bill** at an average cost of supply and the **extent of subsidy** required in relation to a datum regarding affordability of different consumer groups. The datum regarding the affordability is however rather subjective. In case of an item like water, application of the principle of marginal utility is rather difficult. Nor the present expenses on water are indicative of the affordability of the relevant groups in view of widely varying situations in different town classes or even in different areas within a town. In the present exercises, the datum is considered as 20 of disposable household income as a subjective estimate, which is, however, quite close to the estimates used by different national and international agencies in working out the affordable water bill of households.

The cost is, in the first place, worked out on the basis of unit supply (say 1000 litres) reflecting the average cost of existing and augmented system. The cost estimates for the augmented system are obtained as an average of some of the project reports prepared for Gujarat towns as well as other cities in India, it has been assumed that atleast 1/3rd of the capital will be in the form of grant and the period of recovery will be about 20 years at 10% interest. In some sense, the annualised cost would be **less than the real cost** of the system, if we take the other approach of **resource cost** of catering to the extended water supply and sewerage system.

This assumption appears to be valid considering the project cost estimate of most of the proposed water supply schemes of major urban areas in Gujarat as prepared by individual Corporations and State level agency.

The exercise is separately carried out for cities and small and medium town groups, particularly to reflect the impact of the more comprehensive sewerage system on per capita level of consumption and the differentials in income distribution of households. In areas covered by municipal sewerage system, per capita level of consumption is generally higher. The desired level of consumption has been assumed constant for all income groups except the higher income groups, who can afford to pay more and thus subsidise the consumption of poorer income groups. Desired levels of consumption for cities and smaller towns have been assumed to be 90 and 120 lpcd respectively. For the higher income groups, the per capita consumption level is raised to 125 and 150 lpcd.

As the main idea of the exercise is to estimate the gap between what households in different income groups would be expected to pay for the desired level of consumption (household water bill) at an average cost of supply and what may be considered as the affordable expenditure for such consumer household groups, the analysis has been carried out for each broad income groups. The important assumptions implicit in such an exercise are:—

Distribution of households by broad income groups in 1981 has been assumed to be as the same as that presented in Table 2.

Percentage growth of population during the period 1971-81 has been assumed to be same for both cities and smaller towns.

For all income groups, 2% of disposable household income has been considered as affordable expenditure on water (one of the many alternatives that can be considered for the purpose).

The mode of supply and cost of delivering water are assumed to be same for all consumer groups.

The cost of water supply, expressed as annualised cost (including capital and operating cost) per 1000 litres of net supply, is assumed to vary between 70 paise and Re. 1/- in different groups of towns.

On the basis of the above set of assumptions, detailed estimates of deficit or surplus (the gap between cost of supply and affordable payment) in broad income groups and the net subsidy requirement per month are presented in TABLE VIII (city) and IX (small and medium towns). The principle of cross subsidy is explicitly built into the exercises to demonstrate to what extent higher income group can subsidise the poorer segments of population. A few general conclusions that can be derived from the above exercises are:—

Average monthly water bill per household would be about four times the present average expenses on water, if the desired consumption level is to be met. As illustrated earlier, per capita **annual** revenue on water supply account (mostly **water charges)** in most of the municipalities varies between Rs. 5 and 10, which would imply a **monthly** household water bill of Rs. 2 and 4, taking into **all households** as the beneficiaries. The future household water bill, on an average, at constant prices would appear to be somewhether between Rs. 12 and 15 per month at average cost of supply.

The principle of **cross subsidy** may have significant impact by way of raising adequate revenue on water supply account in case of cities but not so for small and medium size town groups. This is primarily because of both less favourable income distribution and higher average cost of supply in the latter group. The **implementation of the principle** of cross-subsidy, however, raises certain operational and conceptual issues. Apart from the fact that income cannot be taken as the operational index of prorgessive water tariff

TABLE VIII

Extent of Subsidy Required by Household Income Group of Desired level of Consumption — Cities in Gujarat

Monthly Household Income Groups (Rs.)	% of HH+	Desired level of Water Consumption lt/capita/ day	2% of HH income (Affordable Payment Rs./month)	Monthly HH water bill at desired level of water Consumption++ (Rs.)	Deficit/ Surplus per HH per month (Rs.)	Extent of Subsidy required per month (Rs. in '000)
Upto 350	32.8	120	4.0	14.3	—10.3	2906.7
351— 500	24.2	120	8.5	14.3	— 5.8	1207.6
501—1000	27.2	120	15.0	14.3	— 0.7	163.8
1001—1500	7.0	120	25.0	14.3	+10.7	— 644.4
1501 & above	8.8	150	42.0	16.4	+25.6	—1937.9
Total	100.0 (860400)*	123	12.9	14.7	— 1.8	1695.8

Source : + NRS — II, 1978

* Estimated no. of households in 1981. Average HH size 5.5.

++ Estimated at average annualised cost of supply Re. 0.72/100 1.
Subsidy after cross subsidy is estimated to be Re. 0.36/person/month and without subsidy Re. 1.07/person/month.

TABLE IX

Extent of Subsidy Required by Household Income Group at Desired Level of Water Consumption — Small and Medium Towns in Gujarat

Monthly Household Income Groups (Rs.)	% of HH+	Desired level of Water Consumption lit/capita/ day	2% of HH income (Affordable Payment Rs. month)	Monthly HH water bill at desired level of water Consumption++ (Rs.)	Deficit/ Surplus per HH per month (Rs.)	Extent of Subsidy required per month (Rs. in '000)
Upto 350	47.7	90	4.0	14.8	—10.8	5166.9
351 — 500	23.5	90	8.5	14.8	— 6.3	1484.5
501 —1000	20.8	90	15.0	14.8	— 0.2	41.7
1001—1500	4.2	90	25.0	14.8	+10.2	— 429.4
1501 & above	3.8	125	42.0	18.0	+22.9	— 914.4
Total	100.0 (1003000)*	92	9.6	14.9	— 5.3	5349.3

Source : + NRS — II, 1978

* Estimated no. of HH in 1981. Average size of HH 6.0

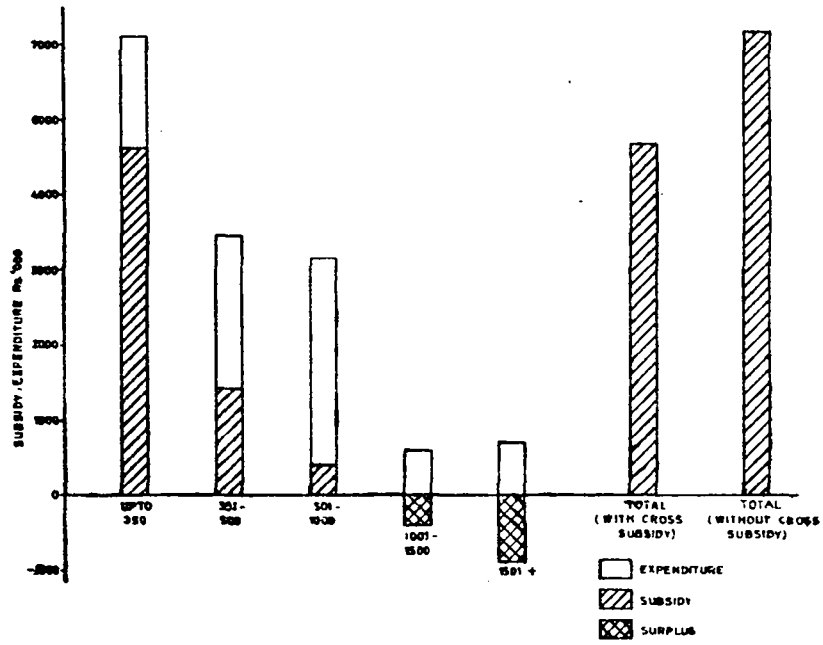
++ Estimated at average annualised cost of supply of Re. 0.91/100 L.

structure, the concept is based on the assumption that demand for water in the higher income groups is more or less **price-inelastic.**

If the principle of cross subsidy among different income groups can be implemented in practice, then in case of cities, the deficit per houschold per month would be Rs. 1.8. Translated in absolute monthly subsidy requirement, it would be Rs. 1.7 million per month. However, for smaller town groups per household deficit would be Rs. 5.3 for implied monthly subsidy requirement of Rs. 5.3 million. Assuming no cross subsidy, monthly subsidy requirement would increase by significant margin for cities but not so for smaller town groups.

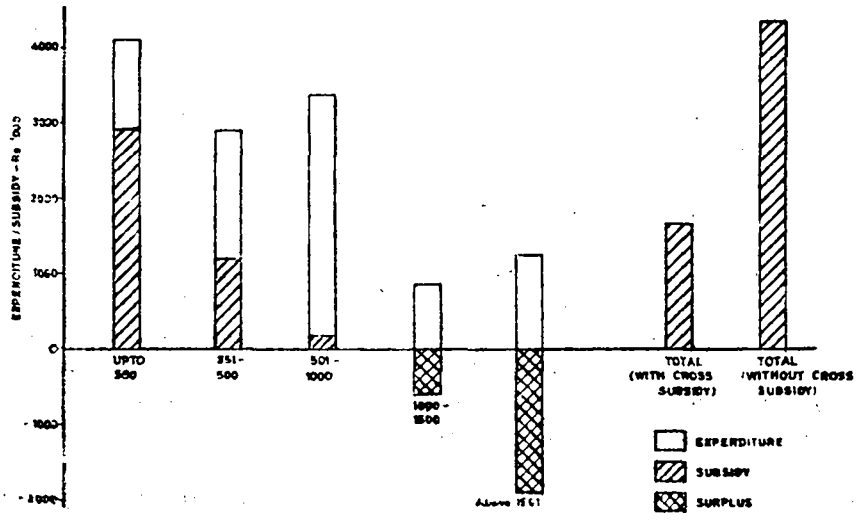
The impact of the extended water supply and sewerage scheme to meet the desired level of consumption on the budget of the urban local bodies would be substantial. This should be particularly true for smaller municipalities in which case, the **aggregate** current expenditure budget (on all civic services) has to be increased by more than one-third just by inclusion of the augmented water supply and sewerage scheme. For Municipal Corporations, increase would be in the range of 10 to 15%. Viewed against the fact that the water supply and sewerage is only one of the civic services provided by the urban local bodies, this magnitude of increase on the expenditure budget calls for substantial improvements on the revenue and management system.

In the context of the above findings from a quick exercise for the State Urban as a whole, it would appear that if provision of water supply and sewerage remains to be the responsibility of the urban local body, and if the future project has to be self-financing in nature, the



Monthly HH Income Groups (Rs)

Monthly Subsidy Requirement—By House hold Income Groups for Water Supply—Small and Medium Towns in Gujarat



Monthly HH Income Groups (Rs)

Monthly Subsidy Requirement—By House hold Income Groups for Water Supply—Cities in Gujarat

goal of meeting the desired level of consumption at an acceptable quality can be achieved only with stupendous efforts towards revenue augmentation and efficient management of the system. This should be particularly so for those town groups where the cost of the extended system would be quite large compared to the present one for various reasons and where the concept of cross subsidy (either inter-class or inter-use) will have limited impact. It would appear from Table 9 that the annual subsidy towards water supply system for smaller town groups would be atleast Rs. 12 per household. This shall have definitely a significant impact in the context of limited revenue budget of the smaller urban local bodies. However, if we look at the problem from the point of view of the State Financial System, the magnitude might not look a frightening one compared to the size of grants provided by the State Government on different accounts.

The other improtant dimension of the problem is the **mechanism of making water available to the urabn poor**. This is not simply a matter of subsidising the budget of the urban local body, but it also involes the aspects like mode of supply and management of the system. For example, free supply of water through public standpost should be examined in detail both from the point of view of economising the cost of the system and the feasibility in operating and maintaining a wide network of public distribution system.

Policy Option.

In the context of the above discussions, it may be possible to visualise a few policy options for the State towards long-term objective of providing basic urban services like water supply and sewerage. These policy options are described in simple terms as follows:—

Evolve a method of water charges which should be implemental by the urban local bodies in due course of time, embodying both the principales of cross-subsidy and wider network of public distribution system.

Instead of treating the matter of revenue generation from water supply and sewerage project in an isolated manner, integrate the method of financing with the entire revenue system of the urban local bodies. The fact that provision of water supply and sewerage adds to the general appreciation in the values of property and the location as such, there are justifications for recovering the additional expenses on water supply account through augmentation of the **general tax base** of the urban local bodies.

The additional cost of the future water supply scheme to the target group, particularly the urban poor and the implied subsidy requirement to meet the expenses on an annual basis can be considered as a part of the State Financial System, rather than Financial System of the urban local government. The methods of financing may comprise of grants or some kind of additional levies for urban development at large.

Importance of Tubewells in the Programme of the Decade

By

G.L. Malik*

IT is very encouraging that various organisations such as World Health Organisation, AFPRO, CARE, PADI, UNICEF and others are implementing the proposal by United Nations, Third Development Decade (DD II) 1981-90 to improve drinking water supply and sanitation in India.

Most of the diseases are due to polluted water. Proper attention to the sanitation in the supply of drinking water will eradicate the root cause of water borne diseases and is bound to improve the health of the nation. Since the author is connected with construction of tubewells all over Northern India for the tapping and exploring underground water resources, the following suggestions may assist the organisations in plannig during the decade in respect of tubewells.

There is a general impression that suitable equipment for drilling tubewells is not available in India. This is not correct as practically all types of drilling rigs are now being manufactured in India, though rig manufacturing is a sort of monopoly business and its cost is very high. Government of India must encourage small industries and public sectors to bring out cheaper equipment. Most of the private drilling agencies prefer to fabricate their own rigs at nearly 50% of the cost charged by a few monopoly houses.

The other misconception is about the nonavailability of proper material for completing the tubewells, due to shortage of steel and other type of pipes using petrochemical products. This, however, is not the case. There are so many alternative materials available that there be no hindrance in implementing the programme. The World Bank is already assisting manufacturers of pipes used in the tubewells for irrigation, town water supplies and for the carriage of water to the fields.

The impression about lack of management talent and lack of trained personnel, specially the Operators and middle level engineers, is also not corect. On the contrary, many qualified engineers having specialised in rig manufacturing and tubewell construction technology have switched over to other professions due to frustration and lack of encouragement in their specialised fields.

The engineers of Government Departments have to appreciate the difficulties of the private drilling agencies and assist them after discussions with them. A few glaring examples will convince the Government Departments about their inability in implementing tubewells construction schemes properly. Some of the draw backs in implementing such schemes by the Government, are:

Funds are normally sanctioned for such projects only a couple of months before the closing of the financial year. As a result they are in a hurry to spend huge amounts in either purchasing drilling rigs or collecting steel pipes, instead of putting to use the available material and utilising the money on construction jobs.

Governments issue very short period tender notices and expect dozens of tubeweels to be completed in a month or so, specially in those areas, where drilling depth ranges from 600 to 1500 ft.. Normally it takes a month to complete one tubewell per drilling rig. When this is brought to their notice, the examples of other States are cited, ignoring the fact that ior

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different formations, different type of drilling rigs are required, D.T.H. rigs can construct one tubewell per day but those are meant for rocky areas with limted diameter bore of 6″/8″. But to expect the same progress with percussion, direct rotary or reverse rotary system to complete the bore in one day, instead of one month is surprising, as 27″/24″ bores are required and that too, when these are to be deeper than D.T.H. bores.

There is a view that since larger diameter bores consume more fuel, smaller diameter tubewells should be encouraged. But author's experience of 30 years in research and development definitely suggest that in most of the aluvia areas large diameter bore is the only solution to pump out maximum discharge. Though initially the fuel cost of boring holes of large diameter may be a little high, these produce almost double the yield during the life span of the tubewell, which may range between 25 and 30 years. So the argument of initial high cost does not hold at certain places where conventional strainer wells were producing 40,000 gallons per hour. With large diameter slotted gravel packed tubewells, 3,00,000 gallons per hour have been obtained within the same drilling depth.

Now that sufficient funds have been allocated for drilling for water supply in the 6th Five Year Plan, it is strongly felt that proper attention may be given for the manufacture of drilling rigs in public sector at cheaper price. Manufacture of pipes with alternative and easily available raw material should be encouraged. The available management talent and training schools may be encourage to overcome the shortage of trained personnel. There should be public investment in such schemes at district and village levels. All the State Tubewell Corporations should concentrate on construction jobs with the available equipment, instead of stock pilling more and more equipment and pipes over long periods and thus create scarcity in the market.

It has also been observed that equipment purchased hurriedly, are either disposed off at throw away prices or got converted for its proper utility at high cost. Even the designs of tubewells are not modified to suit the latest tubewell well construction technology. Most of the Government Departments are still sticking to the tubewell designs conceived 30 years back and do not wish to modify due to various reasons or accept responsibility for experiments. Audit objection is more cared for than expertise.

As for sanitation, it is observed that no care is taken to provide sanitary sealing for the tubewells, though the Code ISI 2800 : 1979 exists for such a step. There is no proper check and control on the water management problems arising in areas where industries are developing rapidly. Though there is limit for exploiting underground water resources no care is being taken for re-charging the water bearing zones. The integrated programme will definitely overcome such problems and the participation of private sector will yield good results. Most of the consulting engineers prepare water supply schemes without considering such factors or consulting geohydrologists. Even spacing of tubewells is not planned properly to avoid interference.

Mini Water Turbines for Water Supply in Hilly Regions

By

D.R. Bhutani*, T.N. Visweswara**

WATER falls in nature have been perennial source of energy. The energy available in these falls is converted into electrical energy by using water turbine and electric generators. The water while flowing through the turbine transfers its energy to the turbine runner, thus converting its energy to mechanical shaft power which in turn drives an electric generator in conventional systems to produce electric power.

Until recently the hanessing of water power in a small scale from a head drop of 2 to 20 meter was not economical. The equipment, the civil and the poerating costs were prohibitively high. The recent developments in technology necessiated by the rising cost of energy have made these sources economically attractive. The tubular is one of the outcomes of this technological developments.

Conventionally a pump is driven by an electric motor. Instead of using electrical power generated from hydel sources to drive a motor, the turbine can be directly coupled to a pump. We can use the energy avilable in low head sources to pump a small quantity of water to a very high elevations. This concept has also been tried successfully in many installations.

Description of the Pumping Plant

Construction of a small bund across the stream will create a small reservoir or a head pond, impounding sufficient quantity of water.

The function of the head pond is only to maintain constant supply head to the turbine. But when the stream flow is less as during dry seasons, the size of the head pond should be sufficient to run the turbine for atleast half an hour.

From the head pond water is lead through 400 mm diameter pipes into the turbine via gate valve at the turbine inlet. The shaft power of the turbine is transmitted to the pump by means of suitable belt drive.

A pipe line with a small valve connecting the supply pipe to the pump will serve for easy priming of the pump. The suction pipe of the pump is connected to tail race or head pond as required. The delivery of the pump is lead to the overhead tank in the village (Ref. Figure I)

Constructional Features

The tubular turbine is an axial flow propeller type turbine with almost straight water passage and simple configuration. This type of turbine is well suited for low head applications. It consists of a specially designed runner blades fixed to the hub and mounted on the shaft supported on bearnings on either side.

The guide vanes fixed to the hub and casing and provided to guide the flow. The draft tube is of high energy recovery elbow type fabricated from plate steel. A sluice valve, manually operated, is provided at the inlet for starting or stopping the system. A belt drive transmits the turbine shaft power to the pump.

The centrifugal pump, converts shaft energy to fluid energy through the impeller. A single stage pump can deliver a head of 10—15 meter of water depending on speed and size and a multistage centrifugal pumps are ineffect a series of single stage pumps within a single casing having only one shaft and one set of bearings. These pumps are readily available in the market as compact efficiency units (Ref. Figure I)

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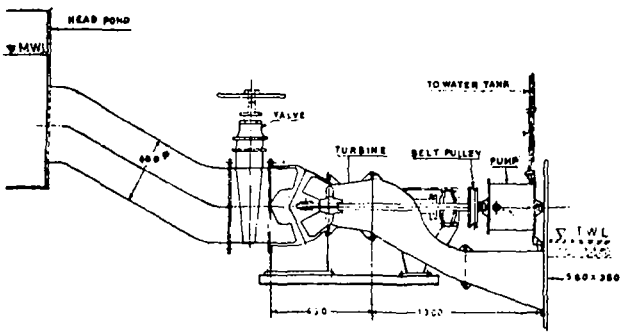
Operation of the system

Special attention has been given in designing the system so that the operation of the mini turbine pump combination is made very simple as the availability of skilled operations in these remote regions is very little. For starting the system, the operator has to first ensure that the pump is properly primed. To facilitate easy priming water from the supply tank which is readily available under pressure is fed into the pump when priming is completed the inlet valve is to be opened slowly and completely. The system will start operation and water will be pumped to the overhead water tank situated in the village nearer to consumer. When the pumping is not made the inlet valve is closed completely which will automatically stop the system.



SCHEMATIC LAYOUT OF THE PUMPING PLANT

In dry seasons when the stream flow reduces and is not sufficient to run the turbine, it may be necessary to create a small pond to collect sufficient quantity of water. The unit needs to be operated for shorter duration and more number of times, water must first be allowed to collect in the head pond. The size of this tank should be enough to run the turbine for atleast half an hour. Then the tank is full the gate valve is opened for the pumping operation. The pumping of water is continued till either the tank is emptied or the level of water falls to a predetermined level as the case may be, when the unit is stopped by closing the gate valve. The process is repeated till the required quantity of water is pumped in to the water tank.

Performance Range Estimates

The range of operation expressed in terms of actual speed in revolutions per minute and actual discharge in litres per second and power output in terms of KW is given in the table. The quantities have been estimated and tabulated for net head of 6 meter and 10 meter separately (Ref. TABLE I).

TABLE I

Turbine Performance

Head 6 meter		Head 10 meter	
Discharge LPS	Power KW	Discharge LPS	Power KW
175	7.0	225	16
260	10.5	338	24
350	14	450	32
440	17.5	564	40
Speed range: 100-1500 RPM		Speed range: 1200-1800 RPM	

This range of operation is achieved by suitably setting the angular position of the runner vanes and guide vanes at works.

Example

As an illustration let us consider a village consisting of about 400 persons. The per capita consumption of water is taken to be about 100 litres perday, making a total demand of 40,000 liters per day for the entire village. Further if the water is to be lifted through a head of 125 meter with frictional losses in pipe of 25 meter. The power input to the pump will be 12 KW which is the same as the turbine output. The turbine will require 265 lit/sec at 6 meter supply head or 125 lps at 10 meter head when developing the required power. The turbine will run at 1050 RPM at 6 meter head of 1350 RPM at 10 meter head which will be stepped upto 2900 RPM by the belt drive.

Economic considerations

As mentioned above in this paper, to make this type of units economically viable, it is necessary to simplify and reduce the cost of not only the equipment but also all other aspects of the system including civil work and operation and maintenance of the system. All efforts have been made to achieve this aim. It may be noted in this context that the tubular type turbine is very

TABLE II

Pump Performance

Size Del. X Suc.	No. of stages	Speed RPM	Head in meter 90	100	110	120	130	140	150	160	170
50 x 65	6	2900	5.3	5.1	4.2	3.6					
80 x 100	6	1450		16	13.9	5.5	5.2	4.8	4.5	4.2	3.6
50 x 65	8	2900				10					
80 x 100	6	1450		16	13.9			15	13	10	
80 x 100	8	14500									
						discharge in LPS					

much simple and economical in comparison with a conventional Kaplan type turbine and that the tubular turbine as adopted for this specific purpose of water supply in hilly regions is a further simplification of the conventional tubular type turbines. The total elimination of the guide apparatus with its governing system and the concept of "single point operation" by maintaining supply and demand same has been responsible for considerable cost reduction.

The comparison of the economics of this system with that of electric motor driven pumping system is not realistic since this system is conceived and created specifically to harness the abondance energy available and not to consume the scarce electrical power. Further the sites envisaged for the application of these units are far from any electrical supply grid and hence no electrical power is available and the system needs no electrical power.

Other Applications

The system has been specifically designed to operate at a single point. For purpose of economy and simplification of operation, controlling apparatus like the adjustable guide vanes along with governors and operating mechanism have been totally eliminated. By maintaining the input head same and also by keeping the load on the turbine, the pumping load same, we balance the supply and demand and the system will be in equilibrium.

Hence this system can also be considered for other constant demand applications or also for such application which can tolerate a certain amount of speed fluctuations. The mini turbine can then be a prime mover for floarmilds, small size cave crushers and other agricultural equipments. It can also be used to drive auxiliary equipment like cooling tower fans in thermal power plants where the water under high pressure is available from the cooling system.

Water Supply and Sanitation Decade Training & Research Needs

By

Prof. K.J. Nath*

The task of providing 100% of our population with potable water and 80% of the Urban population and 25% of the rural population with sanitation facilities by the year 1991, would necesitate large scale augumentation in our training and resarch facilities. The educational process has to be tailored to the needs of:

Decision makers & administrators who need to be aware of the relationship between service and health benefits, the capital& operating costs of water supply & sanitation projects and long range implications of technologies and technology sequences so that they can programme long term water supply and sanitation investments.

Enginers & designers, who must have uptodate technical information on how to plan, design, construct and operate water supply & sanitation projects. They must be trained to look for the least-cost solution for any specific health problem. They should know how to evaluate existing conditions, disease patterns, and relate health conditions & project interventions. Apart from the conventional technology solutions, they must have upto date informations about the low cost appropriate technology solutions.

Sub ordinate Engineers, Sanitarians, community workers, plant operators, Research scientists & Laboratory personnel, etc. who would supervise the field work, maintain the plants, organise the community and monitor operations. They would require training in project implementation, surveying, laboratory techniques, monitoring plant operation, preventive maintenance, health education etc.

According to some statistics, we would require about 200,000 new staffs, for achieving the Decade-objectives, which includes managers, engineers, technicians, operators and other staffs, which surely exceeds the capacity of existing formal programmes and institutions (in the field of Public Health & Environmental Engg.) which never had to cope with such massive effort before. Faculty development programmes and building up of institutional facilities alone could take considerable time before any significant increase in the enrolment might take place. The magnitude of the problem requires approaches different from the ones heitherto used, if the decade is to have a chance to succeed. The manpower planning for the decade should have two basic approaches:

(i) **Short term planning for the 6th plan period**

The additional staff requirement during 6th plan period has been put at 5,800 graduate engineers, 13000 junior engineers (Diploma) and 35000 other staffs. This requirement has to be met mostly through organising short term orientation courses for graduate and subordinate engineers in various institutes, and in service training courses by departments, and workshops for senior managers & decision makers.

(ii) **Long term planning for post 6th plan period**

A substantial portion of the post 6th plan manpower requirement (15,000 enginers, 27,000 junior engineers, 80,000 other staffs, could be met by taking immediate action for bringing about certain basic changes in our graduate, post graduate and diploma courses in Environmental Engineering. This will require large-scale augumentation of our Institutional facilities and faculty development programmes.

The Decade's efforts in this sector must be directed towards application of appropriate technology for project implimentation, so as to make water and sanitation affordable for the poor. For this, job oriented and time bound research projects must be carried out on full scale models by working departments in collaboration with some academic research institutes for preparing design and operation manuals, which could be used for actual project implementation.

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Public Participation and Institutional arrangements

Women and Problems Associated with Water Supply and Sanitation

By

Jean Chapman*

Quantative data, especially on the non availability of water, have been graphically portrayed by earlier speakers. Let us now proced to see why women must be brought into the discussion on this basic and vital issue.

Scarcity of drinking, cooking, bathing or inded water for any purpose, is a fact of life for the vast majority of Indians not withstanding the fact that they are being propelled into a repidly industrialising world. Let us remember that the availability of water is an important indicator of national prosperity; it not only bespeaks the well being of nations, but it also is a vital ingredient to the laying down of the basic infrasrtucture required for an industrial society.

The quantity and quality of water has a serious impact on the lives of women. But let me hasten to add that this is not a plea that women be treated separately on the issue of water. **No.** The lethal effect of unsanitary drinking water, for example, is not sex sepcific: men, women and children are potential victims. But cognisance must be taken of the fact that, in addition to the work performed by women outside the home, it has fallen to their lot to per form household chores where the availablity, or **not,** of water plays a pivotal role. Also, we must recognise that women are prone to certain diseases, the problem all the more compounded by an unsanitary water supply. Upto the present time, however, scant attention has been paid to the problem of women and water. In other words, even though a plethora of literature exists on women, even though a conference has recently concluded in Bombay specifically on Women's Studies, we find the two issues of women on the one hand, and water on the other, have not been Justaposed. We find that the issue is seldom discussed, even less researched, and is only rarely used as an issue on which women are brought together to achieve their rights.

It is to the credit of the sponsors of this symposium, WATER WORLD and the DELHI SCIENCE FORUM, that they have seen fit to begin a discusion on this vital area. Because it is an issue. To be kept firmly in mind is the fact that a lack of water and/or unsanitary water supplies are contributing factors to the perpetuation of water borne diseases such as typhoid-cholera, dysentry, gastric problems, guinea worm, etc. Stagnant water is the breeding ground for carriers of malaria and filaria. Dirty water, in which people are forced to bathe, results in chronic skin and eye ailments. And far be it for me to suggest that women, alone, suffer from these diseases. But we are fact being made aware that women are more susseptible to infectious diseases on account of their dietary intake. Leela Gulati, in her **study**** of a brick kiln female worker in Kerala, counted the caloric intake of each member of that particular joint family. She noted the tendency that not only do women eat last, but they also ate the least: in all circumstances, whether they were lactating mothers, pregnant, ill, or not. These findings go some way in explaining why there are fewer and fewer females in the Indian population. The sex ratio of men to women in the 1970 census was 1000: 932: at the turn of the century, the ratio was 1000-970. Although the re-

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** Leela Gulati 'Female labour in the organised sector' in Economic and Political weekly, Vol XIV,. No 16, 21 April, PP 744-52.

debated by demographers and other social scientists, I submit that the causes are more likely to be:

(i) inadequate food intake leading to low resistance to infection and women's natural proclivity to aenemia; and

(ii) unsanitary living conditions caused by a shortage of water to purify the person, and the environment.

Major reason why women must be considered in any discussion on water, is, it falls to them to collect it in those households where there is no running water. Anthropological studies tell us of the distances that have to be traversed in the various seasons of the year, for water collection. Yes, the village well is an institution. It has been immortalised in paintings, poetry, novels, and on the screen. Indeed, the social aspect of women meeting at the well cannot be undermined: news and views are exchanged. But what of villages where there is no well. And there are plenty of these as earlier speakers have pointed out. Eighty kilometers out of Madras, for example, is a village inhabited by families of bonded labourers. Their only source of water is 8 km, from the village. The pond is also used for wallowing people and livestock. At a slightly elevated end, fresh water bubbles labourously through the earth. Water has to be scooped up with a small recepticle. The collection of water, in circumstances like this, is time consuming, to say the least. And during the monsoon, it is even more difficult. A canal has to be forded, but in this season, the water level rises to shoulder height: children here are unavailable to help their mothers in this chore. Small compensation is, prawns are in the sedimet of the bottom of the canal, which women pick up with their toes. This supplements their meagre diet. In another village just outside Bangalore, Sarah Ho'son describes water collection. She tried it. She found herself carrying at least sixty ponds on her head, and as much again on her hip. This operation might exhibit the sheer grace of womanhood, but it is tough on all the muscles, especially the neck ones.

So much of rural India. In urban area, the situation is worse; the general decay of the infrastructure in cities has seen overcrowding into areas that have few, if any, civic amentieis. Fetching and carrying water is all the more difficult, as there is an even grater scarcity of this essential of life. People have to do without, or women have to travel inordinately long distances for water collection. Desperation leads to water mains being broken. This invites the attention of civic authorities who extract bribes from the 'offenders', or worse, they institute criminal proceedings against people in their genuine search for water. Women are thus thrown to the tender mercies of the law enforcement agencies, and we do not have to go into details here of what befalls women when they are taken into custody. In resettlements colonies these realities are lived with day in and day out. If handpump sets do exist, they operate for only very short span of time. If public conveniences have been constructed in these colonies, they are filthy and are a constant health hazard, primarily because there is no water. Decorum forces women, the aged, the infirm, to use these disgusting facilities.

To all women, rural and urban, rules of hygiene dictate that separate water pots are used for different purposes. They are stored away from each other, conditioned by the amount of floor space available. It is to be stressed, however, that in as much as water is concerned, women are only relieved from the chore of water collection only by other women, and then only in dire circumstances. For example, pregnant women may be permitted to go easy on jobs outside the home like harvesting, sowing and weeding, collection of fuel and carrying food to labouring menfolk, but not on the collection and storage of water.

Let us now link the question of water and sanitation. Due to lack of amenities like running water and toilet facilities in houses, together with the sentiment "modesty most becomes a woman", we find that here, too, women have to regulate their natural urges according to the clock of social custom. Women "go to the fields" at sundown, or very early in the morning. The risk to all women groping around in the half light, are great; to sick or pregnant women, the risks are enormeus. A woman from a juggie in

JNU campus died of snakebite; women have slipped and fallen; how many others are harassed, assaulted, even raped?

And what about bathing? It is a common enough phenomenon to see men, women and children undertaking this personal chore, in public. But too many people capitalise on this solely for commercial gain. Having thus projected women as sex objects through the ritual of bathing, along come the moralists and decry vulgarity. But shouldn't energy be expended in decrying the vulgarity of scantily clad people due to poverty, and public bathing because there just is no option?

There are answers to the problem. But before we find these answers to the problem of water scarcity and its impact on the lives of women, we will have to ascertain just where the barriers are. Are we really that short of capital to finance schemes to improve India's water supply? Are we short of technology and expertise? Or are we suffering from a lack of water? I would say 'No' to all the above. I would say 'YES' to a lack of will: a lack that is borne out of centuries old social, economic and cultural practices. Let me illustrate the point. We may feel that the answer lies in building another well. But does it? As things stand, the ritualisitc notions of 'purity' and 'pollution' have taken a hold on the psyche of too many 'clean' people in our society. They have liberally translated this to mean that the abundance of nature is not to be shared by all. Given the existing social reality, the construction of wells is an expensive underaking. In a village near Bangalore, it costs some Rs. 10,000 for the digging and laying of stones, requiring 40 labourers working for over a year. The costs of the pumpset and installing electricity pushed the cost up to well over Rs. 20,000. Reality dictates that a new well is likely to become yet another string in the bow of domination, of the few over the many: technology runs the risk of losing its progressive edge. A lack of will to change the very fabric of Indian society will continue to be a barrier to an improved environmental until we place value - and high priority- on human life.

Women can, and have taken the initiative in improving the immediate environment. In Andhra Pradesh, the first issue a democratic women's group took up was sheltered areas, with running water, for women to perform their daily ablutions. The women were only too keenly aware of infections that continued to plague especially pregnant women whose natural urges had to be controlled by the clock. Their collective effort saw the realization of their demand. Take the instance of Thane. On being refused well water by the Brahmins, they appealed to the police to supply them with tanker water. This request fell on deaf ears. The women asked their menfolk to help them to get well water, but the men had to go labouring in the fields and were afraid of reprisals by the caste Hindus. On their own initiative, the women drew water from the prohibited well. The brahmins called for the police. They arrived in full force, and lathi charged the women. This was the theme of a feature film called Chatrabhang which won the much coveted Berlin International Critics Award in 1975. Surprisingly enough, this feature film is yet to see the light of day! I myself am an activist in a women's organization. Women are only too aware of the problems that arise due to a scarcity of water and bad sanitation. They have taken the initiative to appeal to civic authorities to voice their problems. The reception they receive from these authorities is mixed; sometimes they are successful, at other not.

And finally, I appeal to all here to encourage the participation of women in all stages of planning for, and the installation of, water and sanitation facilities. Write women into your plans, as other-wise you may all be wasting a lot of your time in that the plans will have to be rewritten to take into consideration the demands of women. Because women are slowly becoming conscious that they too have a place in the scheme of things. They too can alter their social and physical environment. **As Change it Must.**

Information Support to Water Supply and Sanitation Decade Programme

By

S.G. Bhat* and S.K. Kesarwani**

Introduction

A basic element of planning at all levels of human endeavour is the acquisition and maintenance of an adequate information base from which rational plans and decisions can be made. This has proved to be true in the development of plans for water supply and sanitation also. A universal concern of the persons involved in R & D activities pertaining to water supply and sanitation is that adequate information is not available to do their jobs properly or are not aware of the available information. These are the persons who are never given the means to satisfy their information needs or are geographically cut off from the centres of information. It is worthwhile to mention here that one of the recommendations of the UN Water Conference held in 1977 is of particular interest from an information point of view. It was recommended that an effective clearing house mechanism should be developed by strengthening existing mechanisms if available to provide for the communication of selected information concerning all elements of community water supply and sanitation.

The WHO Expert committee on community water supply in 1968 noted the almost complete absence of reliable and relveant technical, economic and financial data emanating from national governments about their community water supply programmes and their progress. Such data have to be relevant to the needs of the government planning agencies, and also suitable for onward transmision to international agencies to enable them to promote improved organisation, financing and planning of national water supply programmes. It was further advocated that energetic steps need to be taken to ensure the collection of these data by the establishment of systematic registry. For creating such a data base as well as for implementing a water supply & sanitation programme a strong information system needs to be developed.

Nature of the Probelm

Although no systematic studies have been carried out to know the exact needs of the R & D workers in this area, apparently the need is of two kinds viz. (i) Data, which is quantified information and (ii) Documentary information. Besides this, much relevant and potentially useful data pertaining to rural water supply & sanitation is collected at some place, but it is officially not published and as such not available. Many internal reports, state of the art reports are compiled; however, their existance is many a time not known. Last but not the least, much useful information which is hidden in published literature existing in diversified publications makes literature survey expensive, burdensome and often inadequate, and a paradoxical state has been reached when the appropriate information cannot be traced, out of ocean of information.

Typical aspects on which information is required has been given in STATEMENT A.

It is generally found that most of the institutions and organisations work in isolation, and there is lack of co-ordination in their activities. There is no access to information which is available in an organisation in the same or at a nearby station. Moreover, whatever information is available, it is not collected, collated, ana-

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lysed, stored, retrieved and disseminated in a systematic manner.

Decade Programme

India alongwith other developed and developing countries is committed to the water supply and sanitation decade programme. Preparatory steps at several levels have been initiated. A Workshop on R & D needs to supports the decade programme was held at NEERI, Nagpur during November 1979. Participants included Chief Public Health Engineers of several states, Research Profesors and Scientists/engineers. Inadequacy of information service was identified as one of the major constraints for its successful implementation. Need for establishing an appropriate information system capable of providing requisite information was also stressed at this Workshop.

The information system has to gather the knowledge or information available at various places and disseminate the information where it is required. In other words, the system should be capable of providing right type of information at the right place at the time and in a right or appropriate manner. If activities at various institutions are properly co-ordinated by co-operative efforts, it would not only prevent duplication and wastage, but would also help to determine areas in which a more balanced programme would be desirable. All this calls for establishing a strong information system for 'water supply & sanitation'.

Objectives of Information System

Information system has to be developed in such a way so that it would not only accelerate R and D efforts in this important field, but also would endeavour to eliminate various difficulties faced by all concerned.

Main objectives of the information system should be to reduce the gap between generation of knowledge and its use. In general, the objectives of the system should be :

(a) to serve the R & D needs of the persons involved in water supply and related disciplines by collecting, collating, organising & storing pertinent information,

(b) to disseminate information about new and better techniques for handling of water supply & sanitation schemes,

(c) to provide for an input/output mechanisms for the information concerning water supply and sanitation,

(d) to seek, select and acquire both published and unpublished literature pertaining to the field,

(e) to prepare periodical directories of R & D personnel in water supply & sanitation organisation as well as registry for ongoing research projects,

(f) to provide the three 'R' services (Reference, Reprography & Referral),

(g) to co-operate with other information services and systems in the field of water supply, sanitation and related topics,

(h) to design, develop and establish services appropriate to different kinds and levels of users in R & D and other sectors,

(i) to establish bilateral exchange programme with (a) International, (b) Regional, (c) National and (d) Local agencies,

(j) to establish necessary equipment and facilities like audiovisual, reprographic and Information Retrieval System equipment & tools for processing of information and dissemination,

(k) to promote cohesiveness, co-operation and co-ordination among the various agencies enumerated at (i) above,

(l) to establish feedback channels internally and with users individually and collectively to correct, orient and introduce services of maximum effectiveness to users.

Structure of the System

It is advisable to have a two tier system comprising of (i) Local Information Units (LIU) at State and District level and (ii) A Central Facility at a National level.

The local information units within operating agencies would serve basically to organize and maintain the information support system within their agency, department etc. They will (a) act as a recipient for information from central facility (b) provide in formation/data to parent organization and other users and (c) feed information generated by it to central facility.

Need for a Spade Work

Before establishing the system, it would be helpful to make a survey of the potential users of water supply & sanitation information as well as various aspects of information system. These are detailed as follows :

(i) Identification of the requirement of information of all the agencies working in the field

(ii) Information sources available and identification of local information units

(iii) Information outputs of different institutions at local, national, regional and international level

(iv) Expertise and skills available

(v) Finance and other physical facilities available

(vi) Selection and development of suitable techniques for collection, storage and retrieval of information

(vii) Impediments and barriers to the effective communication of ideas such as over abundance of information, occurrence of unwanted, redundant and erroneous information, language barriers,

(viii) Time required for processing and dissemination of information,

(ix) Extent of secrecy, i.e. classified or unclassified information,

(x) Subject interest, the variety of data and information requirements at different organisations

Considering the vastness of the country establishment of a Central Information Bureau at the national level with a chair of information units at the state level has been suggested. Such a bureau has to be established at an existing institution wherein some infrastructural facilities are available.

Outputs of the Information Bureau

Before establishing the bureau it would be worthwhile to know the expectations of the Bureau which would be its output. Besides coordinating the activities of local information units, the following will form the major outputs.

(i) Registry of ongoing research pertaining to water supply & sanitation

(ii) Inventory of completed and current programmes in the field of water supply and sanitation

(iii) Data Bank for rendering data service technical and economic

(iv) Publication of digests, reports news bulletin

(v) Abstracting bulletin

(vi) Package information service

(vii) Publication of Reference tools

(viii) Bibliographies-Adhoc, current, subject oriented

(ix) National catalogue of serials in the field

(x) Products & Processes Index for Water Supply and Sanitation facilities

(xi) Current awareness bulletin

(xii) Selective dissemination of information

(xiii) User Orientation Training Programmes

(xiv) Developing of other appropriate services for R & D as well as other agencies concerned with water supply

Pre-requisites for Establishing a Bureau

In view of the multifarious activities which are to be handled by the Bureau, it should be established at a place which should have following facilities.

(ii) Experience and expertise in the technique of collection storage and dissemination of information

(iii) Established linkages with organizations doing similar work both in country and abroad

(iv) Should have in built mechanism for providing services

(v) Accessibility and acceptability of the centre

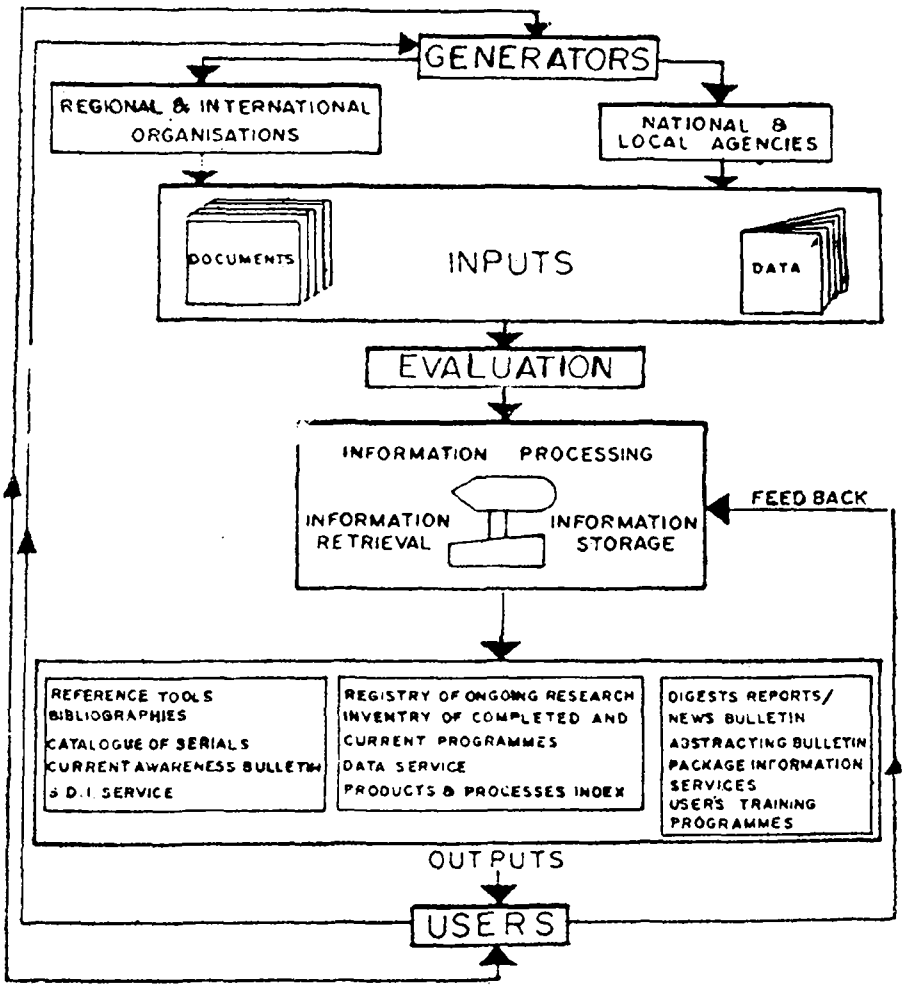


Figure I
Schematic Diagram of Information System

(i) Strong data base in form of well organised Library having rich collection of literature both in core as well as peripheral areas

(vi) Availability of reprographic equipments for quick dissemination of information.

(vii) Demonstrated ability to take up the work of a Switching Centre

The centre should collect relevant information through acquisition of materials and the establishment of co-operative links with existing institutions or centres in the country and throughout the world active in the field of water supply and sanitation. It should disseminate water supply and sanitation information enumerated earlier under 'output' of the system.

Possible Locations

As stated earlier the bureau has to be established at an existing institution wherein some infrastructural facilities are available. Incidentally, NEERI has developed the requisite infrastructure as well as expertise and has already done necessary ground work to establish Central Information Bureau. Many of the services envisaged under the information system are already being rendered by NEERI and is thus in a position to take up the responsibility of establishing the proposed bureau.

Organisational Structure of WATSSIB

The WATSSIB would consist of a large central facility at one place complemented with facilities in various zones of the country. The plan envisages four functional divisions of the central facility of WATSSIB.

Methodology

In meeting its objectives, WATSSIB will undertake the following activities under phased programme.

(1) draft a detailed subject scope definition for water supplies and sanitation to serve as the scope of the information bureau.

(2) Prepare an inventory of important institutions (government, academic, professional) in India working in the field of water supplies and sanitation. The directory, to be published will include instituions and their programmes and projects, past, present and future (1960 to 1990) in the field.

(3) establish regular exchanges of information with institutions identified above.

(4) prepare and publish an inventory of existing information sources (e.g. information units, libraries) supporting water supplies and sanitation activities in India.

(5) identify a basic set of information materials and information sources that will then be made available to individuals or centres in India working in the field of water supplies and sanitation with little or no information resources.

(6) Co-operate with other institutions such as the Environmental Sanitation Information Centre ENSIC of the Asian Institute of Technology, Bangkok in the collection, exchange and dissemination of information materals relevant to the field.

(7) print a quarterly newsletter giving information such as new publications, forthcoming event, news of the information centre's activities, user notes ongoing projects, sources of information and generally speaking any type of news relevant to water supplies and sanitation.

(8) collect data pertaining to water supply and sanitation in India and establish a data bank for its processing, storage and retrieval.

(9) compile selected bibliographies on subjects such as:

(a) rural water supply systems (e.g. handpumps, standpipes wells) utilized in Indian rural development programmes;

(b) sewage farming;

(c) wastewater disposal techniques and sanitation systems (e.g. sewage systems, sedimentation ponds, privates, treatment) utilized in Indian development programmes;

(d) biogas utilization.

(10) provide a reprographic service. Bureau will supply to users on their request

copies of documents available at the centre.

(11) provide a reference service. The Bureau will perform bibliographic searches on request and provide advisory services where possible.

The work for this project will begin by preparing a detailed subject scope definition for water supplies and sanitation. This will be followed by the preparation and testing of a questionnaire, and its distribution to all potentially relevant institutions in India and follow-up visits. This work will greatly benefit from an earlier project carried out by NEERI in the identification of environmental institutions in India. Institution program and user information will be collected, exchange agreements arranged and relevant documentary information identified. Wherever possible, copies of documentary material will be collected for storage and dissemination by proposed bureau. As these activities are being carried out, a newsletter, a reprographic and reference service and a current awareness system will be established. Subsequently, specialized reviews and bibliographies will be developed. Arrangements will have to be made for regular exchanges of information between centres in other regions of the world, such as the Asian Institute of Technology, Bangkok, the Pan American Centre for Environmental Engineering and Sanitation in Peru, the Inter-African Committee for Hydraulic Research in Upper Volta and the Companhia Estadual de Technolgia de Saneamento Basico de Controle de Poluicao das Aguas in Brazil.

Conclusion

The paper presents a tentative plan of the proposed information bureau and details will have to be worked out. The system would also establish linkages with other information systems existing in related fields in India as well abroad so that a strong linkage is established.

STATEMENT A

Typical Aspects on which Information is Required
(list is only indicative and not exhaustive)

1. Preinvestment feasibility study reports
2. Projection of supply and demand for water after 5 years
3. Percentage of population served with :
   (a) safe water supply;
   (b) piped water supply;
   (c) house connections;
   (d) street stand post.
4. Guidelines for flood loss development
5. Planning and development of conjunctive ground and surface water resources
6. Cost of drilling a bore well
7. Tube well construction costs
8. Means for broadening natural resources base
9. Hydrogeological information of particular site for assessing feasibility of constructing wells
10. Utilization of waste water for agriculture—information on specific waste water with a specific crop
11. Utilization of waste water for aqua culture—types of fish, types of waste water
12. Evaporation control methods
13. Availability of particular chemicals for evaporation suppression
    evaporation supression
14. Variation of sediment discharge with temperature
15. Design and construction of waste Stablization
16. Designing of septic tanks
17. Designing of rural latrines
18. Artificial recharge
19. Wattr quality fo rindustrial use
20. Rainfall data
21. Methods for bacteriological analysis of water
22. Easy method for determination of residual chlorine
23. Use of pot chlorinators for disinfection of well waters
24. Use of bamboo pipes for water distribution
25. Sanitation facilities at high altitudes
26. Water supply to drought affected areas
27. Ground water investigation
28. Water quality for recreational use
29. Standards for drinking water
30. Legislation on water pollution
31. Defluoridation techniques
32. Production of membrane filters
33. Availability of wattr treatment—chemicals, bleaching powder
34. Availability of plastic pipes of particular dimension and quality
35. Availability of membrane filters
36. Leakage detection equipment
37. Coconut shell as filter media
38. Selection of washers
39. Availability of boring equipment
40. Size of the ring required
41. Maintenance of hand pumps
42. Package water treatment plants
43. Guidelines for operators of water treatment plants
44. How to carry out river surveys
45. Guidelines for operators of sewage treatment plants
46. Waste water collection methods
47. Water distribution system
48. Maintenance of waste water treatment plants
49. Treatment and disposal of solid waste
50. Transport of solid waste
51. Waste water plumbing system
52. Solution to common plumbing problems
52. Solution to common plumbing problems
53. House sewer connections
54. Sewer design
55. Manholes
56. Materials for sewers
57. Use of concrete pipes
58. Pipe joints
59. Problem of corrosion of sewer
60. Freezing of water in pipes

Other Documents

Community Water Supply and Waste Disposal

(Recommendation of the United Nations Water Conference, 1977)

15. IN ORDER TO IMPLEMENT RECOMMENDATION C. 12 OF HABITAT: UNITED NATIONS CONFERENCE ON HUMAN SETTLEMENTS, THE DECADE 1980-1990 SHOULD BE DESIGNATED THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE AND SHOULD BE DEVOTED TO IMPLEMENTING THE NATIONAL PLANS FOR DRINKING WATER SUPPLY AND SANITATION IN ACCORDANCE WITH THE PLAN OF ACTION CONTAINED IN RESOLUTION II BELOW. THIS IMPLEMENTATION WILL REQUIRE A CONCERTED EFFORT BY COUNTRIES AND THE INTERNATIONAL COMMUNITY TO ENSURE A RELIABLE DRINKING WATER SUPPLY AND PROVIDE BASIC SANITARY FACILITIES TO ALL URBAN AND RURAL COMMUNITIES ON THE BASIS OF SPECIFIC TARGETS TO BE SET UP BY EACH COUNTRY, TAKING INTO ACCOUNT ITS SANITARY, SOCIAL AND ECONOMIC CONDITIONS.

16. To this end it is recommended that countries should:

(a) Set targets for community water supply and waste disposal and formulate specific action programmes to attain them, while evaluating the progress made at regular intervals;

(b) Establish standards of quality and quantity that are consistent with the public health, economic and social policies of Governments, ensuring by appropriate measures, duly applied, that those standards are observed;

(c) Ensure the co-ordination of community water supply and waste disposal planning with over-all water planning and policy as well as with over-all economic development;

(d) Adopt policies for the mobilization of users and local labour in the planning, financing, construction, operation and maintenance of projects for the supply of drinking water and the disposal of waste water;

(e) Consider carefully inequalities in the standard of drinking water and sewerage services among the various sectors of the population. As far as possible, design programmes so as to provide basic requirements for all communities as quickly as possible, generally deferring the provision of improved services to a subsequent stage. Priority should be given to the provision of drinking water and sewerage services in areas where the quality and quantity of water supplied is inadequate, for instance, in rural areas and urban fringe areas populated by low-income groups;

(f) Ensure that the allocation of funds, of other resources and of all forms of economic incentives to community water supply and sanitation programmes reflect the urgency of the needs and the proportion of the population affected;

(g) Promote the construction of facilities by granting low-interest loans or subsidies to communities and to other entities concerned with water supply and sanitation;

(h) Provide, where needed, additional well-drilling capability or other equipment for the establishment of local drinking water supply facilities;

(i) Review the organizational infrastructure for community water supply and sanitation and set up, where it is considered appropriate, a separate department for this purpose;

(j) Prepare long-term plans and specific projects with detailed financial implication;

(k) Develop a financing system capable of mobilizing the resources needed for the implementation of the national programme for water supply and sanitation, as well as for the operation and maintenance of these services, for instance, by a system of revolving

funds to ensure continued financial support for the execution of long-term programmes. This system should make it possible to bridge the gap between production costs and payment capacities;

(l) Provide mutual assistance in the transfer and application of technologies associated with these programmes;

(m) Carry out special water supply and waste treatment programmes as national or regional undertakings or as activities of non-profit organizations, such as users' associations, where local resources do not make it possible to achieve the desired goals;

(n) Adopt pricing policies and other incentives to promote the efficient use of water and the reduction of waste water, while taking due account of social objectives;

(o) Seek to promote in rural areas with low population density, where it seems appropriate, individual water supply and waste water disposal systems, taking account of sanitary requirements;

(p) Carry out a programme of health education, parallel with the development of community water supply and sanitation, in order to heighten the people's awareness with respect to health;

(q) Establish, at the national level, training programmes to meet immediate and future needs for supervisory staff;

(r) Provide inventory and protection of water supply sources;

(s) Provide additional facilities and possibilities for drinking water supply during natural hazards;

(t) Use water effectively, reduce losses, equalize water prices by purposes for which the water is used over wide areas and reduce water costs due to reorganization models of some countries' water-supply arrangements so as to strengthen the financial management of basic of supplies in metropolitan, urban and rural areas. Develop new concepts, such as the use of advanced water-treatment techniques, the utilization of low-quality sources and the re-use of waste water. These trends (reorganization and the use of new concepts) need to be encouraged where they are found to be necessary and desirable. Rural water supply projects and programmes for implementing them on a priority basis are being undertaken in some countries and should be encouraged in order to achieve the targets in the field of community water supplies set by Habitat: United National Conference on Human Settlements.

17. International organizations and other supporting bodies should, as appropriate, and on request, take the following action:

(i) Provide technical assistance to countries in the preparation of long-term plans and specific projects;

(ii) Consider adapting their criteria for financial assistance in accordance with the economic and social conditions prevailing in the recipient countries;

(iii) Promote research, development and demonstration projects for reducing the costs of urban and rural water supply and waste disposal facilities;

(iv) Promote public health education;

(v) Support research, development and demonstration in relation to predominant needs, particularly:

(a) Low-cost ground water pumping equipment;

(b) Low-cost water and waste water treatment processes and equipment, with emphasis on the use of materials and skills likely to be available to rural communities for installation, operation and maintenance;

(vi) Strengthen the exchange of information, **inter alia,** by arranging expert meetings and development of a clearing-house mechanism.

Community Water Supply—Action Plan

Resolution—II of the United Nations Water Conference, 1977

In view of the course taken by the discussions and the aspirations of the countries represented at the United Nations Water Conference and in view also of what was proposed at Habitat: United Nations Conference on Human Settlements, and

CONSIDERING THAT:

(a) All peoples, whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs;

(b) It is universally recognized that the availability to man of that resource is essential both for life and his full development, both as an individual and as an integral part of society;

(c) To a significant extent similar considerations apply to all that concerns the disposal of waste water, including sewage, industrial and agricultural wastes and other harmful sources, which are the main tasks of the public sanitation systems of each country;

(d) The fundamental challenge facing all mankind can be met only with full international co-operation in all its aspects, entailing the mobilization of physical, economic and human resources;

(e) It is imperative to facilitate ways of achieving this essential co-operation, so that water is attainable and is justly and equitably distributed among the people within the respective countries;

(f) Those countries which are in a position to provide assistance, as well as international or regional organizations, should undertake to do so until the objective is attained, seeking to simplify regulations and administrative arrangements;

(g) Organizations of the United Nations system and other international organizations are making progress towards possible establishment of a consultative group mechanism on community water programmes.

RECOMMENDS:

(a) That where human needs have not yet been satisfied, national development policies and plans should give priority to the supply of drinking water for the entire population and to the final disposal of waste water; and should also actively involve, encourage and support efforts being undertaken by local voluntary organizations;

(b) That Governments reaffirm their commitment made at Habitat to "adopt programmes with realistic standards for quality and quantity to provide water for urban and rural areas by 1990, if possible";

(c) That with a view to achieving these ends, the nations which need to develop their systems for providing drinking water and sanitation should prepare for 1980 programmes and plans to provide coverage for populations and to expand and maintain existing system; institutional development and human resources utilization; and identification of the resources which are found to be necessary;

(d) That the United Nations agencies should co-ordinate their work efforts to help Members States, when they so request, in the work of preparation referred to in sub-paragraph (c) above;

(e) That in 1980 the national programmes which have been implemented for that purpose, and the extent to which the countries concerned have succeeded in mobilizing local and national support should be reviewed by an appropriate mechanism to be determined by the Economic and Social Council and based on the use of existing machinery, with a view to attaining co-ordinated action toward agreed targets;

(f) That in accordance with the decisions of the existing structures of the Economic and Social Council, appropriate external assistance should be available in order to assist in building, operating and maintaining these systems;

(g) That the plan of action formulated below should be implemented in a co-ordinated manner at the national and international levels.

PLAN OF ACTION

In order to be able to reach the targets of Habitat recommendation C. 12, drastic measures have to be taken. This will need firm commitment on the part of countries and the international community.

A. Priority areas for action

1. Action must focus on promoting (a) increased awareness of the problem; (b) commitment of national Governments to provide all people with water of safe quality and adequate quantity and basic sanitary facilities by 1090, according priority to the poor and less privileged and to water scarce areas; and (c) larger allocation to this sector from the total resources available for general economic and social development.

2. Action must be taken to remedy constraints of manpower shortage (especially at the intermediate and lower levels), inadequacies in institutions and organizations, and lack of appropriate and cost-effective technology.

3. New approaches should be developed which will result in larger flows of national, international and bilateral funds on more favourable and flexible conditions, so as to enable countries to increase the speed of implementation and more important, enable the more effective use of the additional resources.

4. Communities must be provided with effective education on domestic hygiene and must be motivated and involved as appropriate at every level of the programme, including the planning, construction, operation, maintenance and financing of services, and the monitoring and safeguarding of the quality of the water supplied.

B. Recommendations for action at national level

5. Each country should establish goals for 1990 which match as far as possible the global targets adopted. In order to attain these goals, each country should:

(a) Develop national plans and programmes for community water supply and sanitation, and identify intermediate milestones within the context of the socio-economic development plan periods and objectives, giving priority attention to the segments of the population in greatest need;

(b) Immediately initiate engineering and possibility studies on projects that are considered to be of the highest priority, and are based on a cost-effective technology appropriate to local conditions, with community participation, good management, and provision for operation and maintenance;

(c) Assess the manpower situation and, on the basis of this assessment, establish training programmes at the national level, to meet the immediate and future needs for additional professional staff, intermediate level technicians and most important, village technicians;

(d) Promote massive national campaigns to mobilize public opinion regarding the provision of basic sanitary services, and develop appropriate procedures to ensure the active participation of communities in the programme;

(e) Establish appropriate institutions, if these do not exist, and assign to them specific responsibilities for the planning, implementation and monitoring of progress of the programme;

(f) Co-ordinate the efforts of all sectors active in rural areas, utilizing the manpower and other resources available, to ensure the provision of technically and socially acceptable sanitary facilities in rural areas;

(g) Develop a national revolving fund, in the first instance financed from substantially in-

creased loans and grants from national and foreign sources, for water supply and sanitation which will encourage both the mobilization of resources for this sector and the equitable participation of beneficiaries; discourage wasteful cosumption; and include a flexible combination of rates and where necessary, explicit subsidies or other measures designed to achieve the economic and social objectives of the programme.

C. Recommedations for action through international co-operation

6. To achieve the Habitat targets, the international community must adopt new approaches to support increased national commitments with particular reference to the least developed and most seriously affected countries. It is, therefore, recommended that:

(a) Financial contributions be increased to strengthen the capabilities of international and bilateral agencies co-operating with Governments in the extension of community water supply and sanitation;

(b) At the request of national Governments co-operation be extended to the formulation and implementation of high priority projects and programmes for community water supply and sanitation, with analysis of goals, methods and resources;

(c) Collaboration with the ongoing activity of the World Health Organization for monitoring and reporting on the status and progress of community water supply and sanitation be intensified.

7. The international community should give high priority to collaborating with Governments with regard to manpower surveys, the establishment of national training programmes (to meet immediate and future needs for professional staff, intermediate level technicians, and village technicians), research and the promotion of community participation.

8. There should be even greater emphasis on social benefits. Multilaterlal and bilateral financing institutions should recognize the need for a higher level of grants and low interest-bearing loans to community water supply and sanitation programmes and, where this practice is already accepted, increase the proportion of such loans. They should be prepared to shoulder a higher proportion of local costs when financing community water supply and sanitation, increase their total allocations especially to rural water supply and sanitation, and complement local efforts in the rehabilitation and maintenace of systems.

9. Developing countries should foster co-operation among themselves, **inter alia**, in the establishment of inter-country training facilities; the development of appropriate technologies and of methodologies for training and management, and the exchange of experts and information, so that experienece available elsewhere can be adapted to local conditions.

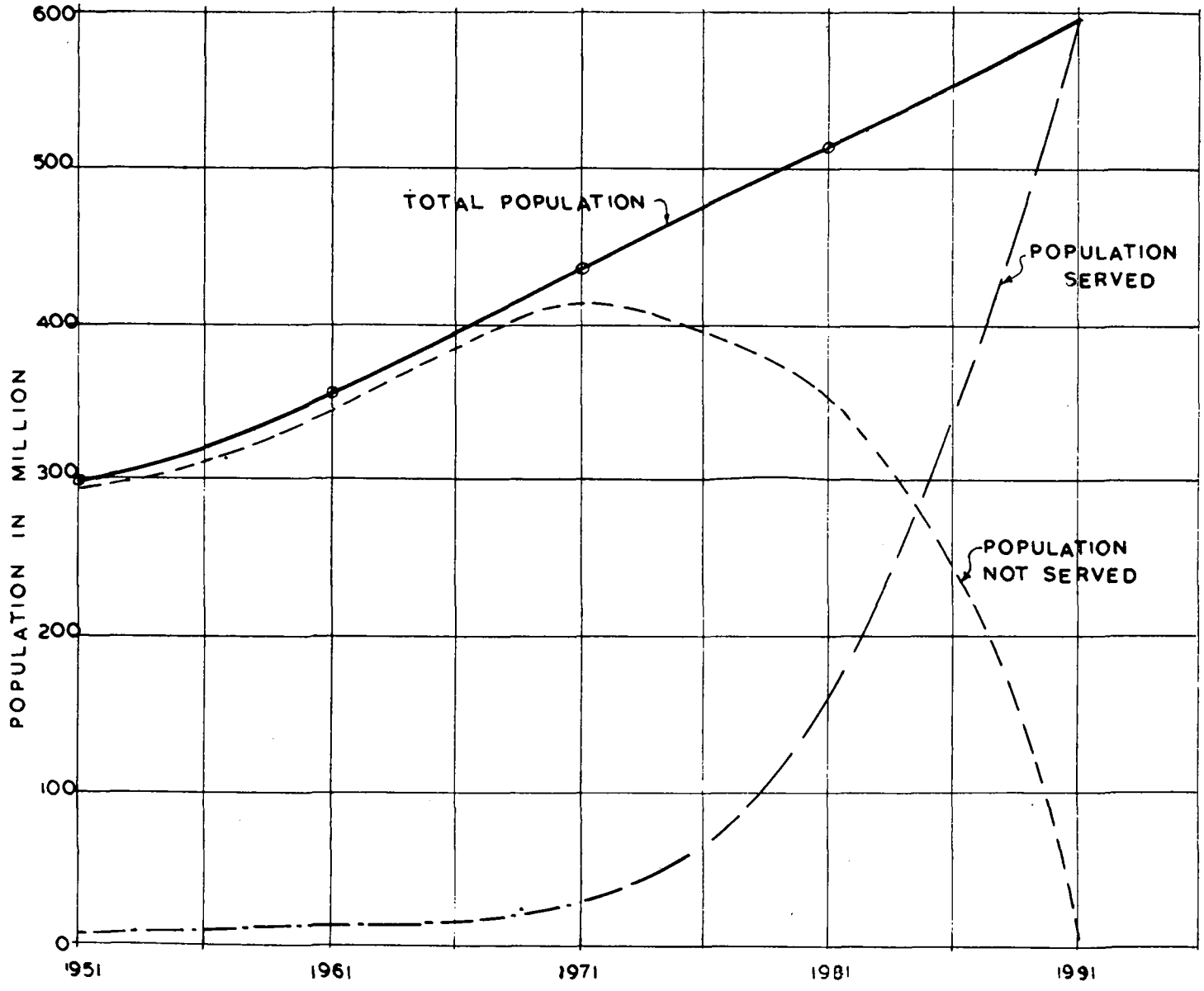
10. An effective clearing-house mechanism should be developed through international co-operation, by strengthening existing mechanisms if available, at the national, regional and international levels, to provide for the communication of selected information concerning all elements of community water supply and sanitation. An interrelated communication function should be included at every stage in all community water supply and sanitation projects.

11. Regular consultations should be held among Governments, international organizations, the international scientific community and relevant non-governmental organizations to ensure co-ordinated and accelerated action in the area of rural water supply and sanitation.

12. Co-ordination within the United Nations system should be improved at country level in order to ensure (a) a multidisciplinary approach in the development of community water supply and sanitation services; and (b) that rural water supplies and sanitation form part of integrated rural development projects.

YEAR	RURAL TOTAL POPULATION	POPULATION SERVED	POPULATION NOT SERVED
1951	299	6	293
1961	360	14	344
1971	439	26	413
1981	516	155	361
1991	597	597	—

POPULATION COVERED BY SAFE WATER SUPPLY (RURAL)



Magnitude of the Problem
(Background Paper for Discussion)

Urban Water Supply

1. In their paper entitled "India and the International Drinking Water Supply and Sanitation Decade" Sarvashri P.K. Chatterjee and M.M. Datta report that, "in terms of percentage of population, the following table indicates the coverage in water supply and sanitation sectors in India, as obtained in 1980:

Urban Water Supply	82%
Rural Water Supply	30%
Urban Sanitation	27%
Rural Sanitation	2%

2. Applying these percentages of the population figures obtained from the Census Commissioner of India, the following picture of coverage in the urban sector is obtained.

3. Out of the total urban population of 144 million, 118 million (82%) enjoy water supply facilities leaving a population of 26 million as the number representing those without facilities in 1980 or 1981.

4. Urban areas are grouped into 6 classes depending upon their population size which have different percentages of coverage in each one of them within this overall figure of 82. Some States are more advanced than the others.

5. These figures would perhaps indicate that taking the country as a whole, barring some States or areas, the problem of provision of basic water supply facilities to urban areas in India is within manageable proportions in the coming decade. It is, however, important to remember that in the towns which are included in the category to those enjoying these facilities of water supply, not all the population of the town are provided with adequate supplies of water of safe quality.

6. There are segments of population in these towns, particularly on the growing fringes which do not have reasonable access to safe water.

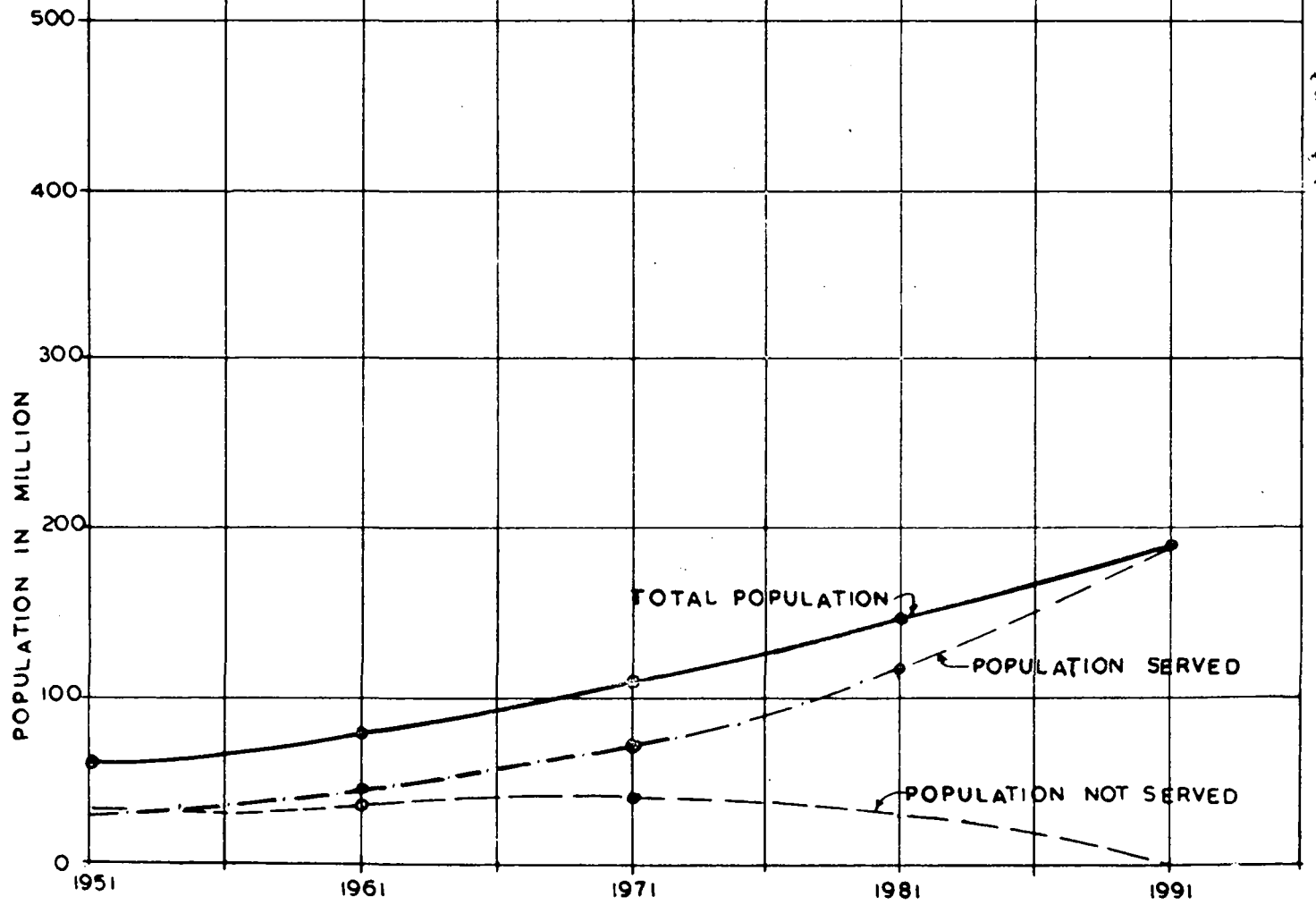
7. In a recent study carried out by the Programme Evaluation Organisation of the Planning Commission, it was revealed that 34% of th localities inhabited exclusively by the poor ('poor' as defined in the study "Those who belong to the Scheduled Castes and Tribes and the landless agricultural labourers") only 16% had drinking water points (through pipes, borewells, tubewells and drilled holes). As against this, 17% of the localities inhabited exclusively by the non-poor, 19% had the water points. Similarly the piped water ponts in the localities of the poor were only 10% as against 17% of the non-poor. Piped water private points were 3 times more in the localities of the non-poor as compared to the poor. The main reason why the poor have not benefited from the drinking water facilities is that the points were far away (point at a distance) or there were alternative sources close-by." The paper by the Operations Research Group, Baroda deals with the "provision of basic services to the urban poor".

8. Even those that are now served, do not have adequate supply. The, level of per capita consumption rate varies widely from 10 to 400 litres a day. In some cases, rates as low as 5 to 15 litres per day are indicated which would not be conducive to any distribution system at all.

9. Therefore, the provision of urban water supply to urban communities in future takes on two aspects, namely, (i) provision of facilities to those not yet served, and (ii) augmenting existing supplies to bring up the levels of per capita consumption to 70 to 200 litres depending upon the population concentrations in the concerned urban communities according to the rates of average per capita supply recommended in the "Manual of Water Supply and Treatment" published by the Ministry of Works & Housing.

POPULATION COVERED BY SAFE WATER SUPPLY (URBAN)

YEAR	URBAN TOTAL POPULATION	POPULATION SERVED	POPULATION NOT SERVED
1951	62	30	32
1961	79	47	32
1971	109	72	37
1981	144	118	26
1991	189	189	–



10. Approximate cost estimates worked out indicate that the total cost of providing new supplies and augmenting existing supplies would be of the order of Rs. 2,500 crores in the Decade or Rs. 250 crores per year over the next decade. This figure is likely to be higher, if definite project reports are prepared for new schemes and if appropriate allowance is made for cost escalation in future. These figures also do not take into account the maintenance and operation costs.

Rural Water Supply

11. According to the figures obtained from the Census Commissioner of India, the rural population in India in 1980 was 516 million. From the paper of Sarvashri Chatterjee and Datta it is learnt that 30% of this population, namely, 155 million are provided with water supply facilities, leaving a figure of 361 million as the population which do not at present, enjoy facilities of water supply.

12. It is reported that, out of 1.53 lakhs of problems villages (as identified in 1972) about 40,000 villages have only been covered till the end of March 1977. Coverage of problem villages (1972 identification) during the last three year is as under:—

1977-78		12,922
1978-79		20,920
1979-80		18,535
	Total :	52,377

Thus it is observed that about 92,377 problem villages have been covered by March 1980.

13. A village is considered a problem, if drinking water source lies 1.6 Kms away from the village or if no water is available within a depth of 50' or if it is endemic to cholera and guinea worm infestation or with excessive salinity, iron and fluoride content. Even if all the 1.53 lakh problem villages were provided with water supply facilities, it would mean that only 123 million of rural population would have been served, leaving as large a number as 393 million (516-123) without water and for whom provision will have to be made in future. To this must be added future increases.

14. "Many of the State Governments claimed that the original list of problem villages did not represent the magnitude of the problem, partly because of incomplete survey and partly because of drought conditions subsequent to 1972. It is estimated that the total number of problem villages that would have remained without provision of safe water supply as on 31 March 1980 will be about 2 lakhs."

15. It is estimated that the investment required for rural water supply during the decade would be of the order of Rs. 4228 crores.

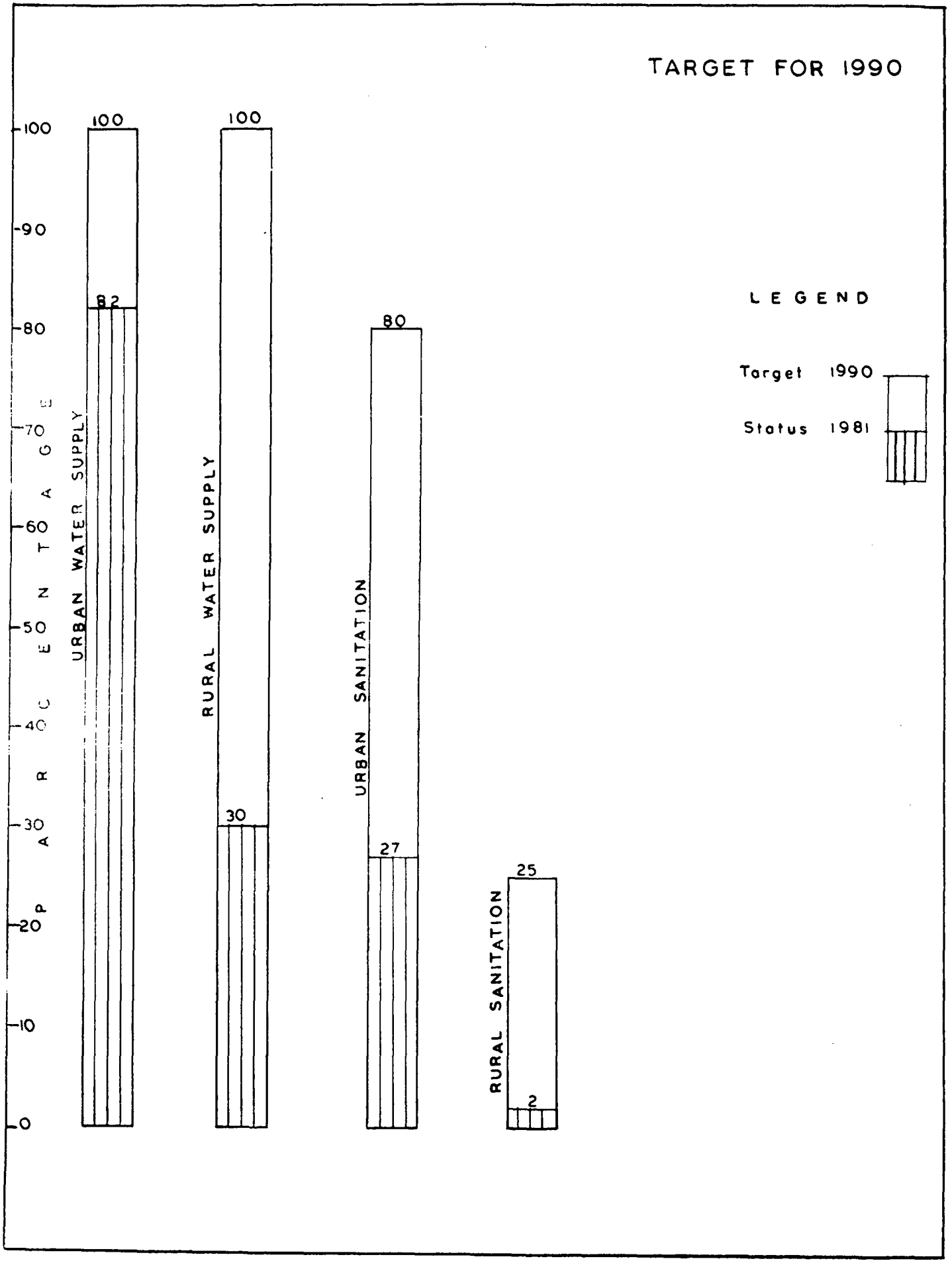
16. Dealing with the "norms for rural water supply", Sarvashri B.B. Rau and M.M. Datta deal with the criteria for defining problem villages, sources of supply, per capita rates of supply and per capita costs.

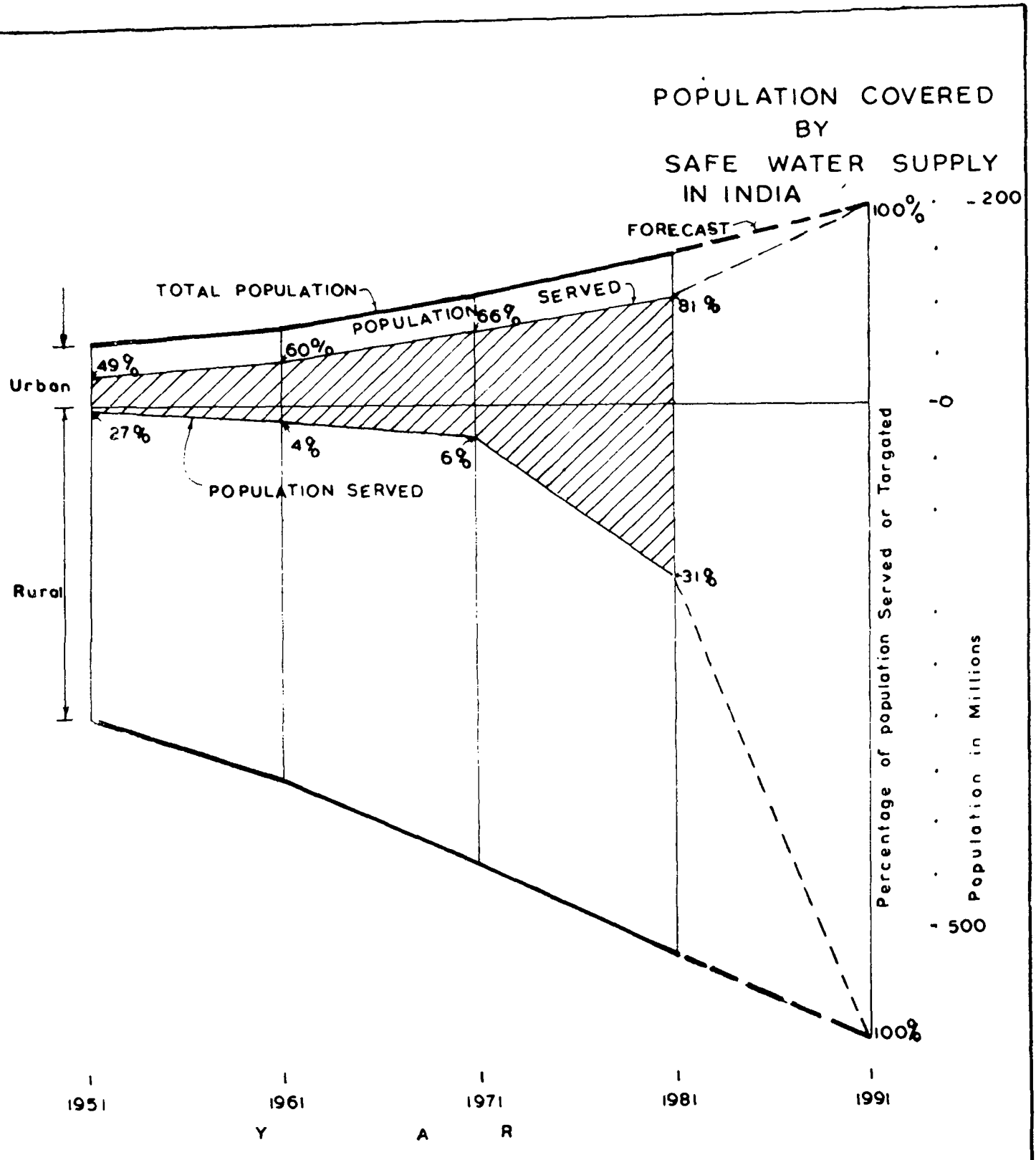
17. Sarvashri K. Rudrappa and K.L.L. Narasimhan deal with aspects pertaining to the quality of water and, in particular, the physical and schemical characteristics affecting potability.

18. Engineer Gyan Sagar points out that if the dream of the Decade is to be realised, the priorities will have to be redefined and that we should take up chlorination of village wells in a big way. Secondly, we should give preference to hand pumps and sanitary dug well schemes over piped water supplies which are highly costly. Thirdly, we must also insist on drainage around the wells and hand pumps. Fourthly, carry out a programme of health education parallel with the development of Community Water Supply and Sanitation and, lastly, develop appropriate technologies in the context of existing socio-economic conditions.

Perspective for Water Supply

19. In order to understand the perspective for water supply, two graphs are prepared on the basis of the available data, one for urban and the other for rural. The graphs show the total urban and rural population, those served and also those not served with the facilities at different points of time.


TARGET FOR 1990
PERCENTAGE
100
90
80
70
60
50
40
30
20
10
0
URBAN WATER SUPPLY
100
82
RURAL WATER SUPPLY
100
30
URBAN SANITATION
80
27
RURAL SANITATION
25
2
LEGEND
Target 1990
Status 1981


POPULATION COVERED
BY
SAFE WATER SUPPLY
IN INDIA
FORECAST
TOTAL POPULATION
POPULATION SERVED
100%
81%
66%
60%
49%
Urban
Rural
27%
4%
6%
31%
POPULATION SERVED
100%
- 200
-0
- 500
Percentage of population Served or Targated
Population in Millions
1951
1961
1971
1981
1991
Y A R

20. According to available statistics 46 million urban population were provided with additional water supply facilities during the last decade (1971-81) (118-72 = 46). The perspective is that during the Decade 71 million (189-188) additional population should be provided with water Supply facilities in order to reach a target of 100 percent by 1990. This represents an increase of 155% over the average rate for increase in coverage during the last decade. Every year in the next decade, 7.1 million additional population should receive water supply as against an average annual growth rate of 4.6 million during the last decade. Stated in these terms, the magnitude of the problem becomes clearer. For instance, when it is stated that coverage should be increased from 82% to 100% it appears that the problem is one of getting only an increase of 18%, whereas in fact our efforts in the field of urban water supply during the next decade should be 155% over the last decade.

21. Similarly in the rural sector, available data indicates that 129 million additional rural population (155-26) received water supply facilities during the last decade, whereas the numbers to be provided over the next decade is 442 million (597-155). This represents an increase of 350 percent over the performance during the last decade.

22. At this stage, it is of interest to note that the figure of 26 million rural population served with water supply in 1971 has increased to 155 million in 1981-an increase of about 500 percent over the position in 1971.

23. This brings up the question of looking into the methodology of the assessment of coverage in various States. A uniform methodology should be evolved and applied in all the States and territories in India for determining the current status to serve as a benchmark against which future progress could be monitored.

24. There are special problems in hilly areas. The paper by Sarvashri D.R. Bhutani and T.N. Visweswara discusses the possibility of generating power from natural falls of 6 to 10 meters on hill streams and using such power to drive shafts of mini turbines to pumps water from stream to hill tops over limited heads.

25. Prof. D. Banerjee dealing with Social and Epidemilogical issues in Rural Water Supply Programmes states in his paper that allocations for rural water supply should be made on the basis of a better understanding of sociological issues and better epidemilogical analysis and forecasts so as to ensure a rational basis for allocations.

26. A number of difficulties in the implementation of tube-well programmes are discussed in the paper by Shri G.L. Malik on the importance of tubewells in the programme of the Decade

Urban Sanitation

27. The present level of the coverage in urban sanitation is 27%. This gives a figure of 39 million (144x27/100) 80% of the urban population in 1991 of 189 million is equivalent to 151 million representing an increase of 112 million (151-39). In other words, a threefold increase in the level of coverage has to be effected during the Decade.

28. Even in towns where urban sewerage facilities exist now only a part of sewerage is treated and the balance is partially treated and led on to land for agricultural purposes or discharged into water courses. The cost of urban sanitation over the next decade is expected to be Rs. 2590 crores.

29. The paper by Sarvashri P.S. Rajvanshy and S.K. Mishra on 'Sewage treatment and its essentials" describes the sewage treatment plant installed in Jaipur, Rajasthan in 1977 and the several innovative features that the design involved. "For instance, one of these features is used with aerobic digester attached with sledge thickener".

Rural Sanitation

30. Rural sanitation has been the most neglected so far. The level of present coverage is stated to be 2% and the target for 1990 is 25% at projected estimated cost of Rs. 1584 crores. Stated in terms of absolute numbers, 10 million rural population now have some sanitation facilities and an additional 140 million should be covered to reach the target set for 1991. The tragetted increase is, in fact, 14 times the present level and unless concentrated efforts are made, it will be very difficult to fulfil even this modest target.

Resources

1. Resources may be considered in the following aspects: Financial, material, equipment and manpower,

2. **Financial Resources**

(A) **Current Situation**

The investment costs of the water supply and sanitation schemes are substantial. Depending on the level of service provided and the technology adopted in different countries, these costs vary greatly. Major financing of water schemes is done through the Government budget. But these Government finances have to compete with other needs equally important and significant like education, health, roads, etc. Of late foreign aid has become significant and important in the water and sanitation sector. The amounts of funds allocated to water supply from both national and foreign sources are usually determined by the Government on the basis of national priorities and the needs of the other competing sectors of the economy.

A major policy decision is necessary whether to regard water supplies as public utility or social service. Mr. K.R. Qureshi in his paper on "Financing for Rural Water Supply and Tariff Policy" states that "there is a strong case for regarding rural water supplies as a social service like schools and hospitals. The possibilty of free rural water supply should be seriouly considered. This policy can be justified on social and economic grounds. In this way, the Government would be subsidising the poorer sector of the community, the income distribution of which would be socially desirable". On the other hand, Dr. Kanwar Sain in his paper on "Problems of Rural Water Supply in India" dealing with "As free as Air" approach to the issue, states that "the commodity such as water which does not have adequate selling value is unlikely to be an attractive investment. No Government howsoever humanitarian or socialistic its policy may be, can successfully supply to people with essential services such as electricity, water, sewerage without any hope of repayment in some form or the other. The cost of the utility services must be reimbursed at least in part if not in toto as each community is gradually raised to a level of self support. The mythology that a commodity which costs money to produce and to deliver can be as free as the air must be rapidly expunged from the minds of both the officials and the people. It is worth pointing out here that almost no where in the world is electric power provided free".

Dealing with the experience in this regard Sarvashri P.K. Chatterjee and V. Venugopalan in their paper, "on Rural Water Supply: Achievements, Goals and constraints however, state that "as the majority of the people are below the poverty line in rural areas, contribution towards not only capital cost but also towards annual recurring expenditure becomes difficult. It also becomes difficult to make rural water supply self-supporting as the tariff structure cannot be drastically increased due to the peoples inability to pay." They are of the view that "conditions imposed such as making water supply and sanitation sector to be run on commercial lines and to make them self supporting are difficult to be fulfilled in case of rural schemes."

(B) **Financial Estimates and National Outlays**

The paper on the Decade by Sarvashri P.K. Chatterji and M.M. Datta mentions that "a rough assessment was made of the projected requirement of funds for the Decade of about 15,000 crores (based on State Governments indications)" at a workshop organised in November, 1978. Later, the CPHEEO projected the requirement of funds for the Decade Programme at Rs. 10,900 crores to achieve the goals set. The sectoral break down of this figure is given below:

	Rs. in crores
(a) Urban Water Supply	2,475
(b) Urban Sewerage and Sanitation	2,590
(c) Rural Water Supply	4,228
(d) Rural Sanitation	1,584
Total:	10,877
Say Rs.	10,900 crores

The paper on the "Decade in Tamil Nadu" points out that "with the existing pattern of funding from the State Governments, the Central Government and other international agencies, it will be very difficult to achieve the target of providing good water supply and better sanitation to all the people in Tamil Nadu by 1990. Hence it is necessary to generate a major portion of funds required for these programmes from international agencies". On the subject of allocation to rural sector, the paper points out that "this allocation has to be trebled to achieve the objective of covering all rural habitations within the Decade (1981-1990)".

The national outlay indicated in the Sixth Plan for the sector is of the order of about Rs. 4,000/crores. If the overall requirement for the Decade, which covers both Sixth and the Seventh Plan periods, is of the order of Rs. 11,000 crores, the outlay for the Seventh Plan should be at least Rs. 7,000 crores (Rs. 11,000 - Rs. 4,000 crores) without taking the factor of price escalation into account. If, on the other hand, the overall requirement of the Decade is of the order of Rs. 15,000 crores, as originally worked out, then the outlay for the Seventh Plan will have to be Rs. 11,000 crores (Rs. 15,000 - Rs. 4,000 crores) as against the Sixth Plan provision of Rs. 4,000 crores. In any case, the question that deserves consideration is the adequacy of the level of funding of the sector in the Sixth Plan in the background of the overall funding requirement of the Decade.

In this connection, it is of interest to note that Sarvashri P.K. Chatterjee and M.M. Datta point out that "funds from external sources such as World Bank, bilateral aids etc. as well as funds to be generated from the LIC are all pooled in the country's plan resources and as such there is no additionality to the plan. once the plans are finalised."

(C) **Suggestions for consideration**

The following suggestions deserve consideration in this context:

(i) The sector should be given the highest priority and the possibility of doubling the plan outlay may be examined. At present, water supply and sanitation is not in the core sector but is a part of social services sector. A cut in the plan outlays would automatically result in cutting the outlays under the various social services including water supply. This situation has to be remedied.

(ii) The recommendation B-5(g) of the United Nations Water Conference called upon countries to "develop a national revolving fund, in the first instance financed from substantially increased loans and grants from national and foreign sources, for water supply and sanitation which will encourage both the mobilisation of resources for this sector and equitable participation of beneficiaries; discourage wasteful consumption; and include a flexible combination of rates and, where necessary, explicit subsidies or other measures designed to achieve the economic and social objectives of the programme." The possibility of creation of such a revolving fund deserves consideration. Further, in view of the fact that the available resources for the sector are scrace and they have competing alternative uses in the economy. The Mar del Plata Action Plan called upon the countries to "use water effectively, reduce losses, equalise water prices, develop new concepts such as the use of advanced water treatment techniques, the utilisation of low quality sources and the re-use of waste water"

(iii) In the paper on "Financing for Rural Water Supply and Tariff Policy" Mr. K.R. Qureshi makes a number of suggestions regarding appropriate tariff policies.

(iv) Financial institutions such as LIC and nationalised banks may also be involved in the programme by contributions towards the revolving fund for providing, in their turn, financial resources to local bodies in different areas.

(v) Possibility of direct lending by nationalised banks to different schemes in the water supply and sanitation sector on a short term basis may also be considered.

(vi) The paper by the Operations Research Group, Baroda, details the tariff policies which are being evolved in Gujarat.

Public Participation and Institutional Arrangements

It is generally accepted that the problems of safe drinking water supply and hygienic disposal of human excreta and other wastes effect the lives of every citizen of the country, every man, woman and child, not only in the great metropolitan cities but also those dispersed over widely separate and remote areas in all parts of the country. The problems in regard to environmental hygiene are actually very acute for all those who belong to the weaker sections of the society, be they from the rural areas or from the slums of metropolitan cities like Calcutta, Bombay and Delhi. It is obvious that they need immediate priority attention in the matter of safe drinking water necessary for a healthy and dignified human living—a fundamental right of each and every citizen.

This problem even touches intimately the status and the quality of life of the Indian Women of all deprived sections of the population from all communities of all parts from Kashmir to Kanya Kumari and from Rajasthan desert to Nagaland or the other areas near the eastern-most border of our country. The drawing of water has come to be associated traditionally as the responsibility of women not only in rural areas but in the deprived sections of urban areas also. The priority to provision of safe drinking water supply to be made available within a reasonable distance would actually be one step further in the direction of ameilorating the lot of the Indian Women belonging to all sections, especially to the deprived sections.

But it is also the fact that the above mentioned sections who are going to benefit the most from the programmes for drinking water supply and sanitation are precisely the same sections who have had little say in planning, construction, operation and maintenance of the later supply and sanitation works. They are the people who should have been involved in monitoring the programmes. These are the sections who, if educated properly and appropriately involved, would have come forward to maintain and protect the works and safeguard the quality of water supplied.

The Mar del Plata Plan of Action adopted in Argentina in March 1977 called for the designation of 1981-1990 as the International Drinking Water Supply and Sanitation Decade and included the need of ensuring public participation among the priority areas for action. The plan emphasised that "Communities must be provided with effective education on domestic hygiene and must be motivated and involved as appropriate at every level of the programme, including the planning, construction, operation, maintenance and financing of services and the monitoring and safeguarding of the quality of water supplied." Further, it called upon each country" to promote massive national campaigns to mobilize public opinion regarding the provision of basic sanitary services and develop appropriate procedures to ensure the active participation of communities in the programme".

The importance of developing "massive national campaigns to mobilise public opinion" was again forcefully brought to the attention of the World Community in the inaugurating address of Dr. Halfdan Mahler, Director General of the World Health Organisation who stated, during his speech to the General Assembly on 10th November 1980 :

"Most important of all, this Decade is for people and, when the chips are down, it will be executed by people. So it is vital that we open and continue a dialogue with people at large, in the North as well as in the South. Only in that way will we have a small chance of avoiding more frustration and inertia and only in that way can individuals and communities achieve that positive feeling that this is not our bureaucratic decade but their own living Development Decade."

The Decade has been launched at the special session of the United Nations General Assembly

on 10th November 1980 and in India the Decade has started from 1st April 1981, being the first day in the financial year of the Decade. The programme will have to cover population of about 700 million people which is expected to reach the figure of about 1000 million people by the end of the Decade, and cannot obviously be accomplished alone by the Government (as it is clear even from the magnitude and allotted resources). It should be clear-involvement of the people and their participation in the programme is a **sin-quo-non** for the success of the targets and objectives set for the Decade.

Notwithstanding the general recognition of the need for associating the people with various phases of the programmes for water supply and sanitation, not enough thought seems to have been given to the practical institutional mechasms and ways and procedures to be devised for public involvement to facilitate public participation as a part of the planning and implementation processes.

Even from the papers received for the symposium, it can be noted that most of the papers are authored by the Engineers and not much attention has been given to the aspect of public participation by these authors. Only a few papers have been received from the social scientists. It is essential that the participants in the symposium should give some attention to outline the approach which would deal with the aspect of public participation comprehensively, meaning ensuring appropriate involvement of people at all stages and in all aspects of the Decade Programmes.

Financing of the rural schemes has always been considered a problem area, evading easy solutions, and serious differences have existed on the ways and means of generating local funds from the beneficiaries. Dealing with funds and associated items, Sarvashri P.K. Chatterjee and V. Venugopalan point out in their paper entitled 'Rural Water Supply: Achievements, Goals and Constraints' that "a lot of problems are envisaged especially for locally generated funds. The beneficiaries contribution has been discouraging. As the majority of the people are below poverty line in rural areas, contribution towards not only capital cost but also towards recurring expenditure becomes difficult. It also becomes difficult to make rural water supply self supporting conditions imposed such as making water supply and sanitation sector to be run on commercial lines and to make them self supporting, are difficult to be fulfilled in case of rural Schemes". Because of these difficulties, many have argued for water supply to be delivered free and financed from the general revenue. Others have argued that "the mythology that a commodity which costs money to produce and to deliver can be as free as the air must be rapidly expunged from the minds of both the officials and the people" and suggested that it is possible for the Government to wean away the citizens and the local bodies from their established notion that drinking water should be provided as a partial gift by the Government. In paper entitled 'Problems of Rural Water Supply in India' Dr. Kanwar Sain actually devotes main part of the paper to deal only with this issue. He has suggested that "Public participation, in the matter of financing the water supply schemes as well as in their execution is impreative if the Indian Villages are to be provided with adequate and safe drinking water in a reasonable time and though he grants the fact that "they (Rural Population) cannot be expected to contribute in a large measure towards the huge investments for such a project but, notwithstanding this limitation, there is a way and an important way whereby they can contribute towards this venture and that is their contribution in the shape of their labour." He further suggests that "such a contribution could partly be as 'shramdan' and partly be on the basis of wage payments." The duration of voluntary labour is feasible and must be organised. However, people will have to be motivated to donate labour voluntarily. The issues arise that would it be possible for the local bodies (largely village panchayats) to ensure participation of the public in the construction processes by the donation of voluntary labour if these bodies do not involve people in planning the rural water supply programmes and projects in their respective villages, monitoring and supervising the programme and maintaining and safeguarding the potable water supply for each and every one in the village. How can the people, belonging to all sections including the weaker and deprived, be associated in the management, operation,

maintanance and repairs to the water supply facilities that would be created during the Decade? These are the concrete questions involved in motivating them for participation in the construction processes and even educating the people in rural areas on domestic and public hygiene.

At the village level, there are already village panchayats. These panchayats enjoy different powers and are assigned different functions in different States. It is clear that it will not be enough to make the existing panchayats just functionally responsible for rural water supply. Thought will have to be given to evolve the necessary ways and means and design appropriate institutional arrangements for facilitating the involvement as a part of the planning and implementation processes. Many ideas have been tried all over the world and in India also for involving the local communities in fulfilling the tasks of maintenance and operation arrangements and in the planning and implementation processes. One such idea of a three tier maintenance set up, with a caretaker at the village level, a mechanic at the block level and a mobile repair team at the district level, has already been successfully tried in Tamil Nadu and may be adopted in other States with suitable variations. This was also a partial involvement. Self help schemes have also been proposed, as in the case of rural sanitation projects, mainly with the aim of involving public in the implementation of the projects. Thought can be given to the need and desirability of setting up separate water supply committees which should include the representatives of other developmental activities in rural areas and in perepheral urban areas to be solely in charge of planning, implementation and operation of water supply schemes at the village and district levels. In some of the developing countries, rural water supply committees were constituted and entrusted with the responsibility of mobilising even financial support, at least in a token manner to cover the projects costs partially if not fully. Such a partial coverage would inculcate a sense of direct and active involvement and participation on the part of the people in project planning and implementation. The focal point for responsibility of arranging the assistance and technical inputs would remain with the panchayat only.

It is needless to say that these committees or any similar arrangement would have to see that all the weaker and deprived sections including the untouchables in the villages; socially oppressed and economically deprived, the landless, the peasants, the agricultural labour and the women who have come to be associated traditionally with the drawing of water to be only their responsibility; whether be they in villages or be they from the poorer sections of the urban areas, will have to be involved and represented at all stages and in all aspects of the planning and implementation of the projects. It is not easy to ensure such a representation and wholesome involvement. Consideration should be given to launch a special programme to involve the poor, rural and urban women in the "massive national compaign to mobilise public opinion." Further, it will have to be seen that these programmes relate to safe Drinking Water Supply and Sanitation are not tackled in isolation but as an integral part of the integrated development strategy. For example, the provision of water for irrigation and water for drinking could be integrated and tackled simultaneously in the multi-purpose schemes. All these mean that new and practical instituional arrangements will have to be designed with suitable variations for each region.

On the institutional plane, as well, there have been many problems and a multitude of institutions have existed and still exist in various states for tackling the different aspects and stages of the programmes related to Drinking Water Supply and Sanitation. This institutional weakness was recognised by the authors of the Mar Del Plata Action plan and they called upon the countries to, "establish appropriate institutions, if these do not exist, and assign to them a specific responsibility for the planning, implementation and monitoring of the progress of the programme".

While there are institutional mechanisms which have existed wthin the Government to plan, implement and monitor the progress of the programme, the adequacy of the existing institutional mechanisms at various levels appears to deserve consideration. It is relatively easy to establish committees at the centre and at the state capitals but the real implementation

at the grass root levels takes place at the district and other sub-divisional levels right down to the level of the villages. And the adequacy of the institutional mechanisms at the grass root level requires consideration.

If broad sections of the people are to be associated at the village, district and the state levels, this should naturally also find reflection at higher levels. Association of non-official and voluntary agencies, organisations of the various sections of the people and parliamentarians with Committees or other bodies set up or porposed to be set up at different levels would ensure public participation at the highest level and thus would give a new dimension and new sweep to the programme which is being launched. There is perhaps a need for constituting a National Water and Supply Commission consisting of the Central Ministers and State Ministers in charge of programme of implementing. Various pilot schemes could be tried simultaneously in different States/parts of the State to acquire experience and obtain data for taking scientific decision regarding the suitability of different arrangements. For instance, it can be experimented on a pilot scheme if **rural co-operatives** could be established for water supply and provided with loans. And there could be established rural water supply corporations in all States which would ensure smooth flow of funds from such corporations to the various co-operatives. Appropriate procedures and criteria for financial assistance could be workedout. Such a decentralised responsibility for the implementation and the making of the schemes economically more viable may perhaps provide a new basis for programmes.

There is a danger that these rural cooperatives may become privilage of few rich and siphon off the public funds and, in the ultimate, defeat the very purpose of the Decade programmes and priorities given to the weaker and deprived sections. How would it be ensured that the assistance reaches the needy ? Such crucial aspects will have to be taken care of in implementation of a strategy based on rural co-operatives.

Another institutional arrangement of forming the Water Committees at all levels for overseeing and mobilizing public support and involvement including the generation of local financial resources to meet at least a part of the costs, for the implementation of the Decade programmes has already been described previously in all its ramifications. The solutions to problems of financing and institutional arrangement actually constitute the crux of the problem. It is noteworthy that the World Bank paper itself has recognised that "By far the most crucial problems are the institutional and financial ones, if these could be resolved, the technological problems would largely disappear"-(World Bank Paper : Village Water Supply).

The above mentioned points have been put up with the aim, of initiating the discussion. After envolving a consensus, a Committee can be constituted to consider follow up.

Part IV. Presentation of Papers and Discussion

A View of the Delegates at the Sessions

Presentation of Papers and Discussion

Magnitude of the Problem

The first Session of the Symposium was devoted to presentation and discussion of the papers on the Magnitude of the Problem. The session was chaired by Shri P.R. Vyas Dhiman, Chairman, U.P. Jal Nigam.

A background paper on the magnitude of the problem was presented by Shri K.V. Krishnamurthy. The paper was based on different papers on the subject presented at the Symposium. The following points were made.

(i) Taking the country as a whole, the problem of provision of basic water supply facilities to urban areas in India is within manageable proportions in the coming decade. However, in the towns which are included in the category of those enjoying the facilities of water supply, not all the population of the towns are provided with adequate supplies of water of safe quality. Further, there are segments of population in these towns, particularly on the growing fringes which do not have reasonable access to safe water.

(ii) In a recent study carried out by the Programme Evaluation Organisation of the Planning Commission, it was revealed that the poor have not benefitted from the drinking water facilities as compared to the non-poor.

(iii) Even those that are now considered served, do not have adequate supply or quantity of safe or potable water.

(iv) It is estimated that the total number of problem villages that would have remained without provision of safe water supply as on 31.3.1980 would be about 2 lakhs. Population-wise, about 361 million of rural population in India do not at present enjoy facilities of water supply.

(v) According to the available statistics, the perspective that emerges is that during the Decade about 71 million additional urban population should be provided with water supply facilities so as to reach a target of 100% supply by 1990. This represents an increase of 155% over the average rate for increasing during the last decade.

(vi) Similarly in rural areas, the numbers to be provided with water supply over the next decade works out to 442 million which represents an increase of 350% over the performance during the last decade.

(vii) As regards urban sanitation, the present coverage is 27%. To reach the target of 80% of the urban population in 1991, about 112 million urban people still need to be provided with sanitation facilities.

(viii) Rural sanitation is the most neglected so far. The present level of coverage is stated to be 2%. Stated in terms of absolute numbers, the target of 25% coverage by 1990 would mean that an additional 140 million people should be covered to reach the target. The targetted increase is, in fact, 14 times the present level.

Prof. Dave felt political will, proper planning and management of a well prepared national water and sanitation policy was essential to ensure adequate coverage of the country's population in terms of both quality and quantity. Mr. Gyan Sagar pointed out that if the dream of the decade had to be realised, the priorities will have to be redefined. He suggested chlorination of village wells in a big way and preference to handpumps and sanitarily managed dug wells over costly piped water supply systems in rural areas.

The discussion was wound up by the Chairman at the close of the session.

Resources

The Second Session was devoted to presentation and discussion of the papers on Resources. The session was chaired by Shri P.S. Rajvanshy, Technical Member, Rajasthan Water Supply and Sewerage Management Board and Additional Secretary to the Government of Rajasthan.

A background paper on 'Resources' was presented by Shri C. Sanjeeva Rao. The paper was based on different papers on the subject presented at the Symposium. The following points were made.

(i) Major financing of water schemes is done through government budget. The government finances have to compete with the other needs equally important and significant such as education, health, roads, etc. Oflate, foreign aid has become significant and important in the water and sanitation sector.

(ii) Funds from external sources as well as funds to be generated from L.I.C. and the Government budgetary resources are pooled in the country's plan funds and as such there is no additionality to the Plan, once the plans are finalised.

(iii) A major policy decision is necessary whether to treat water supplies as public utility and charge or take it as social service and supply free of charge.

(iv) A rough assessment was made of the projected requirement of funds for the Decade of about Rs. 15,000 crores (based on State Governments' indications) at a workshop organised in November, 1978. Later the CPHEEO projected the requirement of funds for the Decade Programme at Rs. 10,900 crores to achieve the goals set.

(v) The national outlay indicated in the Sixth Plan for the sector is of the order of Rs. 4,000 crores. If the overall requirement for the Decade which covers both the Sixth and Seventh Plan is of the order of Rs. 15,000 crores, the outlay for Seventh Plan will have to be Rs. 11,000 crores. This shows the inadequacy of funding of the sector in the Sixth Plan.

(vi) At present water supply and sanitation is not in the core sector but is a part of the social services sector. Its inclusion in the core sector may be considered.

(vii) Greater attention should be paid for more efficient use of the available funds by application of appropriate low cost technology, reducing the losses, developing new concepts of water treatment and reuse of waste water.

(viii) A national revolving fund should be developed, in the first instance financed from substantially increased loans and grants from national and foreign sources for water supply and sanitation. Financial institutions such as LIC and nationalised banks may also be involved in the programme by contributions towards the revolving fund.

(ix) Possibility of direct lending by nationalised banks to different schemes in the water supply and sanitation sector on a short term basis may also be considered.

(x) Suitable tariff policies with flexible combination of rates should be evolved to achieve the economic and social objectives of the programme.

(xi) The existing production capacity for the manufacture of materials and equipment requires to be considerably stepped up. In respect of materials like cement and steel, apart from overall increase in production, there is also the need to ensure that the sector gets earmarked additional quantities.

(xii) As regards the manpower requirements for the Decade - professional and non-professional - a thorough review should be made of the existing programmes of training and research in different institutions and long-term perspective plans should be prepared.

Prof. D. Banerjee, Centre of Social Medicine and Community Health, Jawaharlal Nehru University, New Delhi and Dr. D.N. Basu, O.R.G., Baroda spoke on the subject. Prof. Banerjee stated that allocations for rural water supply should be made on the basis of a better understanding of sociological issues and better epidemological analysis and forecasts so as to ensure a rational basis for allocations. Dr. Basu said that a method of water charges should be evolved which should be implemented by the urban local bodies in due course of time embodying both the principles of cost subsidy and wider net work of public distribution system. Instead of treating the mater of revenue generation from water supply and sewerage projects in an isolated manner, we should integrate the method of financing with the entire revenue system of the urban local bodies.

Public Participation and Institutional Arrangements

The Third Session was devoted to presentation and discussion of the papers on public participation and institutional arrangements. The Session was chaired by Prof. Ramlal Parikh, M.P., Vice President, Gandhi Smarak Nidhi, New Delhi.

In his opening remarks, Prof. Parikh emphasised the need for a self-reliant and self-generating solution to the problem of water supply and sanitation. While seeking solutions, he said, that the gravity, magnitude, diversity and complexity of the problem should be kept in view. He referred to the widening gap between the men of expertise and the outside world and stated that planning should start at the lower levels. In addition to planning nationally and globally, it should also be done at the grass root levels. He said that we should shift from aggregative to segregative approach. He also referred to the paradox of putting more money and coming out with more problem villages. He suggested that the present institutional arrangements will have to be changed and made self-reliant and self-generating. He also stated that water supply should be treated as a part of a package consisting of water supply and sanitation, water disposal, biogas, etc.

A background paper on public participation and institutional arrangements was presented by Shri D.K. Abrol, Secretary, Delhi Science Forum. The paper was based on different papers on the subject presented at the symposium. The following points were made.

(i) People belonging to weaker sections of the society, be they from rural areas or from the slums of metropolitan cities need immediate priority attention in the matter of safe drinking water.

(ii) The problem even touches intimately the status and quality of life of Indian women of all deprived sections of the population from all communities from all parts of the country.

(iii) It is also the fact that the above-mentioned sections who are going to benefit the most from the programmes for drinking water supply and sanitation are precisely the same sections who have had little say in planning, construction, operation and maintenance of the water supply and sanitation works.

(iv) All weaker and deprived sections including women who have come to be associated with the drawing of water will have to be involved and represented at all the stages and in all aspects of planning and implementation of projects.

(v) Broad sections of people should be associated in committees at village, district and State levls.

(vi) Association of non-official and voluntary agencies, organisations of the various sections of the people and Parliamentarians with committees or other bodies set up or proposed to be set up at different levels would ensure public participation at the highest level and would give a new dimension and tempo to the programmes.

(vii) There is a need for constituting a National Water Supply Commission consisting of Central Ministers and State Ministers in charge of programme implementation.

(viii) Possibilty of financing the schemes through the establishment of rural cooperatives for water supply may be considered.

Shri B.P. Varma, Managing Director, U.P. Jal Nigam, Lucknow, Shri Y.N. Nanjundiah, O.S.D., Gujarat Water Supply and Sewerage Board, Ahmedabad, Shri Subhan Khan, Haryana Agricultural University, Hissar and Ms Jean Chapman, Janwadi Mahila Samiti, New Delhi, spoke on the subject.

Part V. Coverage in the Media and the Reactions

Coverage in the Media and the Reactions

The proceedings and conclusions of the Symposium received wide publicity in the National Press, AIR and T.V. highlighting the importance and significance of provision of safe drinking water supply and sanitation in India. Different aspects of the problem have been reported by the national dailies under the following headings which are interesting to note.

"Good Water Supply still a dream for many people"
- Hindustan Times (10 May, 1981)

"Call for National Sanitation Policy"
- Hindustan Times (10 May, 1981)

"Not enough water to drink"
- Statesman (12 May, 1981)

"No money for water, plenty for arms"
- Indian Express (13 May 1981)

"Water supply a distant dream for most villages"
- Indian Express (10 May 1981)

"Rich are richer in water too"
- Times of India (10 May, 1981)

"Water Supply and Sanitation body suggested"
- Times of India (11 May, 1981)

"Not enough water for 361 million rural people"
- National Herald (12 May, 1981)

"Clean Water, a luxury for poor"
- Economic Times (13 May, 1981)

"No water facilities for 361 million rural people"
- Tribune (12 May, 1981)

"Rural areas short of drinking water"
- Financial Express (12, May, 1981)

"Lack of clean water root cause of diseases"
- Financial Express (14, May, 1981)

Some of the facts that were highlighted at the symposium, according to the Press, are reproduced below which speak for themselves.

(i) The world spends roughly $100 per head on armament every year but it is unable to spend a mere $3 per head to ensure water supply to every man, woman and child in the developing world (WHO).

(ii) If the dream of the International Decade is to be realised priorities will have to be redefined in a big way. These include massive chlorination of rural wells — reference to hand pumps and sanitary dug well schemes — insistence on drainage around wells and hand pumps. A simultaneously conducted programme of health education, community water supply and sanitation and development of appropriate technologies in the context of Indian conditions.

(iii) About 90 percent of tubewells in Delhi have been a failure.

(iv) In several States, costly rigs to dig tubewells are installed but they remain idle.

(v) Disputes on sharing small quantities of water between the States result in vast potential of the country's rivers going untapped.

(vi) Lack of water management results in spread of diseases from polluted waters.

(vii) The benefit of most of the schemes for providing drinking water has gone more to the non-poor and urban population than rural poor.

The proceedings of the symposium were reported in different news bulletins of AIR and Door Darshan with due prominence underlining the significance of the subject of the symposium.

Reaction to the Recommendations

Immediately after the conclusion of the symposium a brief report on the symposium containing the main recommendations together with a list of participants and the list of papers presened and discussed, was prepared and sent to all the participants and the administrative Ministries and authorities concerned for their consideration and implementation.

Copies of the brief report were also sent to all the Members of Parliament with a request to build up the necessary political will both at the Centre and State levels to pursue the policies with full vigour and ensure successful implementation of the schemes and programmes for the purpose. It is a matter of gratification that the report of the symposium has evoked positive, enthusiastic and warm response from leaders of public opinion, a cross section of which is presented below:

Prof. Ramlal Parikh, M.P.

"I will continue to actively promote the idea of water supply and sanitation for larger support in the VI Plan for this crucial problem. Whatever cooperation that you need I will be very happy to extend".

Shri Jaswant Singh, M.P.

"The subject is of great importance. You have rightly identified that whereas a consensus on it exists, the administrative translation into action is sadly absent".

Shri Xavier Arakal, M.P.

"I shall do my best in this matter. Kindly inform me about all the formulations and literature. I shall try to bring to the notice of the House as well".

Syed Shahabuddin, M.P.

"I am certain that your report will help us in evolving a national policy on water resources".

Shri Ladli Mohan Nigam, M.P.

"What can be more important and urgent than the basic problem of drinking water supply which you have been championing in the columns of your journal ? I am with you in your endeavour. I shall do everything within my means to support the cause. I would like to say one thing that I am an old Lohia Socialist and our party in the first manifesto itself had recognised to emphasise two issues at the national level; one, the problem of planning for safe drinking water and second, the related issue of providing latrines. It was our declaration that if we get elected and form the government, we would not divert our attention to any other issue until the whole of our country was provided with safe drinking water. We have also committed to the pledge of eliminating the situation where one half of the country's population including our mothers and sisters are forced to sacrifice their modesty in having to defecate in the open by the road side for want of alternative."

—Translated from a letter of
Shri Ladli Mohan Nigam, M.P.

Shri B. Satyanarayan Reddy, M.P.

"I strive my best at all levels to see that the conclusions arrived at the Symposium are properly implemented as I firmly believe that it is the primary duty of every Government to provide safe and pure drinking water and sanitation to every human being".

Apart from Governmental action, there is need for arousing public consciousness and mobilising public participation at various levels in order to ensure the success of the Decade.

The symposium has proved to be a successful forerunner of the decadal activities in the sector in India. However, much more remains to be done. Provision of safe and adequate drinking water and sanitation facilities for the teeming millions of India is a continuing process and efforts for the purpose should, therefore,, continue with full vigour.

ANNEX I

LIST OF PARTICIPANTS

GOVERNMENT OF INDIA AND PUBLIC SECTOR ORGANISATIONS

Ministry of Works and Housing (C.P.H.E.E.O.)	Shri T. G. Shankaran, Deputy Adviser (PHE)
	Shri M. M. Datta, Assistant Adviser (PHE)
	Shri J. Neogi Assistant Adviser (PHE)
	Shri S. Sarkar, Assistant Adviser (PHE)
Planning Commission	Shri T. K. Vedaraman Deputy Adviser (Water Supply)
Ministry of Defence (Army Headquarters)	Brig. L. V. Ramakrishna
Town and Country Planning Organisation	Shri S. Arunachalam, Planning Engineer
National Buildings Organisation	Shri O. P. Rattra, Assistant Director
National Environmental Engineering Research Institute	Shri V. Hara Prasad
Engineers India Ltd.	Shri Bhaskar Narang
Bharat Heavy Electricals Ltd.	Shri K. Ashok Rao
Defence Science Centre	Shri Lakshmi Narain
Bharat Electronics Ltd.	Shri Ajay Kumar
Indian Agricultural Research Institute	Shri N. K. Dadlani
National Thermal Power Corporation	Shri Probir Purakayastha
National Small Industries Corporation	Shri T. S. Kannan

STATE IRRIGATION AND PUBLIC HEALTH ENGINEERING DEPARTMENTS AND STATUTORY BOARDS

Gujarat Water Supply and Sewerage Board	Shri Y.N. Nanjundiah, O.S.D. Shri R. G. Chandwani, J. E.
Public Health Engineering Department, Jammu & Kashmir	Shri H. S. Bali, Executive Engineer
Public Health Engineering Department, Rajasthan	Shri P. S. Rajvanshy, Chief Engineer Additional Secretary (PHE) and Technical Member, Rajasthan Water Supply and Sewerage Board Shri S. R. Mendiratta, Executive Engineer
Irrigation Department, Uttar Pradesh	Shri Deep Kumar Gupta, Executive Engineer Shri P. K. Bhatia Shri K. C. Varshney
Uttar Pradesh Jal Nigam	Shri P. R. Vyas Bhiman, Chairman Shri O. P. Bishnoi, Managing Director Shri Y. N. Chaturvedi Secretary, Management Shri Mahendra Kumar, Deputy Secretary (Planning) Shri V. K. Agrawal, Assistant Engineer Shri D. P. Singhal Secretary (Administration)
Public Health Engineering Department, Nagaland	Shri J. T. Bulu Ao Superintending Engineer Shri R. K. Katial Executive Engineer
Rural Development Department, Sikkim	Shri R. N. Dikshit Divisional Engineer
Public Works Department, Sikkim	Shri D. Subba

RESEARCH ORGANISATIONS AND UNIVERSITIES

Council of Scientific and Industrial Research	Shri P. N. Chowdhry Shri V. Kharbanda Shri V. V. Krishna Shri Ramesh Kundra Shri S. S. Solanki Shri Shantanu Roy Mrs. Suman Pangasa
Jawaharlal Nehru University, New Delhi	Prof. J. M. Dave Prof. D. N. Banerjee Shri D. K. Abrol
National Council of Applied Economic Research, New Delhi	Shri P. N. Kumra
University of Delhi, Adult and Continuing Education cell, Delhi	Dr. S. C. Bhatia
Haryana Agricultural University, Hissar	Shri Subhan Khan
Indian Academy of Social Sciences, Allahabad	Dr. N. P. Chaube
Indian Institute of Technology, Delhi	Shri K. P. Kotiyal
Central Electronics Ltd.	Shri Onkar Kaul
P E C C E	Shri Mohan Mani
Eicher Good Earth	Shri G. Raza
St. Stephens College	Shri Ashvin Chabra

INTERNATIONAL ORGANISATIONS

World Health Organisation, Regional Office	Shri B. P. Varma
International Labour Organisation	Mr. Michel Vassart

NON-OFFICIAL ORGANISATIONS

Gandhi Smarak Nidhi	Shri Ram Lal Parikh Vice Chairman
Indian Environmental Society	Dr. Desh Bandhu President
Association of Voluntary Agencies for Rural Development	Shri V. K. Goel

Centre for Science and Environment	Shri V. N. Chakravorty Shri Rajiv Kumar Gupta
A F P R O	Col. B.L. Varma
Janwadi Mahila Samithi	Ms. Jean Chapman Ms. Ashok Lata Jain
Institute of Social Studies Trust	Shri Narain Jha
Indian Association of College going Scientists	Shri Sanjay

EQUIPMENT MANUFACTURERS

M/s Drillexperts Pvt. Ltd.	Shri G.L. Malik, Managing Director
M/S Indian Hume Pipe Co. Ltd.	Shri L.C. Gupta, Project Manager
M/s P V C Pipe Development Co.	Shri K.K. Nangia, ManagingDirector
M/s Chemicals & Plastics India Ltd.	Shri M.V. Madhavan Branch Manager
M/s Hyderabad Asbestos Cement Products Ltd.	Shri J.S. Oberoi
M/s Fixopan Engineers Pvt. Ltd.	Shri R. Dixit Shri C.M. Joshi
M/s National Organic Chemical Industries Ltd.	Shri R.N. Bhatnagar
M/s Digvijay Cement Co. Ltd.	Shri K.N.Mathur
M/s Jyoti Ltd.	Shri T.N. Visweswara

CONSULTANTS

(i) Organisations

Development Consultants, Calcutta	Col. P. K. Chakravarti
Hydroconsult International Pvt. Ltd. New Delhi	Shri K. V. Krishnamurthy
Redecon, New Delhi	Dr. Kanwar Sain
Operations Research Group, Baroda	Dr. D. N. Basu

(ii) Individuals

Dr. K. C. Thomas	Consulting Engineer New Delhi

T.V., RADIO, PRESS

Delhi Door Darshan	Shri P.K. Dhar Shri Sandep Tandon
All India Radio	Shri Gaurav Datt Shri Kapil Kapur
The Times of India	Shri Yogendra Bali
The Statesman	Shri Anil Rana
The Hindu	Shri B.S. Padmanabhan
The National Herald	Ms. Shahira Naim
The Hitavada	Pt. Raj Deva
Press Trust of India	Shri G. Sudhakar Nair

WATER WORLD

Shri K.V. Krishnamurthy,

Shri V.V. Prasad

Shri C. Sanjeeva Rao

Shri N.M.K. Mohan Rao

Shri M.L. Varma

Shri M.L. Gupta

Others

Shri K.S.V. Sanjeeva Rao

Shri T.C. Chawla

Shri D.V. Mahesh

Ms. Evelyn Voigt

Shri Kannan Srinivasan

Shri M.R. Sudhakar

Shri S.C.N. Rao Sarode

Shri D.N. Rao

Ms. K. Ranganayaki

Shri A.K. Ghosh

Shri B.M. Vedi

The participants attended the Symposium in their individual capacities and did not represent the organisations with which they are associated The views expressed do not necessarily represent those of the organisations.

ANNEX II

Inagural Address

By

Dr. K.L. Rao*

Mr. Chairman and friends,

It is a privilege to take part in the symposium on 'India and the International Drinking Water Supply and Sanitation Decade' which is jointly organised by the WATER WORLD and DELHI SCIENCE FORUM. I would like to offer my congratulations to these two organisations for having taken the initiative in organising the symposium at the beginning of the decade in India which has officially started from 1st April, 1981 being the first financial year in the Decade as designated by the United Nations. I was involved in the earlier stages of the preparatory process for the United Nations Water Conference in the early 70s while I was incharge of the portfolio of irrigation and power at the Centre. I am glad to note that the United Nations Water Conference which took place in Argentina in 1977 gave the call for the designation of the period 1981-90 as a decade to be devoted to the implementation of Projects, Plans and Programmes in the field of water supply and sanitation in a more intensive manner than ever before.Water supply and sanitation have always received attention from Governments not only in India but in many other developing countries as a part of the normal development process. I sincerely hope that the designation of a decade devoted to these two important aspects of life will make it possible to give concentrated attention to these two sectors which appear to have been neglected so far in relation to other developed sectors like agriculture, industry, power, transport, etc. This decade should, therefore, witness an unprecendented increase in the facilities available to the people, urban and rural in our country as well as in many other countries which are similarly placed.

I wish to recall, in this connection, that the Father of the Nation, Mahatma Gandhi, gave sanitation a prominent place in the programme of constructive activities developd by him for rural development, Harijan uplift, a better social order and greater social justic to all sections of the people in India. The saying of Mahatma Gandhi in this connection is most noteworthy. He said, **"The best service that can be done for the prosperity of the villagers is to provide drinking water and water for the fields, sanitation and electricity"**. All of us recall how at the beginning of his political carrer, he participated personally in sanitation campaigns in rural India and provide example to other constructive social workers. Like he concentrated on Salt Satyagraha on such a common and vital issue as salt which is of concern to all people of India irrespective of class, creed and caste, so did he concentrate on rural sanitation and developed an either against excreta disposal on head-loads as an undignified social practice. It is a tribute to his innovative genius that he concentrated his attention on sanitations as a part of his social,economic and political campaigns. But it is a matter of regret that more than 3 decades after independance we have not been able to make a significant headway in the sector of sanitation and least of all in rural sanitation.

In our country, we have so far given a high priority to water supply over sanitation and we have given a higher priority to the urban situation over the rural situation in both water supply and sanitation sub-sectors. It is appropriate that we should reevaluate the situation and re-arrange

*Former Union Minister of Irrigation & Power.

our priorities so that at the end of the Decade, we should be in aposition to obtain specific tangible results in urban as well as rural India.

The only handicap for expeditious implementation of sanitation and water supply projects is charging 15½% for administrative charges. For example, there is a tank in Vijayanagar which is used for irrigation. The tank is situated close to the town. The sewage of the town is led into the tank. This resulted in very bad smell in the area. When I happened to visit the site four years ago, I suggested that the sewage of the town should be separated from the tank and led to the fields directly. Estimates have been prepared and the cost comes to 7 lakhs. This includes 15½ which comes to Rs. 1½ lakhs. The centage charges are made even on materials like pipes which the Department does not make. The Municipal authorities could not find finance for the works and dropped the project. Now the estimated cost comes to Rs. 12 lakhs. Due to further increase in cost, the project is dropped. On the banks of the tank, some institutions like colleges are located and some time the smell is bad that the colleges were given **holidays, known as 'smell' holidays.**

The priority for the urban over the rural sector sector is not accidental. It is not without reason. The urban communities are in a position to pay for the facilities of water supply and sanitation whereas the capacity in the rural communities is significantly less. This economic weakness perhaps explains greater investment in the urban sub-sector in preference to the rural. Herein lies the need for evolving a national policy in the field of water supply and sanitation. How can we enable the rural communities to pay for the facilities in this sector. Or should we attempt the urban sector to subsidise at least to a certain extent the costs in the rural sector. What should be the policy for fixing subsidies, loans or grants? If our social philosphy leads us to provide for the services free of cost what other sectors in our national economy can be depended upon to subsidise this sector Without finding clear cut answers to these questions as a result of discussions on the widest possible scale in a democratic manner, I am afraid, it would not be possible to make significant advance in this sector even during the decade. In the absence of a policy, the work is likely to limp on as before. I, therefore, suggest that the formulation of a national policy covering all aspects of the field is one of the most fundamental pre-requisites.

The second aspect which I would like to emphasize is the importance of ensuring participation of the people in the sector not only in one or the other aspects like maintenance or operations but in all the phases including planning and construction — not only at the State level or the federal level but at the grass roots level in each district and, may, in every village. There are many voluntary agencies operating in the field whose number is too numerous and it is absolutely essential that the role of voluntary agencies in the implementation of the programme during the decade should be strengthened. I cannot conceive of any significant advance without an active participation, may involvement o fthe people in all the phases in this sector. I am convinced that the nature of the sector is such that not only this is desirable but this is highly possible if only a national effort is made to mobilise the people and galvanise them on an issue which is beyond all political, economic and social divisions. After all water is required by every man, woman and child in every State in every local linguestic or ethnic group irrespective of age. There is no reason why the widest possible national mobilisation is not possible in this sector. I, therefore, make a sincere appeal to all those engaged in the sector to pool the resources and to provide a leadership which will enable the involvement of all sections of the people in all aspects and stages of the implementation of the projects and programmes.

The third aspect which I would like to touch upon is in relation to the choice of technology. Expensive water supply systems, sophisticated water treatment plants, water-borne sewage system, necessary as they are perhaps beyond our means at present. Detailed estimates are certain to point to enormous sums of money which should be required to plan and construct water supply and sanitation systems on the basis of sophisticated technologies applicable more to the developed countries. But we have to spread the services to all the sections of our population using low cost technologies on which there is need for conducting research with an open mind and an

innovative spirit. I cannot visualise when the whole of rural India will be provided with water borne sewage systems but it does not mean we can live in filth upto that time. Some way has to be found in order to provide facilities appropriate to our economic, political and social conditions and itis here that I cals upon the engineers and all other technologists working in the field to evolve suitable and appropriate low cost technologis both in water supply, treatment as well as sanitation sectors so that our people can begin to enjoy the minimum humanfacilities required to lead a tolerably decent life.

I would like to refer to an international climate which has never been more favourable than now for obtaining international financial assistance for the sector from the developed countries. There are many governments in the developed countries of the world today who are more willing to invest in this sector than in other sectors because the economic and social benefits from investment in this sector are obvious and flow to all sections of the communities in the recipient countries. But in order to take full advantage of the possibilities of obtaining technical and financial assistance, we must not only prepare specific projects for obtaining financial assistance but one must have a flexibility of approach and an open mind to receive constructive suggestions and criticisms from the community of the development countries, interested in investment in the sector in India and other developing countries.

Countries like U.K. must be kept as examples for establishing complete sanitation and ample drinking water facilities. In U.K. 99% of population is provided with drinking water, though the resources are not large. For example, the main source of water supply to London is river Thames. In India, population supplied with piped water is less than 20% and that too is only in towns. We are far behind not only in supplying sufficient drinking water but also in ensuring purity. 1800 towns with a population of more than 10,000 each should be our immediate aim for supplying drinking water in this Decade. In a temperate country like USA, per capita supply of water is 150 gallons per day in New York. In Chicago, it is 230 gallons per day while in India, a good city like Bombay, the per capita supply is only 60 gallons per day. With the heavy increase in our population, it is the responsibility of the people and the Governments in India to supply ample drinking water and improve sanitary conditions so that the water borne diseases do not come in the way of the development in various fields of future India.

Mr. Chairman and friends, with these words, I have great pleasure in declaring the symposium open.

The Public Health Engineering Department is at the Services to the People of Meghalaya

OUR AIMS :

DURING THE INTERNATIONAL WATER SUPPLY AND SANITATION DECADE 1ST APRIL, 1981 TO 31ST MARCH, 1991).

* **Coverage of 100% of the total Urban and Rural Population of the State with potable drinking Water.**
* *Coverage of 80% of the Urban Population with Sewerage and Drainage Schemes.*
* **Coverage of 25% of the Rural population with low cost sanitation programme.**

OUR PROJECTS :

* **Greater Shillong Water Supply Scheme -A comprehensive scheme for the Greater Shillong and enroute villages.**
* *Tura Phase - II*
* **Augmentation of Water Supply to Greater Tura area.**
* *A Public Health Laboratory at Shillong.*
* 203 Nos. of Urban and Rural Water Supply Schemes are under execution.

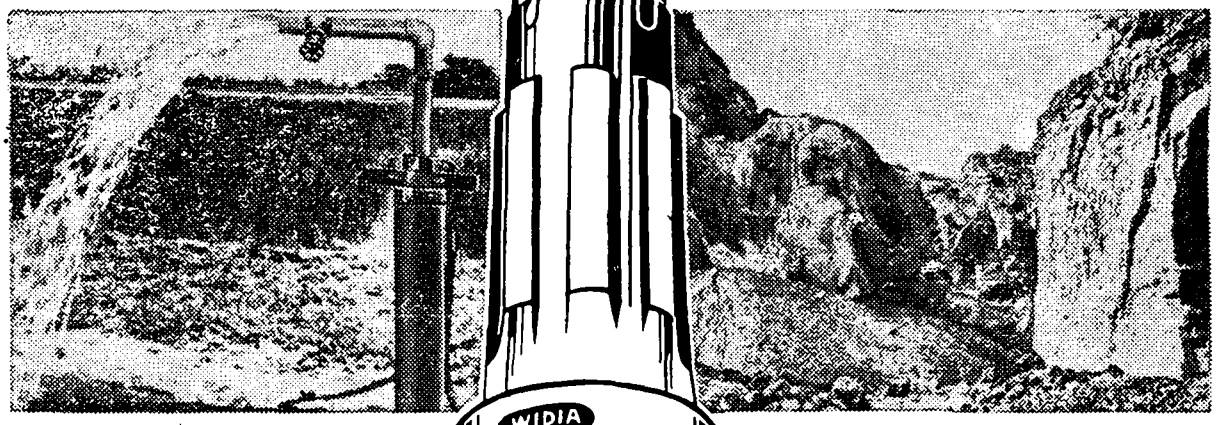
OUR NEED :

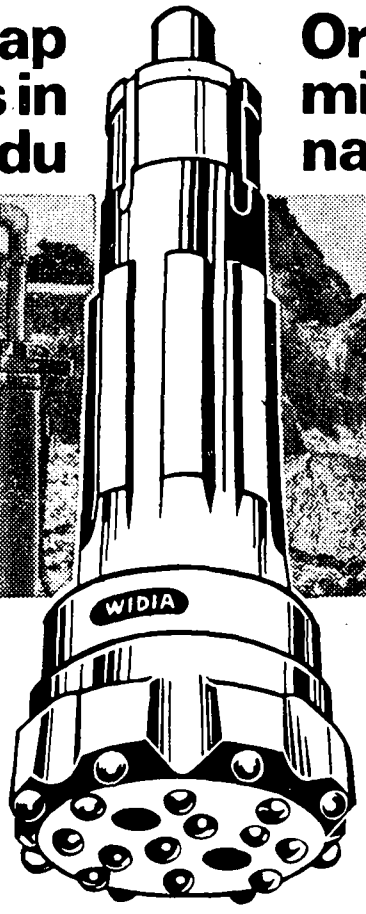
* *Your active Participation and Co-operation is solicited for successful implementation of the Decade programme.*

ISSUED BY THE CHIEF PUBLIC HEALTH ENGINEER; MEGHALAY : SHILLONG.

Water on tap for villagers in Tamil Nadu

Or mining of minerals for national projects





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WIDIA is helping to tap ground water for thousands of villages in other states too, both for drinking and irrigation purposes, where its button bits are active, underground—to fetch water faster and more economically.

The Sixth Plan envisages that one lakh villages which have so far been lacking in drinking water should be provided with this basic amenity. And that major and minor irrigation schemes should create a potential of the order of 17 million hectares.

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WIDIA is active underground.

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