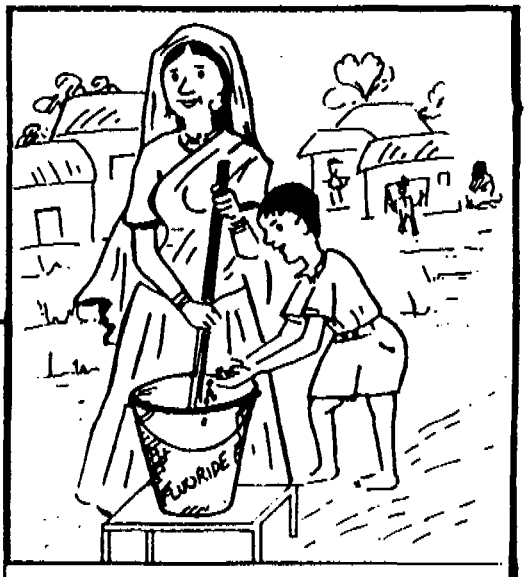
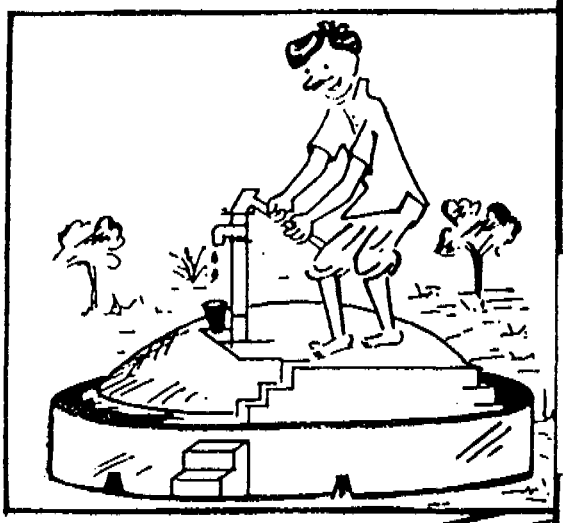
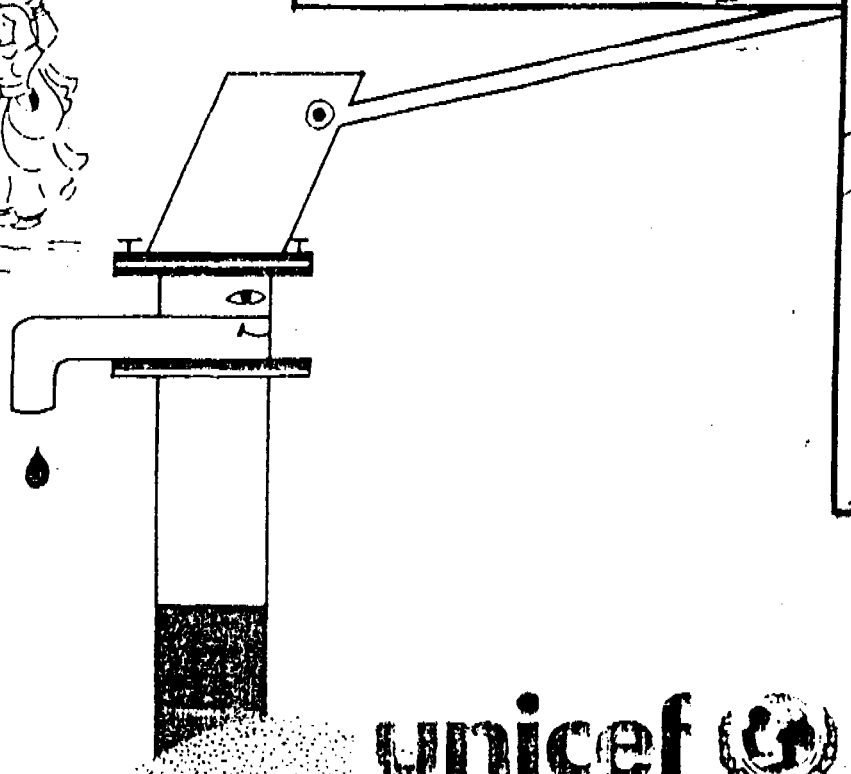
DRINKING WATER FOR ALL: ~~PAST,~~ PRESENT & FUTURE RAJASTHAN





BACKGROUND PAPER



unicef

JUNE 1996

1. AN OVERVIEW

1.1 Introduction

Humanity has the ability to make development socially, economically and environmentally sustainable. Water is a precious resource needed for many uses like drinking, sanitation, agriculture, industry etc. There are many development models in the world which are detrimental to this resource such as inadequately treated sewage, overexploitation of ground water , wasteful practices of agriculture and chemical pollution. Uncontaminated fresh water is necessary for prevention of 80% of the diseases in the developing world.

Rajasthan has not been endowed by nature with its due share of water resources. About 55% of its area falls in the Great Indian Desert. Average rain fall in Western sandy plains is 180 to 410 mm, in Eastern plains 600 to 890 mm and in Southern plateau 650 to 930 mm. All rivers are ephemeral except Chambal river in the South East.

Before 1947 the State was a conglomerate of princely States. Some of the States had enlightened rulers who implemented big projects for enhancement and conservation of water resources such as Gang Canal to bring Sutlej river water in 1927 to Bikaner; Bharatpur feeder to bring Yamuna river waters to Bharatpur State; channels below distant hill slopes to bring water to Jodhpur City and many dams in Udaipur and South-Eastern districts. The landscape was dotted with many beautiful stepwells (baories) and 'pacca'-dug wells for public water supply. During famines, which were recurrent, deepening and digging of wells and of village ponds was done on an extensive scale. Most of the dams and canals were constructed and used primarily for irrigation. Although many of the sources like ponds and stepwells were unsafe, but there was no scarcity of drinking water in quantity. This was because of low water consumption pattern in the absence of (i) piped water systems, (ii) urbanisation (iii) industrialisation and (iv) extensive irrigation.

Rainfall, the most vital input in the hydrologic cycle, has been deficient when totaled for the last decade; the cumulative deficit being 403 mm. This along with overexploitation of ground water, mainly for irrigation, has resulted in decline in the water table in about 76% area of the state during the past decade. Some areas in Alwar, Ajmer, Jaipur, Nagaur, Sikar and Sawaimadhopur districts have shown steep decline of even more than 10 meters. Two maps showing decline in water table from 1979 to 1994 are appended.

1.2 Status of Rural Water Supply.

About 25,000 villages out of 37889 villages are having hand pump systems and the rest have either a pump and tank system or regional water supply system (pumped supply stored in a ground level reservoir with taps around it). Women are the principal water carriers from the hand pumps or taps to home. For a family of five persons and with

1 or 2 cattle, woman of the house has to make about 5 trips daily carrying 20 Kg. load on her head to and fro from the HP or tap, which may be at a distance varying from half Km. to several Kms. in the desert districts.

Under the State Plan and the ARWSP of Central Govt., main villages and their hamlets (other habitations) are being covered with water supply system every year. The situation in April 1995 and April 1996 was as under :-

	April 1995	April 1996
(i) Main habitations fully or partially covered	36671	37724
(ii) Main habitation not covered	1218	615
Total:	37889	37889
(iii)Other habitation fully or partially covered	29746	33482
(iv) Other habitation not covered	15769	12033
Total:	45515	45515

A habitation is said to have been covered if a safe water source (HP or tap) is provided within 1.6 Kms. @ 1 source for 250 persons.

However large number of covered habitations have substantially lower service level than the norm (water supply in litres per capita per day) and chemically unsuitable water.

1.3 Status of Urban Water Supply.

There are 222 towns in the State having a total population of 10 millions which is 22% of the total population of the State of 44 millions. 14 Towns are of more than 1 lac population and 115 towns are of less than 20,000 population. All the towns are having piped water systems; 18 from surface water, 38 from surface as well as ground water and 166 from ground water. Service levels in virtually all the towns are substantially lower than the prescribed norms.

Some large water supply projects under implementation are for Jodhpur, Ajmer, Udaipur and Kota. Apart from the State plan, urban water projects are being financed through loans from HUDCO & LIC and matching grant under AUWSP from Central Govt. The yearly plan budget is of the order of Rs.157 crores.

1.4 Other Organisations.

Other organisations which have interaction with the water supply programme in the State are UNICEF, bilateral aid agencies (World Bank, SIDA, KFW of Germany), NEERI, CAPART & some NGOs.

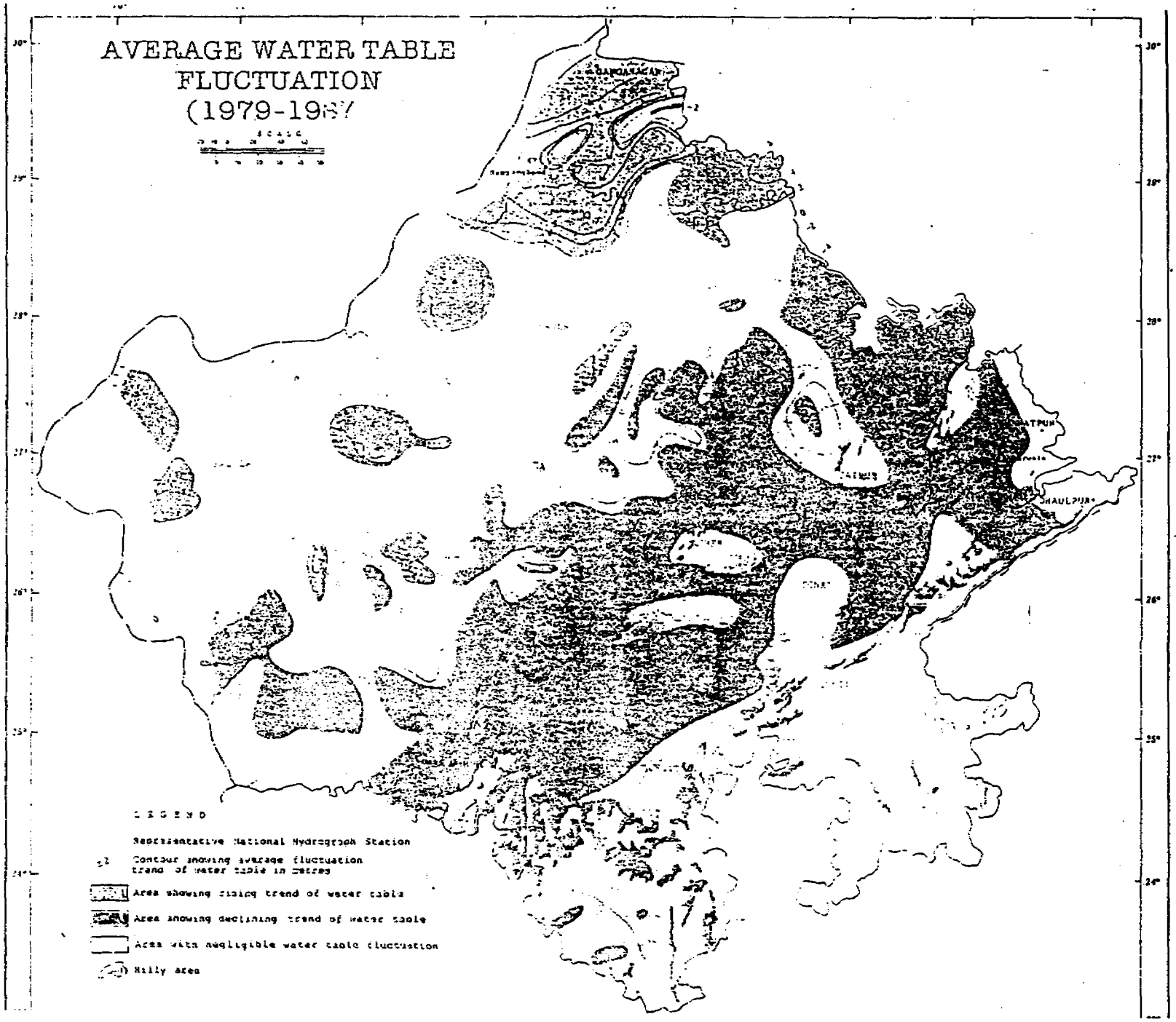
UNICEF is supporting (i) capacity building areas (like drilling and training) (ii) special problem areas like guineaworm disease, diarroheal diseases, fluorosis and (iii) community based hand pump maintenance programme. Focus is on making the systems sustainable.

KFW of Germany is assisting in the Rs.253 crore rural and urban water supply project for saline areas of Ganganagar, Churu and Jhunjhunu districts, which has been under implementation since 1994. SIDA had assisted in the SWACH project for Guineaworm eradication which is in its last stage and World Bank is assisting in the Jaipur Water Supply & Sewerage project which is in the formulation stage.

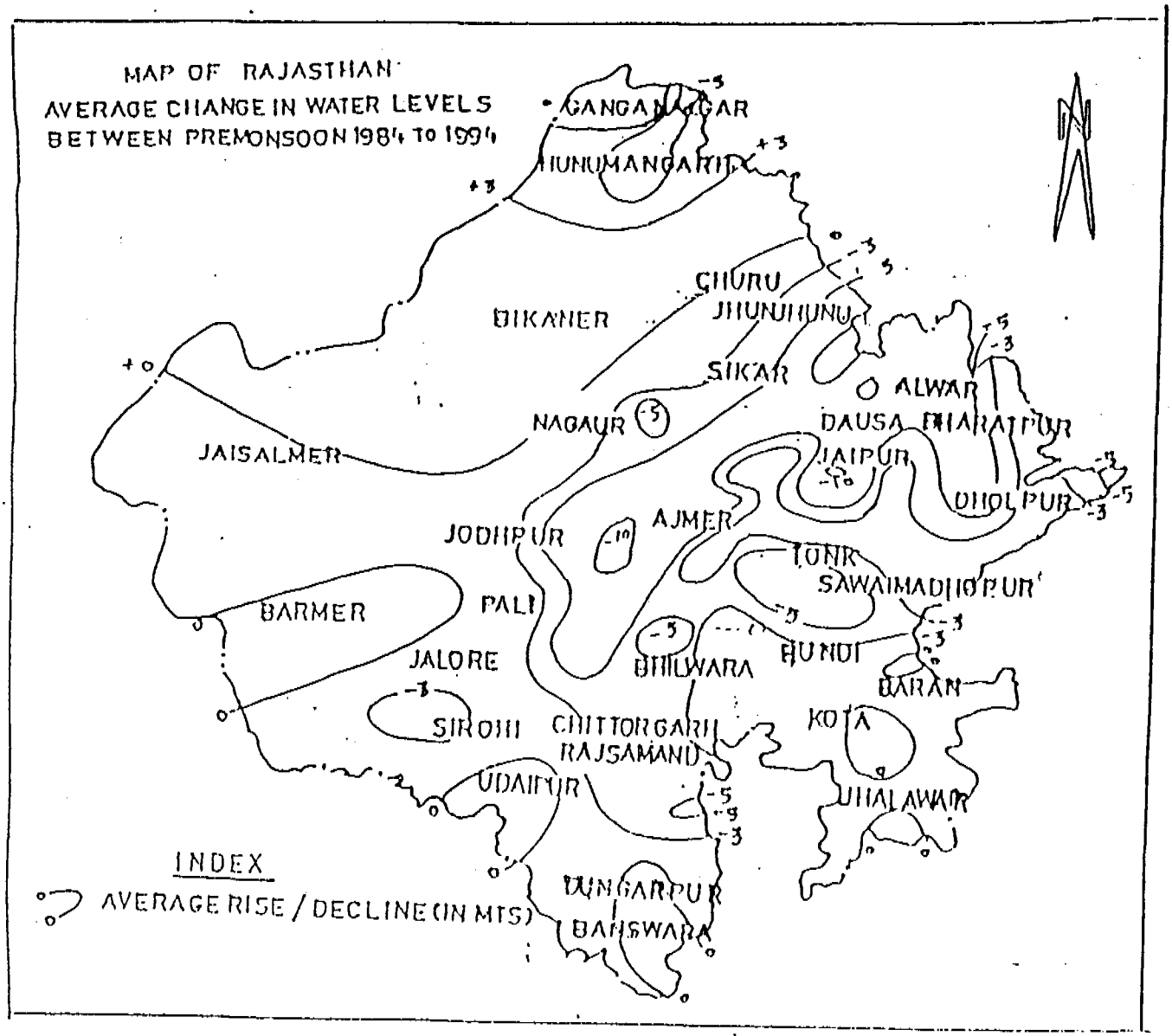
1.5 Conclusion

It can be concluded that ground water sources for drinking water supply have to be supplemented by surface water sources from within the State or from outside such as from Indira Gandhi Canal system and Yamuna river. Surface water schemes involve long carrying systems and treatment and are therefore costly with respect to capital as well as O&M costs.

Simultaneously, conservation of water and recharging of ground water aquifers through water harvesting structures and through recycling and reuse of waste water should be taken up as thrust areas. Efficiency in use of water for irrigation should be increased through improved irrigation and agriculture practices because savings have to come mainly from irrigation.


AVERAGE WATER TABLE
FLUCTUATION
(1979-19
Scale
LEGEND
Representative National Hydrograph Station
Contour showing average fluctuation trend of water table in metres
Area showing rising trend of water table
Area showing declining trend of water table
Area with negligible water table fluctuation
Hilly area
SAWAI MADHOPUR

AVERAGE CHANGE IN WATER LEVELS



2. STATEMENT OF THE PROBLEM.

2.1 Criteria for definition of a problem village.

The present definition implies that if a source is within 1.6 Km. and 1 such source is available for 250 persons the village is no more a 'problem village'. This is an imperfect definition, the distance criterion of 1.6 Kms. and population criterion of 250 persons needs to be reduced to 0.5 Km. and 100 persons.

2.2 Quality problem.

Water supply in 25% villages has salinity in excess of the norm of 1500 ppm., in 26% villages fluorides in excess of the norm of 1.5 ppm. and in 41% villages nitrates in excess of the norm of 45 ppm. Accounting for villages that are common in these groups i.e. which have more than one or more of these chemicals in excess; there are 56% villages which have one or more of these chemicals in excess of the permissible limits and hence have chemically unsuitable water.

Regarding bacteriological quality, leaving aside a few villages where untreated surface water is being supplied, treatment of surface water supplies in remote rural areas of Ganganagar district has been a problem. In handpump supplies too, there have been reports of bacteriological contamination in a large number of hand pumps in those areas where water table is shallow and length of casing pipe is less because of rocky strata such as Udaipur and Banswara districts.

2.3 O & M of water supply systems.

Poor O&M of the created assets not only results in quick depreciation of the assets but also in malfunctioning of the systems resulting in unsafe water supply leading to water borne diseases. Reasons for poor O&M can be ascribed to :-

(i) Inadequate finances
(ii) Multiplicity of agencies (PHED, Panchayat)
(iii) Inadequate training of personnel.
(iv) Inadequate monitoring of performance.
(v) Inadequate emphasis on preventive maintenance aspect.
(vi) Lack of appreciation of the value of the asset by the community.

pure O&M avoid within centralised system
what about alternative?

2.4 In - Service Training.

Trainings to planners, administrators, engineers, subordinate engineers, plant operators and field workers has been quite inadequate. There is a large gap between their present skills, awareness and knowledge and the level of these attributes demanded by their job requirements.

2.5 Employment of unskilled workers.

During the past two or three decades, most of the recruitment of O&M staff has been of unqualified persons on daily wages basis on account of non creation of regular posts and non-observance of regular recruitment procedures. This has resulted in unsatisfactory O&M and implementation of the systems and projects.

2.6 Material and Equipment Problem

The supply of essential materials like pipes, pumps, cables etc. has not been commensurate with the desired speed of implementation of programmes. Existence of sufficient suspense stock and a rational material management and inventory control system are necessary for this.

2.7 Depletion of water table, absence of legislation and integrated water policy.

Regulating the use of ground water through legislation on the basis of the Model Bill circulated by the Govt. of India in 1992 is of utmost urgency. In the absence of any such Act in the State, this resource is being excessively exploited, leading to deterioration in quality also at many places. Following measures are necessary :-

1. Basin wise computerised data storage of rainfall, evapotranspiration, run off coefficient and other parameters to develop a model for surface and subsurface flow and recharge of ground water.

2. Continuous monitoring of water quality and its mapping.

3. Suitable legislation for control of ground water use, particularly in dark and gray areas.

4. Establishment of a separate Deptt. for laying down and implementation of integrated water policy.

5. Education of public through media about the whole area of policy, legislation and their responsibilities for use and conservation of water.

2.8 **Lack of linkages for transaction between community and the programme implementing agency.**

Establishing informal or institutional linkages with community to ensure their participation is not a part of the present system. Creation of public awareness and health education is also not in the agenda of the programme implementing agency.

2.9 **Lack of finances.**

The present level of annual investment of the order of Rs.250 crores in Rural water supply is utterly inadequate in view of the estimated requirement of about Rs.7000 crores to solve the problem. Similar is the situation for urban water supply.

2.10 **Exploring alternate sources and project formulation.**

Due to quality and quantity problems of local water sources, more and more distant sources have to be tapped or alternate technologies have to be harnessed. For this, there should be enough capacity for formulation of good projects.

3. CURRENT STRATEGIES

3.1 Coverage of no-source habitations.

Policy of Govt. of India is to cover the remaining habitations in the following order of priority :-

1. No-source habitations with exclusive, or majority of, SC/ST population.
2. Other no-source habitations
3. Habitations having chemically or bacteriologically unsuitable water.
4. Schools and Aanganwadis
5. Partially covered habitations.

615 main and 12033 other habitants are remaining no-source habitations.

3.2 Coverage of habitations with water quality problem

There are 21318 (56%) such main habitations. Govt. of India has been sanctioning projects with 75% as its share (grant) and 25% that of the State; for habitations having problems due to excess fluorides or salinity. For excess nitrates, project sanctioning policy is awaited.

3.2.1 Control of Fluorosis

Under fluorosis, Govt. of India has sanctioned some projects; one for 94 villages of Ajmer distt., and one for 175 villages of Jaipur district and one for some villages of Tonk district. The projects have a mix of defluoridation plants for a village or group of villages and regional water supply schemes from a distant potable source. Out of the previously installed 18 fill & draw type and 28 HP attached D/F plants, about 30% only have been working because of problems of transfer of technology in H.P. D/F plants and problems of inadequate operating personnel, management and IEC activities for generating awareness in the community.

A multidisciplinary approach to involve medical workers, Panchayati Raj personnel, PHED workers and other organisations has been planned by the RGNDWM under which State level camps, distt. level camps and village level door to door survey & study will be undertaken. Some camps have been held already.

Defluoridation at domestic level by Activated Alumina process or Nalgonda technique is also on the cards. One such pilot project is under implementation through UNICEF support in 8 villages of Dungarpur district.

3.2.2 Control of Salinity

Under Mini-mission and sub-mission programmes, 89 desalination plants based on Reverse Osmosis or Electrodialysis process have been installed in 8 distts. by 1990. After having been operated by manufacturers for three years, 30 of these have been handed over to PHED and remaining are to be set right before handing over. PHED has been handing over O&M of these plants to qualified private parties. O&M will be supervised by local community. Satisfactory working of all the 89 plants needs lots of concerted efforts and adequate management system.

115 desalination plants have been further sanctioned for Barmer Distt. by Govt. of India in 1995, to be installed by the Defence Laboratory, Jodhpur.

GOI can further sanction projects involving provision of desalination plants or regional schemes for such areas.

3.2.3 Eradication of Guineaworm.

SWACH project was launched in 1986 supported by SIDA, UNICEF & GOR in the districts of Dungarpur, Banswara, Udaipur and Rajsamand. The project envisaged providing safe water supply mainly through HPs; environmental sanitation and community health through integrated and grassroot approaches by emphasis on the involvement of rural community. The number of active cases has progressively declined from 8212 in 1986 to nil in 1995 in these districts. Village contact drives, women hand pump mechanics, net works of scouts and animators, 1 safe source for 130 population, comprehensive array of didactic materials and trainings of grass root workers were among the land - marks of this successful programme.

RIGEP costing Rs.27.128 crores is under implementation for complete eradication of guineaworm from the remaining distts. of Barmer, Jodhpur, Nagaur, Jaisalmer, Jhalawar and Bikaner. This project is being cofunded by UNICEF, GOR & GOI. The number of active cases has declined from 791 in 1992 to 443 in 1994 and 76 in 1995. In 1996, there have been only 6 cases upto end of May. Zero transmission is expected in 1996 which may result in no cases in 1997.

3.3 **Water quality monitoring and surveillance.**

30 out of 31 distts. have got a PHED laboratory for this. Almost all laboratories have been testing water samples which are sent to them. A rational system of water quality monitoring is to be established so that all water supply schemes are covered with requisite periodicity.

3.4 **Development of Human Resources.**

A project for training of about 38000 grass root workers for Rs.88 lacs has been sanctioned by GOI in 1995. It is proposed to train these in 5 years so that one trained person will be available in each village. NGOs or some training institutions may be involved to impart trainings. Initially, training of trainers @ 6 district level trainers per district will be got done. In the first phase existing workers of PHED will be trained.

3.5 **Computerisation.**

A project for Rs.643.68 lacs has been sanctioned by GOI for installation of computers in the Head office and field offices of PHED. Training of staff is under progress. System development and preparation of customised software packages shall be undertaken centrally by GOI. The designed system will lay down details of flow of necessary information from village/ block to distt. and State level.

3.6 **Ground water recharge and water harvesting structures.**

These works have been undertaken on a very small scale in Churu, Barmer & Bikaner distt. through DRDAs under Technology Mission. Evaluation of these works of ponds and community 'tankas' has to be got done. Some demonstrative works of improvement of village ponds have also been undertaken by some NGOs.

3.7 **Further Strategies.**

Some large projects based on surface water are under preparation or have been prepared and being posed for bilateral aid. Some of these are (i) project for Nagaur distt. (ii) project of enroute villages of Jodhpur lift canal (iii) project for Bharatpur, Alwar, Jhunjhunu and Sikar distts. from Yamuna river (iv) project for Dholpur from Chambal river etc.etc. Implementation of a German aided project for Churu, part of Ganganagar and Jhunjhunu distts. costing Rs.253 crores has been started in 1994 and first phase is slated to be completed in the year 2000.

4. FINANCIAL INPUT/OUTLAY.

4.1 Summary

4.1.1 Plan i.e. New Works.

The input has increased at a fast rate from Rs.5.82 crores in the 51-61 decade to Rs.962.34 crores in 81-91 decade. The annual plan outlay for 95-96 was Rs.265 crores in addition to the Central assistance of Rs.108 crores. The annual plan for 96-97 is of the order of Rs.302 crore in addition to the Central assistance of nearly the same amount as in previous year. The annual increase in plan outlay is therefore of the order of 10%, which is inadequate to solve the problem even in the next 25 years, keeping in view the requirement of about Rs.7000 crores for rural water supply alone at present day prices. Moreover, the Plan outlay has remained static at about 6.4% of the total plan size of the State. Covering the remaining areas is costly, which has needed greater inputs. Input in rural areas is increasing at a faster rate than in urban areas.

4.1.2 Non-Plan i.e. O&M.

The expenditure on O&M of rural and urban schemes in 93-94 was of the order of Rs.105 crores and Rs.140 crores respectively. The per capita net expenditure (i.e. excluding revenue) was Rs.27 and Rs.90 in rural and urban areas respectively. The O&M expenditure is about 12.5% of the assets created, but a large portion goes to meet the operation expenditure and the portion left for maintenance is inadequate.

4.1.3 Future Perspective.

For rural areas the financial input needed is roughly Rs.7000 crores to solve the problem. With 10% rate of inflation, the increasing requirement of funds can be met with only by sustained increase in annual plan. Computations show that if the sustained annual increase is @ 40%, problem can be solved in 10 years and if it is @ 12%, problem can be solved in 25 years. It should be noted that the envisaged surface water schemes from Yamuna river and Indira Gandhi canal are costly in O&M also and community can not be expected to pay even 25% of the O&M cost. Therefore, those schemes which are low in O&M costs like water harvesting structure should be given due priority. Similarly, overexploitation of ground water should be controlled and water conservation, recycling and reuse should be made thrust areas to reduce dependence on costly distant surface water schemes.

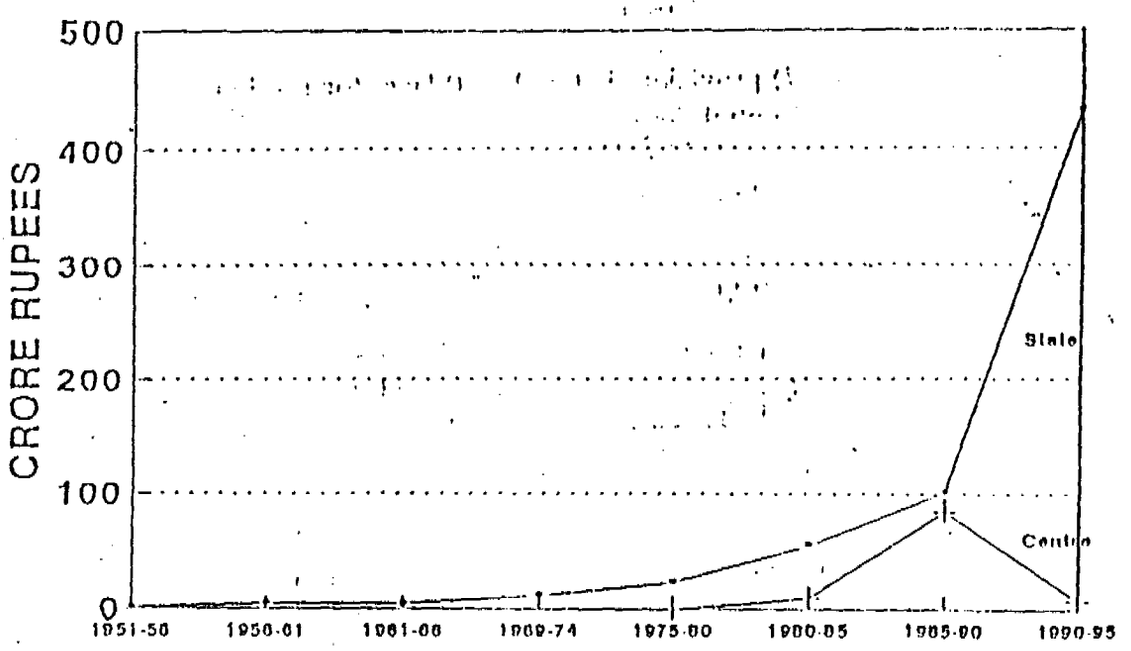
4.2 PLAN WORKS i.e. NEW WORKS

The responsibility of providing potable drinking water to rural & urban areas lies with the State Govt. Right from the commencement of 1st Five Year Plan (1951-1956), funds have been provided in the State budget. Central Govt.has also provided funds in certain years as shown in the following table & graphs for plan works i.e. for new works. .rm70

Sl No	Period	Funds for Rural Areas		Funds for Urban areas	
		By State govt. Rs. in lacs	By Central Govt. Rs. in lacs	By State Govt. Rs. in Lacs	By Central Govt. Rs. in lacs
1.	1951-56 - I 5 Yr plan	0.50	--	88.00	--
2.	1956-61 - II 5 yr plan	14.84	--	478.78	--
3.	1961-66-II 5 yr plan	289.02	--	464.14	--
4.	1966-69-3 yr plan	230.63	--	258.41	--
5.	1969-74-IV 5 yr plan	2090.31	--	1150.50	--
6.	1974-75 1 yr plan	590.83	--	236.78	--
7.	1975-80-V 5 yr plan	5485.76	--	2289.00	--
8.	1980-85-VII 5 yr plan	6847.00	17986.00	5502.00	872.00
9.	1985-90-VII 5 yr plan	10552.48	29231.91	10174.66	8489.97
10.	1990-92-2 yr plan	9384.93	10277.17	9581.64	700.00
11.	1992-94- First two years of VIII Plan	13569.32	12280.20	19446.41	--
12.	1994-95-Third year of VIII 5 yr. plan	10488.28	8975.30	14264.59	--
13.	1995-96 - Fourth year of VIII 5 yr. plan	12265.00	10756.00	14300.00	237.00
	Total	71,808.90	88,906.58	78,235.21	10,298.97

Total VIII 5 Year plan (1992-97) provision is Rs. 29650 lacs for rural areas & Rs. 44304 lacs for Urban areas excluding Central Assistance.

ALLOCATION FOR URBAN WATER SUPPLY

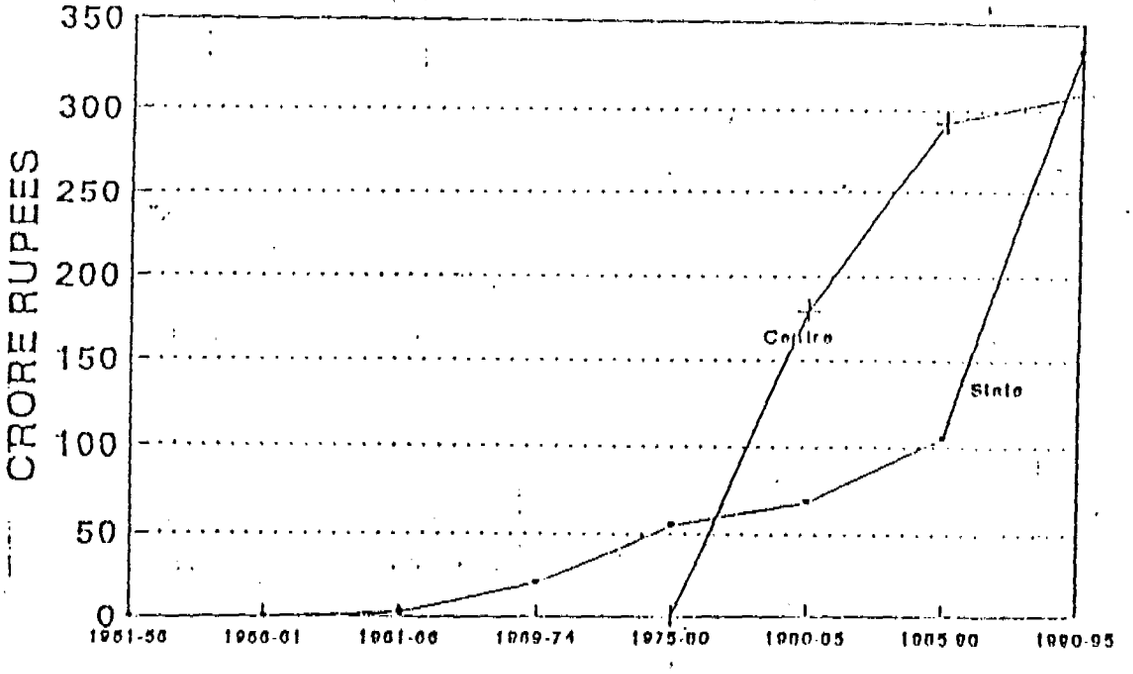


Five Year Plans - years

Funds

--- By State Govt. -|- By Central Govt.

ALLOCATION FOR RURAL WATER SUPPLY



Five Year Plans - years

Funds

--- By State Govt. -|- By Central Govt.

Plan provisions during 1995-96 are as follows :

Period	RURAL		URBAN	
	State	Centre	State	Centre
1995-96	14450.00	10000.00	15730.00	-

The above outlay vis-a-vis population works out as follows:-

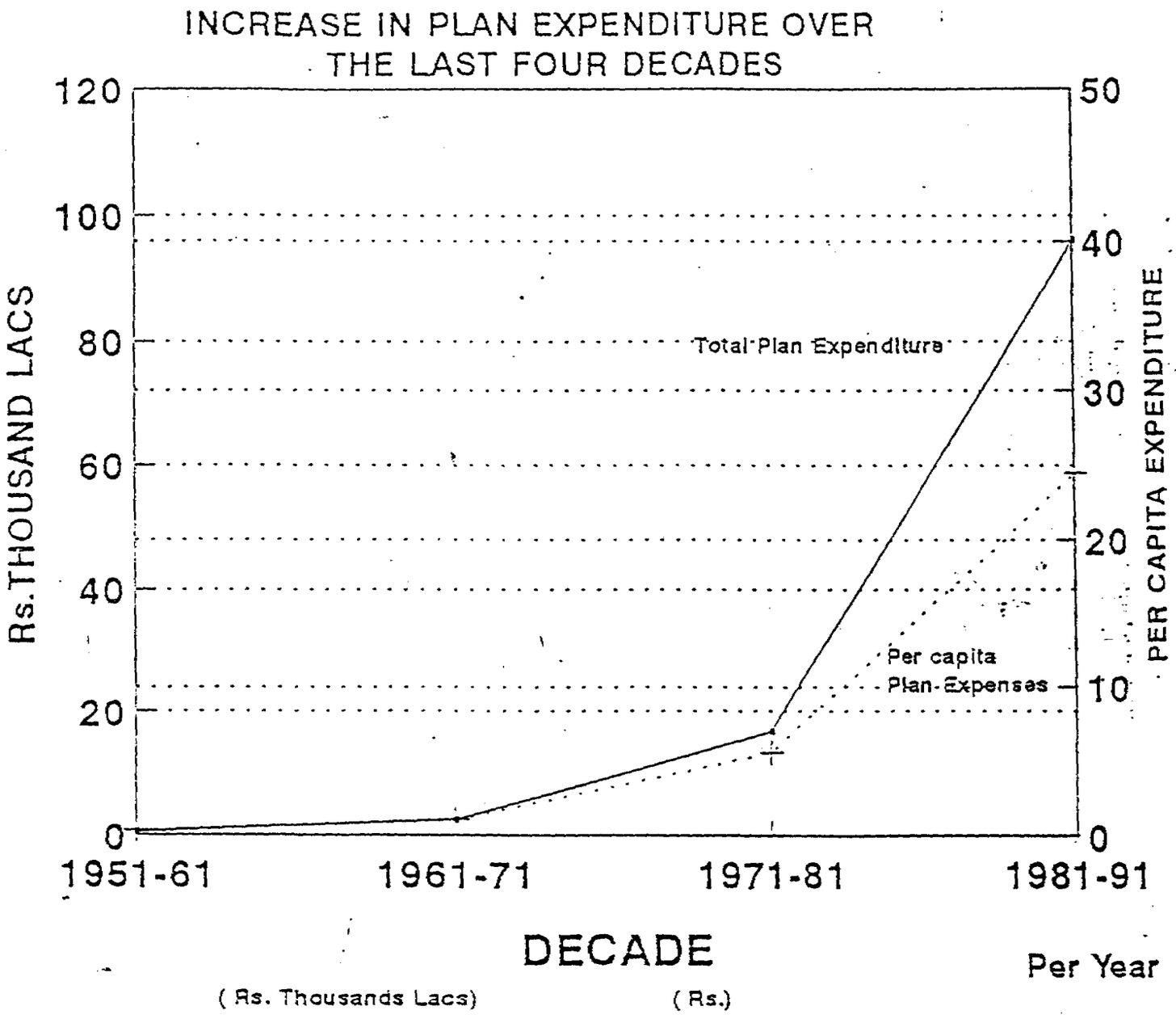
Year	Population in Lacs			Input of funds	
	Pop.	Decade	Avg.Pop.	Rs.Lacs	per capita plan exp./year
1951	160	51-61	181	582.12	0.32
1961	202	61-71	230	2538.52	1.10
1971	258	71-81	300.5	16788.41	5.58
1981	343	81-91	391.5	96234.80	24.58
1991	440				

The size of total State Plans & outlays for water supply sector are as follows:-

State Plan	Total outlay Rs.Crore	Plan outlay - water supply Rs.Crore		
		R	U	T
VIII Plan	11500	296.50 (2.57%)	443.04 (3.85%)	739.54 (6.43)
VII Plan	3106	105.52 (3.40%)	93.74 (3.02%)	199.26 (6.41%)

Following inferences can be drawn from the above tables & graphs :

1. Per capita investments have risen tremendously from year to year & from one five year plan to the next. For instance the per capita investment in the 71-81 decade was Rs 5.58,in 81-91 decade it was Rs 24.58 & in the first 3 years of VIII 5 year plan i.e. 92 to 95, it has been Rs 55.86. But adjusted for inflation, the real value of the rise will be much less. The reasons for the steep rise are : (i) covering the remaining areas has become more costly because of long distance regional schemes, (ii) increased thrust in


INCREASE IN PLAN EXPENDITURE OVER
THE LAST FOUR DECADES
120
100
80
60
40
20
0
Rs.THOUSAND LACS
50
40
30
20
10
0
PER CAPITA EXPENDITURE
Total Plan Expenditure
Per capita
Plan Expenses
1951-61
1961-71
1971-81
1981-91
DECADE
Per Year
(Rs. Thousands Lacs)
(Rs.)
Input of funds
Per capita.Plan Exp.

the 81-90 decade programme & thereafter to achieve the goals of 100% coverage at the earliest, (iii)part of the funds began to be utilised to meet increased expenditures on O & M of the assets created.

2. Size of the State's 5 year plan has increased from Rs. 3106 cr. in VII plan to Rs. 11500 cr. in VIII plan. The allocation to water supply sector has been increased accordingly from Rs 199.26 cr. to Rs. 739.54 cr. in absolute terms. But percentage wise, the sector allocations have remained static at about 6.4% of the plan size.

3. Even though the rural population is 3.4 times the urban population; during the first 4 years of the VIII plan, outlay on rural w.s. has been only 1.42 times the outlay on urban w.s. However, the trend shows that investment in rural areas is rising at a faster rate than in urban areas. This is necessary because whereas all urban population has been covered, large number of rural habitations remain to be covered.

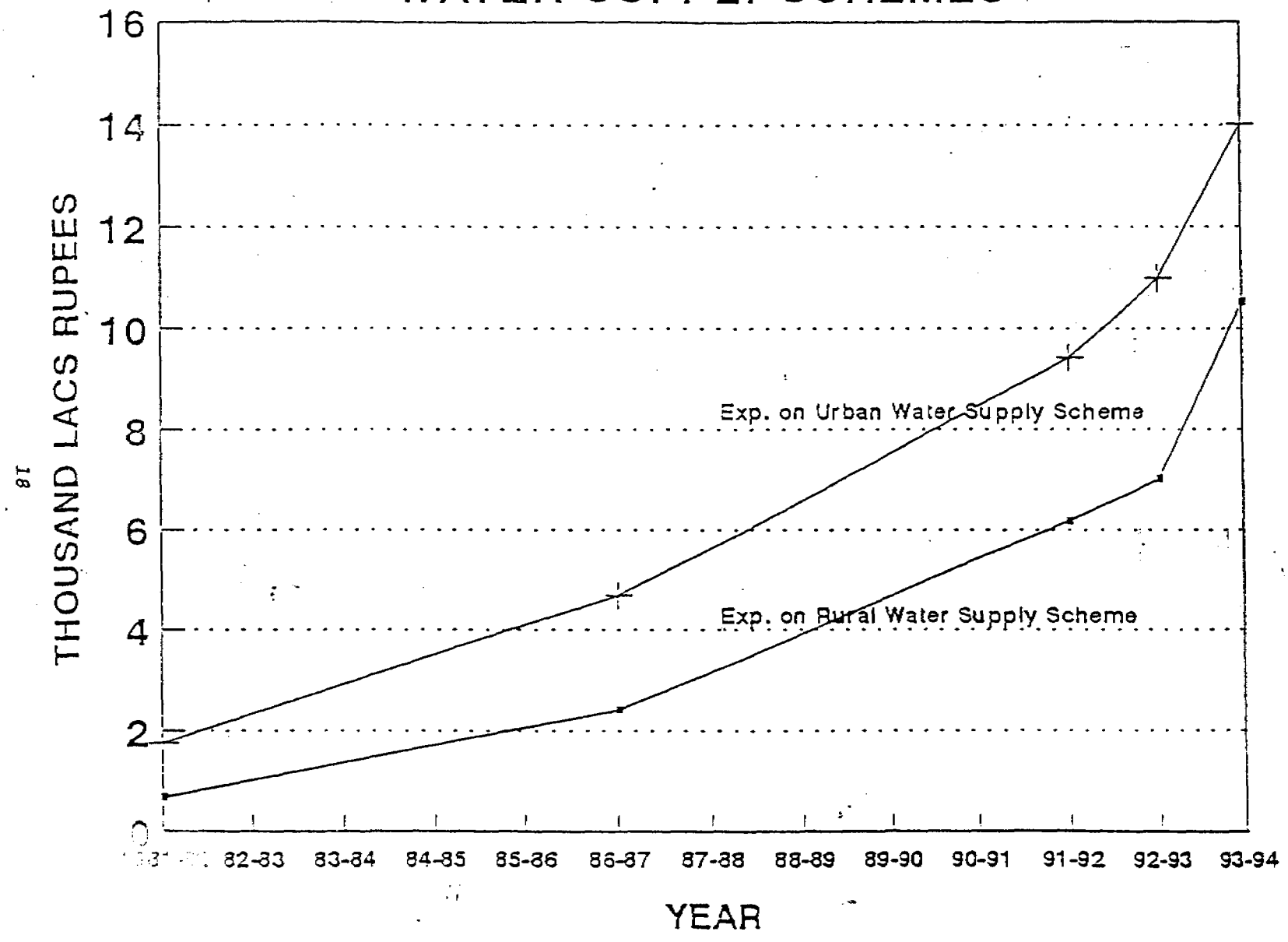
4.3 NON-PLAN WORKS i.e. O & M OF WATER SUPPLY SCHEMES.

The responsibility of operation and maintenance of all rural & urban w.s. schemes rests with the PHE Deptt. of the State except for hand pump schemes in 21 distts. of the state. Provision of funds for this activity is done under 'Non Plan' budget.

Expenditure for this has been shown in the following table & graph for some years.

S.No.	Year	Exp. on Rural W.S. Rs. lacs	Exp. on Urban W.S. Rs. lacs
1.	1981-82	672	1756
2.	1986-87	2424	4682
3.	1991-92	6176	9436
4.	1992-93	7023	10989
5.	1993-94	10528	14014

NON-PLAN EXPENDITURE ON RURAL AND URBAN WATER SUPPLY SCHEMES



EXP. ON RURAL W.S. — EXP. ON URBAN W.S.

Thus in the year 93-94, following per capita expenditure was made for rural & urban population for O&M of W.S. schemes.

Area	Exp.(Rs. lacs)	Pop.(lacs)	Per capita Rs.
Rural	10528	358	29.40
Urban	14014	111	126.25

However, if we take into account the revenue realised from the beneficiaries & deduct the same from expenditure to arrive at the net expenditure figure, the following are the results:

Area	Exp.(Rs. lacs)	Pop.(lacs)	Per capita Rs.
Rural	9591	358	26.79
Urban	9961	111	89.74

Following inferences can be drawn from the above tables and their background:-

1. The assets created through Plan expenditure up to the beginning of the year 94-95 were amounting to Rs. 1786 crore. Funds provided during the year 94-95 under Non Plan for O&M of these assets were of the order of Rs. 282 crores gross or (deducting the revenue earned) Rs 225 crores net. The later figure is 12.5% of the investments made.

   A major portion of this non-plan provision goes to meet the operating expenses by way of electric charges & salaries of staff.It has been generally observed that funds are not said to be sufficient for proper maintenance of the assets created. Non plan allocations for maintenance should be linked up with the assets created.

2. There is a significant disparity between net per capita expenditure on O&M of urban & rural water supply schemes. Per capita expenditure on urban schemes is about 3.3 times of rural schemes.

4.4. FUTURE PERSPECTIVE

For rural areas, rough estimate of the requirement of funds beginning April 95, to solve the drinking water problem of the state has been made as follows:-

		Amount Rs. cr.
1.	Main habitations to be provided with w.s. 814 nos. @ Rs 5 lacs each	41
2.	Other habitations to be provided with w.s. 15183 nos. @ Rs 2.5 lacs each	380
3.	Partially covered main habitations to be fully covered 10646 @ Rs 3.5 lacs each	373
4.	Partially covered other habitations to be fully covered 7282 nos. @ Rs 1.75 lacs each	127
5.	Providing chemically suitable water to 20500 main habitations & their other habitations @ Rs, 10 lacs each	2050
6.	German aided project for 956 villages of Churu Jhunjhunu & Ganganagar Distts. under implementation	502
7.	Project for 555 villages of Barmer & Jaisalmer Distt. from Indira Gandhi canal-(preliminary project prepared)	217
8.	Project for problematic & ravinous areas along Chambal river (preliminary project prepared)	61
9.	Project for Nagaur distt. from Indira Gandhi canal or Bisalpur dam (prefeasebility report prepared)	1256
10.	Ramganj mandi Suket project of Kota distt. (under implementation)	11
11.	Project for Bharatpur, Alwar, Sikar, Jhunjhunu & (part) Churu distts. from Yamuna river water-101 major villages @ Rs 8 cr. per village (prefeasibility report under preparation)	808
12.	Project for Dholpur distt. from Chambal river (to be prepared)	120
13.	Project for enroute villages of Jodhpur Lift canal (Preliminary project prepared)	71
		6017

The current (96-97) level of investment in rural water supply is Rs 244 cr. per year; and has increased by about 6% over last year's investment of Rs.230 cr.

The required investment is based on 1994 prices & with price index rising @ 10% per year; it is difficult to say as to when the water supply problem will be solved. However, sustained annual increase can lead to the solution in foreseeable future.

If the problem is to be solved within next 10 years, the investment has to be increased by 40% every year in a sustained manner. Similarly if it is to be solved in next 25 years, sustained increased of 12% is needed. 12% annual increase appears realistic in view of past trend evident from the following :

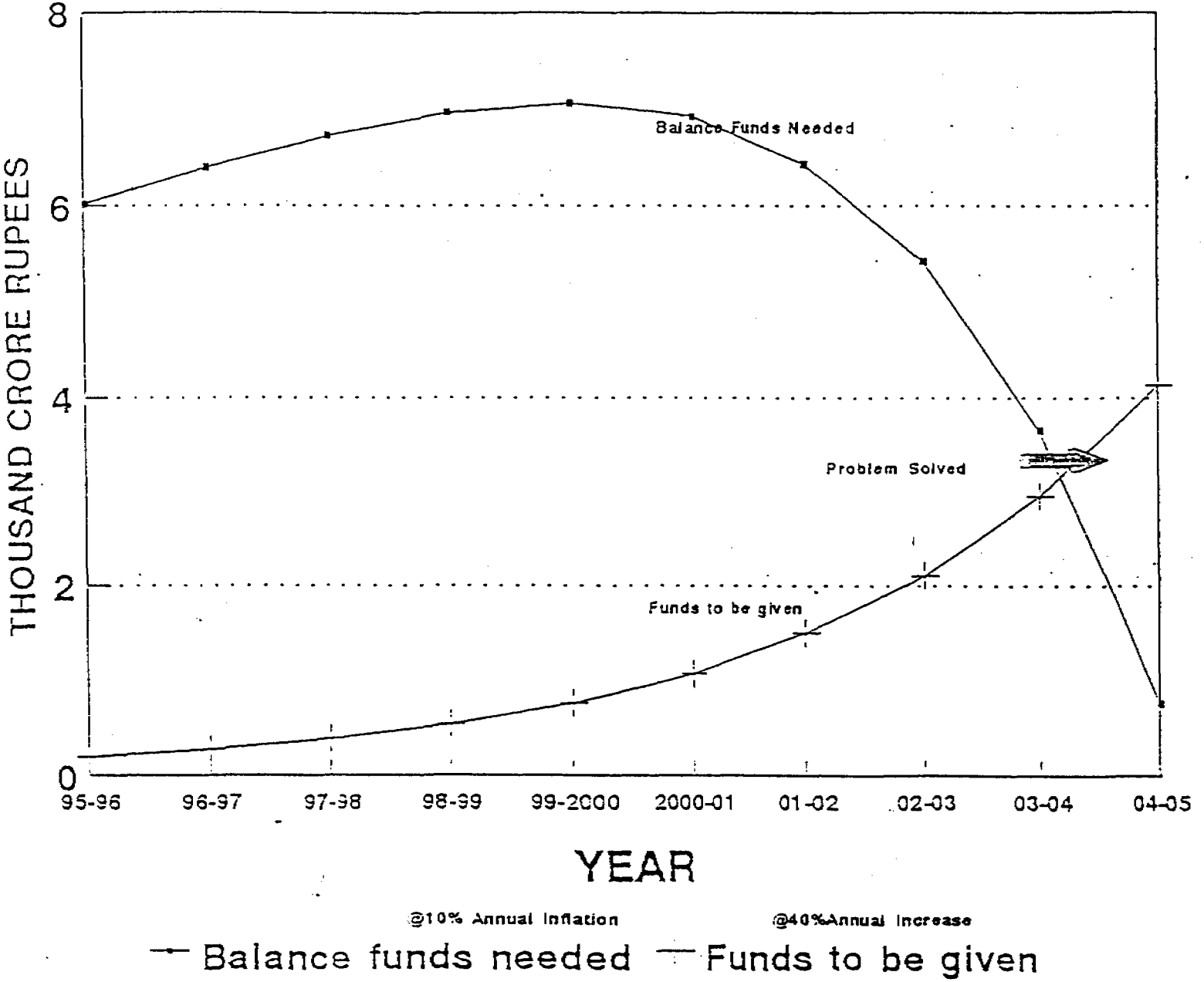
Year	Plan allocation (excluding for contingencies)	Considering 12% increase
1991-92	110	110
1992-93	109	123
1993-94	121	138
1994-95	156	155
1995-96	200	173
	696	699

The following tables & graphs show, that if this is done, the problem in rural area is likely to solved by the year 2005 or 2020 respectively.

A. **40% Annual Increase**

Year	95-96	96-97	97-98	98-99	99-2000	2000-01	01-02	02-03	03-04	04-05
Funds needed	6017	6399	6731	6973	7066	6928	6437	5424	3648	767
Funds given	200	280	392	549	768	1076	1506	2108	2951	4132
Bal. need at current price	5817	6119	6339	6424	6298	5852	4931	3316	697	Prob. solved
Bal. need at next yr. price	6399	6731	6973	7066	6928	6437	5424	3648	767	--

Required Increase in Rate of Funding To Solve water Problem in 10 Years



B. 12% ANNUAL INCREASE

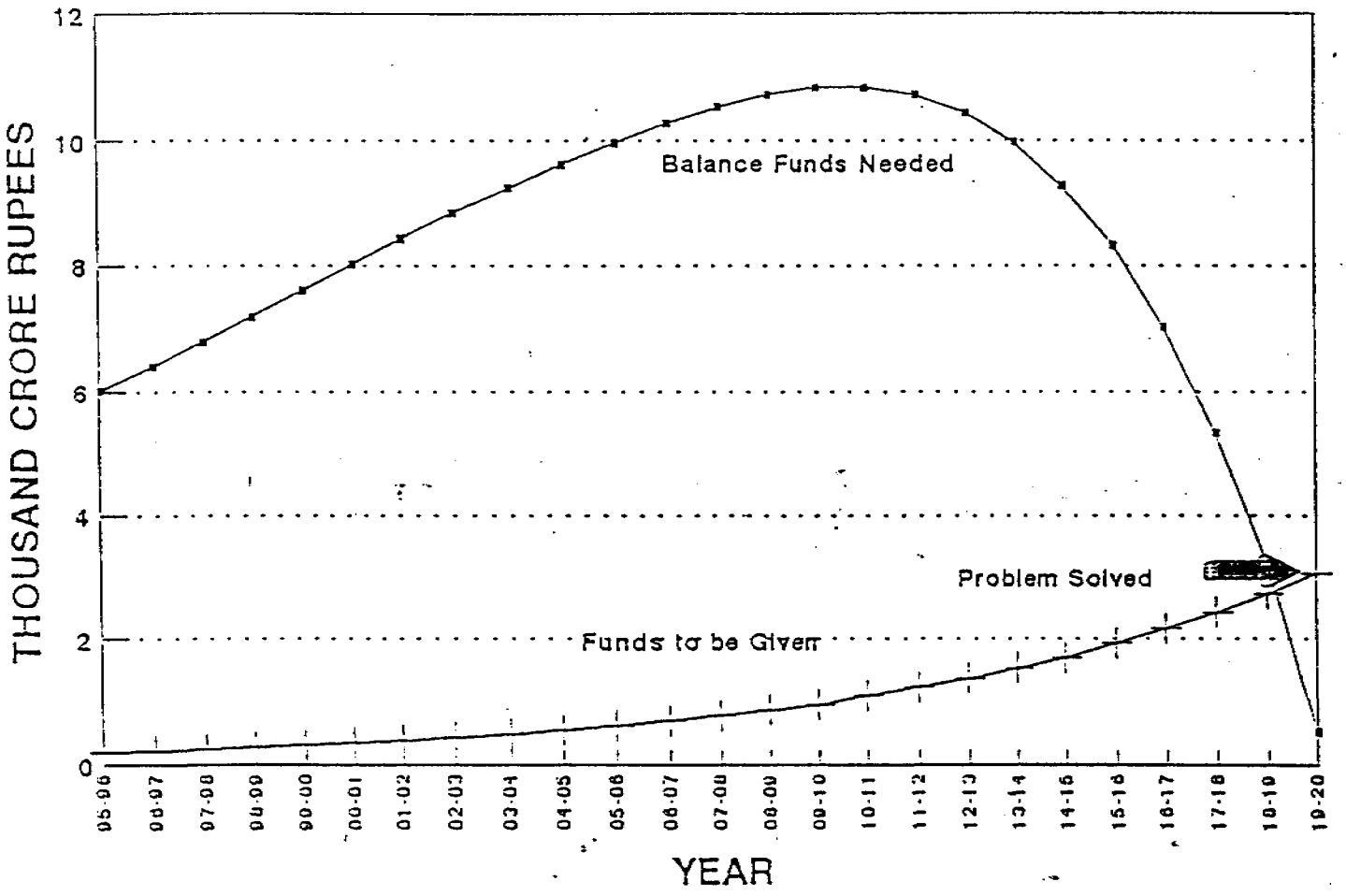
YEAR	95–96	96–97	97–98	98–99	99–00	00–01	1–2
FUNDS REQUIRED	6017	6399	6793	7196	7607	8021	8435
FUNDS LIKELY TO BE AVAILABLE	200	224	251	281	315	353	395
BALANCE FUNDS REQUIRED	5817	6175	6542	6915	7292	7668	8040
FUNDS REQD.WITH 10% PRICE ESCALATION	6399	6793	7196	7607	8021	8435	8844

YEAR	2–3	3–4	4–5	5–6	6–7	7–8	8–9
FUNDS REQUIRED	8844	9241	9620	9970	10282	10542	10736
FUNDS LIKELY TO BE AVAILABLE	443	496	556	623	698	782	876
BALANCE FUNDS REQUIRED	8401	8745	9064	9347	9584	9760	9860
FUNDS REQD.WITH 10% PRICE ESCALATION	9241	9620	9970	10282	10542	10736	10846

YEAR	9–10	10–11	11–12	12–13	13–14	14–15	15–16
FUNDS REQUIRED	10846	10852	10728	10447	9975	9273	8327
FUNDS LIKELY TO BE AVAILABLE	981	1099	1231	1379	1545	1703	1938
BALANCE FUNDS REQUIRED	9865	9753	9497	9068	8430	7570	6389
FUNDS REQD.WITH 10% PRICE ESCALATION	10852	10728	10447	9975	9273	8327	7028

YEAR	16–17	17–18	18–19	19–20
FUNDS REQUIRED	7028	5343	3202	526
FUNDS LIKELY TO BE AVAILABLE	2171	2432	2724	3051
BALANCE FUNDS REQUIRED	4857	2911	478	–
FUNDS REQD.WITH 10% PRICE ESCALATION	5343	3202	526	–

Required Increase in Rate of Funding To Solve Water Problem in 25 Years



— BALANCE FUNDS NEEDED + FUNDS TO BE GIVEN

@10% Annual Inflation @12% Annual Increase

It is to be noted however that the long distance regional schemes e.g. from Indira Gandhi canal, Yamuna river, Bisalpur dam,Chambal river etc. which entail pumping at high heads & carrying of water through hundreds of Kilometers, of pipe lines shall be very costly to operate & maintain. The community can not be expected to pay even 25% of the O&M cost of such schemes. Such schemes shall cost anywhere between 3000 to 10000 Rs per capita as capital cost. It will therefore be prudent to seriously consider & implement low cost solutions like water harvesting structures. Such a structure to collect rain water will although cost about 3000 Rs to 5000 Rs per capita in capital cost but the O&M cost will be negligible. Under JRY and DDP, finances have been available in the past for such structures. The water quantity & quality of other low cost solutions like hand pumps & Pump & tank schemes & small regional schemes must be maintained by:

a) Restricting other uses viz. agriculture by enacting suitable act; for example an act on the lines of the 'Model Bill to Regulate & Control the Development of Ground Water'; circulated by GOI to State Govts.

b) Recharging ground water reservoir by techniques like micro water shed development, sub-surface dams, recycling of waste water, percolation wells etc. If this is done, it will stabilise the problem of water quality & the need for heavy investments to bring chemically suitable water from long distances will reduce.

It is evident, however, that if the current rate of ground water exploitation continues & if ground water conservation & recharge measures are not taken in a expeditious way including through legislation; & if the current rate of investment in the sector does not substantially improve, the problem will be a never ending one.

5. MAN POWER PLANNING AND HUMAN RESOURCES DEVELOPMENT.

5.1 Introduction.

Most valuable resource of any organisation is its people. At the recruitment stage, qualified persons should be available. Further investment in this resource should be made through training, career development, counseling, performance evaluation and reward system.

5.2 Hand Pump Schemes.

Manpower, for installation of HPs and their O&M thereafter, is very crucial for the successful operation of H.P. schemes which cover about 25000 of the 37889 villages. Presently manpower deployed by contractors for installation of HPs is of uncertain competence. The existing H.P.mechanics with the Rural Development and Panchayati Raj Department, though trained, are less in number (about 2700). About 7000 additional mechanics are needed; if one mechanic per panchayat is to be made available. These have to be freelance workers to be paid by the Panchayat on individual job basis. A suitable model for Community Based Hand Pump Maintenance has to be agreed and then enforced. Recently held workshop on this matter had made certain recommendations.

5.3 Other water supply schemes.

Other schemes are pump and tank schemes, regional schemes and piped schemes. PHED has about 25000 workers below the rank of JENs for their O&M. They are largely untrained and poorly educated. For these workers, a project for training has been sanctioned in 1995 by GOI. There will be a HRD cell in PHED at headquarters and six district level trainers (PHED staff) in each district will be got trained first to work as trainers. During the course of 5 years, they will train these workers with the help of resource persons and NGOs as necessary by arranging 3 to 4 days courses for batches of 20 persons. The trainings will include (i) HP installation and maintenance (ii) pipe laying & repairs (iii) installation and O&M of electrical and mechanical equipments, pumps and motors and (iv) O&M of water treatment plants.

5.4 HRD Programme for senior level functionaries.

For PHED staff of rank of JENs and above, whose number is about 2000, there are some training courses conducted within and outside the State. Engineering Staff Training Institute of GOR conducts induction and refresher courses for JEs, AEs & EEs. There are about 18 courses conducted by National level Institutions in the country covering various areas of water supply of about 7 to 10 days duration for engineers. Some courses are for chemists and hydrogeologists also. Most of the courses are sponsored by CPHEEO of MUD of GOI. Some of the institutes/organisations are All India

Institute of Hygiene and Public Health Calcutta; Gujarat Jal Sewa Institute, Gandhinagar; Madras Metropolitan Water Supply & Sewerage Board, Madras; NEERI Nagpur and Motilal Nehru Regional Engineering College, Allahabad.

Some other training courses are (i) 1-1/2 Years study course leading to post graduate degree in Environmental Engg. in MREC, Jaipur, (ii) training in UK for management of water resources and related subjects and (iii) trainings for drilling staff.

Future Perspective.

Under Rajasthan Panchayati Raj Act, 1994, O&M of a large number of rural water supply schemes was to be handed over to the Panchayati Raj institutions and hence training of functionaries for the decentralised system was very important and urgent. Community level maintenance of HPs and trainings of grass root workers need to be expedited. Phased programme of decentralization of function and powers to Panchayats needs to be clearly enunciated and implemented.

6. EQUIPMENT AND HARDWARE PLANNING.

6.1 Purchase of materials

Bulk of the investment is made in materials like pipes, pumps, pipe joints' casing pipes, chemicals etc. Rigs and hydrofracturing equipment forms part of important equipment. For timely achievement of goals, advance planning for procurement of materials and good material management and inventory control practices are essential.

Centralised items of which purchase is sanctioned at the level of C.E and Finance Committee of the Board are- A.C.Pipes, PVC pipes, M.S.Pipes, G.I.Pipes, Hand pumps, submersible pumps, C,I.detachable joints, submersible cables, drilling bits & casing and strainer pipes. Other miscellaneous items like chemicals, starters, switch board panels, G.I.& C,I.fittings, nuts & bolts etc. are purchased by ACEs and lower officers as per delegation of powers. Total purchase is around Rs.140 crores annually of which about Rs.105 crores are of centralised items.

6.2 Drilling, rejuvenation of bores & hydrofracturing

There are 74 rigs with PHED which drill about 3000 HP bores and 300 tube wells annually. Full load for all types of rigs is not available throughout the year, causing under-utilisation of the rigs. In summer , when work load is more than the capacity of PHED rigs, rigs of GWD and private contractors are also deployed. In spite of a recent incentive scheme for drilling staff for performance above the prescribed norms, performance cannot equal to that of private rigs. As a matter of policy, Govt. rigs should be to cater only for problem areas like boulder strata, loose collapsible strata etc. and the normal areas should be left for private rigs to ensure increased output at lower cost. Of course, this would require adequate supervision over work of contractors.

Collapsed or choked bores or bores of less depth need rejuvenation for cleaning, fishing or deepening. PHED is not very enthusiastic about such works as the cost is said to be same as that of a new bore. There are 3 hydrofracturing machines with PHED which have been working for improvement of yield in the hand pump bores in the rocky areas of Kota, Udaipur and Ajmer regions. About 53 bores are annually hydrofractured by each machine with a success rate of 70%. A computerized hydrofracturing monitoring system has been installed, which needs to be operationalized.

6.3 Reserve Stocks & Inventory Control

At present, implementation period of a rural water supply scheme is from 1 to 3 years and that of a big urban scheme from 5 to 7 years. One of the major factors is non-availability of material in shorter period. The internal lead time for purchase of material (receipt of requisition and processing, issue of notice inviting tenders and receipt of tenders, processing of tenders and placement of orders) is 5 to 7 months. Third party

inspection of material from M/s. EIL, RITES OR PDIL is got done before dispatch from factory. The time taken for full supplies of important materials like pumps and pipes is often many months more than ideally desirable because of fluctuations in prices of raw materials and long process of decision making which is natural for a Govt. organisation.

The reserve stock limit is only about 5% of the annual purchase which is quite inadequate when examined in the context of ABC classification, fast and slow moving classification of materials and lead time required for purchase. Such low stocks cannot take care of contingencies and are conducive to delayed completion of projects.

All this calls for rationalised system of material management and inventory control supported by monitoring and data processing through computers. Programme planning, planning of purchase, determining inventory level, reorder point and economic order size, source selection & proper storage are some of the areas which need attention.

A project for computerisation in PHED has been approved by GOI. Trainings to staff, system analysis & development of customised software are to be taken up . This will support the material management information system.

7. **BREAKDOWN RATES OF HAND PUMPS**

During the last 15 years, about 128000 HPs in rural areas and 18000 in urban areas have been installed. In urban areas and 10 desert districts, responsibility of O & M is of PHED and in remaining 21 districts RDPD is responsible. Panchayat/Panchayat Samiti gets the HPs maintained through its mechanics. The system has not been working satisfactorily and 35% to 60% HPs in the rural areas are reported to be out of order every 6 months or so; when campaign by PHED has to be undertaken to repair these.

Each HP mechanic is supposed to take care of about 40 HPs for which he is paid about Rs. 2000 per month. Funds for spare parts @ Rs. 150 per HP per year are given additionally to Panchayat Samities. The mechanics have been recently absorbed as regular employees of the Govt.

In SWACH distts, HP maintenance system, through on similar lines, is working better. System of caretakers is there whose job is to look after the routine maintenance of the above-ground portion of HP, to educate the users & to report the defects quickly to the mechanic . SWACH had also been providing training to HP mechanics & caretakers & had been carrying out modifications in IM-II HPs so that Mean Time Before Failure gets enhanced.

Over the years, about 8% HPs have been abandoned due to bore collapse etc. & 4.5.% have gone dry due to decline in water table. As per recent repair campaign, on an average 44% HPS were found out of order & these were repairable . In SWACH distts, this percentage was 28% .

Community based HP maintenance system with inputs for community awareness, participation & health education can improve the situation. IM-III HPs are reported to have 100% more MTBF than IM-II HPs & require only one skilled & one unskilled person for repairs.

8. LEGISLATION

With increase in the pace of economic development, water resources were exploited more & more resulting in many areas of the state & the country feeling the need for legislation for regulating the use of water, preserving its quality , its conservation and control of pollution.

Ministry of Water Resources of GOI had issued a document 'National Water Policy' in 1987 . GOR is reported to have taken a decision to frame a water policy within its overall frame work. The National Water Policy lays down that in the planning & operation of systems, water allocation priorities should be :

I Drinking water
II Irrigation
III Hydro-power
IV Navigation
V Industrial & Others

It also lays down that exploitation of ground water resources should be so regulated as not to exceed the recharge possibilities as also to ensure social equity.

In 1992, GOI had circulated a Model Bill to regulate & control the development of ground water and had requested the State Govts. to enact suitable legislation on those lines. Some states like Maharashtra, Gujerat & Andhra have done so but Rajasthan has not yet taken any decision.

An act, Water (Prevention & Control of pollution) Act 1974, is in force. It is mainly being used to control environmental pollution by industries. Pollution by untreated sewage discharged from towns is yet to be controlled.

For corporate style of management of water supply systems, Rajasthan Water Supply & Sewerage Corporation Act 1979 was passed. Under this act, any or all of the urban and rural water supply systems could be taken over by this autonomous corporation. However, the Act did not come into force & the corporation exists in name only.

Rajasthan Panchayati Raj ACt-1994 has been passed & some simple water supply systems of rural areas are envisaged to be handed over to Panchayats & Panchayat Samitis. Necessary rules & modalities have to be worked out for this transfer of functions and responsibilities. The phased programme of decentralization has to be clearly worked out.

Meanwhile, the situation about ground water exploitation is becoming more & more grave with every passing year. As per latest estimates of the GWD; 167 blocks (28%) have been more than 100% exploited, & many more have come in the category of

Dark(85% to 100% exploitation) zones. Putting restrictions on further exploitation of ground water in these zones is of utmost urgency, if we do not want to harm the welfare of the next generation.

9. **STRENGTHS & WEAKNESSES**

The water supply sector has witnessed a sea change in the last 3 decades; during which annual investments have increased manifold & a sustainable water supply programme has emerged backed by tested policies, sub-programmes and strategies of operationalisation in the field.

The programme gained importance when it was taken up in 1986 under National Drinking Water Mission as one of the 5 social Technology Missions. There was commitment of GOI to put in maximum amount of scientific & technology development in this Mission. The prime status still continues under RGNDWM. This can be said to be one of the major strengths of this programme.

PHED, which is looking after virtually this entire sector has had an experience of 30 years & has undertaken several projects in diverse geographical & hydrogeological environments & has successfully faced droughts & floods . The number of professionals is around 2000 & thus the services have percolated to the villages. These, again, constitute the strengths in this sector.

The weaknesses are :

(i) Non existence of (a) a State Water Policy & (b) umbrella organisation for water resources.

(ii) Non existence of a suitable legislation to prevent overexploitation of ground water resources.

(iii) Non existence/operationalization of IEC set up.

(iv) Non existence of sufficient feasibility reports for water supply projects to fulfill short term & long term needs.

(v) Unsatisfactory system for assessing the need of funds for O & M & inadequate finances for O & M of assets. A practical tariff system backed by political will may be necessary for this.

10. MONITORING & EVALUATION

The present monitoring system in PHED has been developed mainly to satisfy the information needs of GOR & GOI regarding physical & financial progress of works. It should be perceived as a tool by the management for further planning and for review of performance against set targets & standards of performance.

Presently, RGNDWM has prescribed a few formats as follows :

1. Monthly physical & financial progress report for coverage of villages/habitations
2. Quarterly physical & financial progress report
3. Annual progress report
4. Progress report about bilateral/multilateral externally aided projects.
5. Progress report of Sub-Mission projects
6. Monthly progress report of performance of drilling rigs.

GOR and Head of PHE Deptt. have also prescribed following formats for monitoring progress :

1. Coverage of problem villages & habitations
2. Coverage of SC/ST habitations
3. Tube wells drilled & commissioned
4. Pending power connections
5. Cleaning of reservoirs
6. Hand pump repairs progress (during campaigns only)

At different levels in the hierarchy of the PHED, following activities are being monitored; although not universally & regularly :

1. Status of issue of technical sanctions
2. Material procurement
3. Tours & inspections-quality control of works
4. Revenue realisation
5. Response to VIP letters.
6. Matters relating to establishment such as filling of vacant posts , pension cases, court cases, disciplinary matters etc.
7. Other matters such as for works lying incomplete since a long time, preparation of schemes for targeted villages, disposal of surplus & unserviceable material etc.

A lot of data is thus being generated and the next step should be to analyse the data, get relevant information out of it, evaluate performance against set targets & prepare meaningful reports for the management . This report should serve as a decision support for future planning & for mid-course evaluation, & corrective action as necessary.

Computerisation, which has been initiated , should be able to achieve the above objectives if the system and the needs are analysed properly & the software is developed accordingly with full involvement of the users.

The practice of evaluation which is a post-mortem, is non existent in the deptt.. It should be started for important activities & large projects so as to be useful in planning for similar projects & for next generation of projects & in rewarding or disciplining the persons concerned with that activity.

11. POLICIES & PROCEDURES

The State has limited resources of finances, manpower, materials & is deficit even in water resources. Over a period of time, many policies have been evolved, but they need review in view of changing socio-economic conditions, new technology becoming available & changing environment.

11.1 Pricing of water

Pricing of water is a tool by which uncontrolled demands on this precious & scarce resource can be regulated. Presently the Govt. is heavily subsidising the cost of production & distribution of water both for urban & rural communities . The tariff structure is quite old. There is scope for upward revision of tariff . Rural community is already incurring cost in terms of time, energy & opportunity when they have to fetch water from long distances & in camel carts. A better O & M of water supply schemes coupled with increased tariff, which should automatically increase by about 10% per year (rate of inflation) would be desirable .

11.2 Aesthethic water points

The sites of Hand pumps & public taps are usually an eye sore & are typically points of insanitary conditions, whereas the situation should have been otherwise. A low cost aesthetic environment around a HP or tap has been worked out, which should be enforced with suitable variations as necessary.

11.3 Integrated water policy

The Hari Shanker Bhabhra committee and M/s. Tahal Consultants, have given to the government some very important recommendations regarding integrated policy for management of water resources & for legislation. These need to be looked into urgently.

11.4 Water treatment at domestic level

Whereas guineaworm disease is going to be eradicated within an year or so; the problem of fluorosis is another wide spread disease causing skeletal deformities , difficulty in mobilisation & dental fluorosis in affected persons. Provision of alternate water through D/F plants or regional schemes by the GOVT. may take a long time besides being costly. Defluoridation at domestic level by Nalgonda process or Activated Alumina process should be propagated extensively to supplement the programme.

11.5 Involvement of NGOs

To supplement the efforts of govt. sector, involvement of NGOs & consultants should be increased in the areas of (i) trainings, (ii) IEC activities, (iii) preparation of feasibility reports, (iv) R & D and (v) evaluation of important activities & projects.

11.6 Institutional changes

Institutional changes may be desirable e.g. to form separate water supply boards or corporations for urban towns to promote accountability & responsibility of local community. Setting up separate departments for Rural Water Supply , Urban Water Supply , Water Resources, and Rural Engineering Services should also be considered.

11.7 People's participation

Some policy guidelines and structured system should be evolved under the frame work of the new Panchayati Raj Act to ensure people's participation right from the planning & formulation stage of a project to its O & M .

11.8 Conservation of resources

Policy should be framed for (i) recharge of ground water resources, & (ii) to ensure proper O & M of assets.

11.9 Drought preparedness

Regarding droughts, which are frequent, the policy & approach has been mostly to manage it after it has occurred. Measures are called for preparedness to face the drought by taking advance action for water conservation measures & water augmentation schemes.

12. **SUSTAINABILITY.**

Under the activities of RGNDWM, a sub-mission on conservation of water and recharging of ground water was launched. Emphasis in these was on sustainability aspects of water supply which was sought through :

(i) Scientific source finding (remote sensing)
(ii) Qualitative improvements in materials
(iii) Improved O&M
(iv) Water conservation through water harvesting structures and minimisation of evaporation losses
(v) Recharging of aquifers

The sub-mission could not make much headway in the last two areas. The recommended course of action to have long term sustainable systems would consist of the following measures:

(a) For over-exploited zones, a master plan should be drawn up in coordination with related departments such as agriculture, soil conservation, forest, GWD, PHED. The plan should be implemented with full involvement of community and regular monitoring. It should be supported by suitable legislation.

(b) On the consumption side, better agriculture practices should be introduced and awareness should be generated amongst people to prevent waste and promote efficient use of potable water.

(c) Recharging of aquifers should be undertaken.

(d) NGOs, consultants and professional institutions should be encouraged with provision of incentives and awards for development of methodologies for water harvesting, water conservation and artificial recharge.

(e) Steps should be taken to ensure that after project implementation teams withdraw, the initiated measures for improvement of health and hygiene, provision of safe water supply and community participation are sustained in the long run. The task can be entrusted for a couple of years to a local NGO, with budget provision for the same having been made in the project itself.

1COMMUNITY MONITORING & PARTICIPATION (WOMEN'S PARTICIPATION): WOMEN & WATER

1. INTRODUCTION

The 1980 World Conference of the U.N. decade for Women adopted a resolution that mandated member States to promote full participation of women in planning , implementation & application of technology for water supply projects.

Active participation of community was envisaged in rural water supply right from planning up to O & M . Some of the important benefits envisaged were :

1. A sharper identification of needs
2. Local resources mobilisation
3. Providing added input of traditional local knowledge
4. Closer monitoring & supervision of work
5. Improved O & M
6. Authentic feed back

1.1 It is a mature dialogue between community & the professionals of the delivery system leading to consensus decision; instead of just airing of needs or expressing preference of location by the community.

1.2 Women are the most important group in the community concerned with water supply . It is they who have to haul water from long distances for the family which consumes a large part of their time & energy. Then again because of unsafe water causing diseases in the family, it is they who have to bear the burden.

1.3 The centrality of water to other aspects of development such as health, education, nutrition, productivity, income generation, creation of community assets etc. needs to be recognised in deciding investment priorities & community involvement. Release of women's time through water projects needs to be monitored.

The ultimate priority is to hand over the management of water & associated common property resources to organised groups of women.

Water supply programme is an essential instrument for the improvement of women. The integration of water supply projects with other developmental activities,like poverty alleviation and employment generation,should form core component of women's development programme. There should be a formation of collective voice of women in deciding issues,priorities & concerns.

The villages level committee for water should have at least 50% women members. There should be an integrated & holistic approach for programmes related to education, health, sanitation, women's development & employment.

Women as the managers & principal users of domestic water identify water supply as a first priority because it is they who suffer most from the absence of such facilities close to their homes . Women have the ultimate weapon. They determine whether a facility is used or not.

Although at present there is high level of ignorance & misconception among women about many of the issues related to water,there are far higher levels of motivation among them than among other sections of the community towards improvement & adoption of safe practices & even towards sharing the cost of water supply facilities.

On the part of the implementing agencies, preoccupation with physical & financial targets should not be there. Stress should be on development strategies that focus on human beings: they should be the programme subjects rather than programme objects. People should be partners in the development programme.

Also each delivery system, be it health education, sanitation, or employment generation; works in isolation with each other; whereas the changes sought in user responses demand an integrated understanding of water , health & environment etc. Success of a programme should not be confined to the achievement of time bound physical targets but must be evaluated in terms of ability of communities & authorities to work together towards problem solving . Adequate institutional arrangements should be there to create this enabling environment.

Women between the ages of 15 & 35 are the principal collector of water. Therefore water supply facilities will conserve their time and energy which they can usefully deploy for education , earning opportunities and health & education of their children.

Women are not a special interest group in water & sanitation; they are a mainstream interest group. This is both as beneficiaries (a lessened burden being a prerequisite for contributing to other development activities) & as partners. Without their involvement, project work will be inappropriate & failing.

Women as part of community participation efforts come into clear focus as basic human resources with training needs, in order to better perform their traditional roles & to learn new skills. Women also are increasingly recognized as trainers within their own communities & households.

Water supply & sanitation schemes can only be effective if they contain hygiene education component , based on community involvement in particular that of women. By having more time, energy, better health & higher self esteem through accessible water

& sanitation, women can contribute more to the sustainability & effective use of these improved systems.

2. SCOPE OF COMMUNITY PARTICIPATION

Areas of community participation are :

1. Identification of drinking water problems
2. Utilisation of indigenous technical knowledge regarding water harvesting , source of water supply , use of local resources and technology.
3. Integration of the local knowledge with the technical aspects of proposed scheme.
4. Site selection to ensure maximum social benefit
5. Contribution towards O & M cost, contribution towards capital cost if possible, commitment to operate & maintain the water supply system & assets.
6. Keeping water sources neat & clean
7. Periodic evaluation of project
8. Feedback by monitoring. For instance , people living in the vicinity of hand pump can always report as to how many pipes have been lowered and what repairs were done when .

It is often assumed that community participation in rural water supply project means little more than voluntary unskilled labour. This participation is not enough to ensure a successful project. When villagers learn how to repair a broken pipeline, the community gains an added measurement of security .

A participatory rural water supply programme should be undertaken jointly with beneficiary communities rather than some thing which is done for communities by outsiders.

3. FACTORS CONDUCIVE TO COMMUNITY PARTICIPATION

Factors conducive to community participation are:

(i) EMPLOYMENT OF APPROPRIATE FIELD PERSONNEL

For developing good working relationship with thecommunity, field worker should be some one who can communicate effectively with villagers , who may otherwise not respond fully to outsiders. They should be trained before hand.

(ii) USE OF APPROPRIATE TECHNOLOGY

Technology should not be alien to the community. Examples are : use of equipment or parts which require recurrent procurement from far away places or

are imported e.g. desalination plants , solar photovoltaic plants. Technology chosen should be suited to the needs & resources of the beneficiary community.

iii) ORGANISING & TRAINING VILLAGERS TO PERFORM KEY TASKS

Members of village water committee should be trained in various tasks like collecting monthly charges,repair of leaks in pipe line etc.

(iv) DEFINITION OF RESPONSIBILITIES FROM THE OUTSET

For relationship of mutual trust between community & water supply organisation, it should be made clear from the start as to what participation is needed. There should be open-ness on part of staff of water supply organisation at field level to collaborate with community. It should be realised that water is not purely 'technical'. Matters needing participation should be discussed & an agreement should be reached. Sometimes a resolution of the community or signatures of the beneficiaries are obtained on their commitments eg. to make monthly payments for O & M.

(v) REACHING CHILDREN IN SCHOOLS & PARENTS THROUGH CHILDREN

Hygiene curriculum should be in use in schools while the project is implemented in the community . Schools should have water supply facilities for this.

The matter should be presented at the meeting of parents & teachers so as to sensitize parents.

(vi) PAYING ATTENTION TO COMMUNITY BELIEFS

Project staff should pay close attention to the habits,beliefs & taboos of the people. This will then be a starting point for hygiene education messages to make behavioral changes.

vii) COMMUNITY NEEDS & PRACTICES SHOULD BE SURVEYED.

viii FINDING ORGANISATION IN THE COMMUNITY WHICH CAN HELP THE HYGIENE EDUCATION AND COMMUNITY PARTICIPATION EFFORTS

In almost every community there are formal & informal organisations whose aim is to improve conditions in the community. Such self help group should be given support. .

For community participation , the paternalistic attitude of working for rather than with the community should be changed . For this the officials must have understanding , skill, training, physical resources, beaurocratic flexibility , time, patience and imagination necessary to work effectively with local community.

(ix) PARTICIPATORY APPROACH

The approach should be participatory , which is characterised by high flexibility, high people orientation, low predictability, low external control , low programmed structure, and loss of centralised control. Structure of the programme develops step by step along with action. It requires achieving a balance between ' people know best' and 'we know best'.

Effective & sustainable utilisation is the primary goal and yardstick. It integrates the need for hygiene education, and other support systems to ensure optimal health, social, economic and environmental impact. The indicators of success are

- effective utilisation
- sustainability
- replicability

4. BENEFITS OF COMMUNITY PARTICIPATION

Community participation is instrumental in the following :

1. It maximises health benefits
2. O & M is effective and sustainable
3. It can result in money saving to the water supply organisation
4. It can improve the ability of the community to undertake other community improvements on its own.
5. It initiates behavioral changes for adequate functioning and appropriate use of new system.
6. It can increase their income and /or improve their nutrition through vegetable garden and other micro enterprises .
7. It allows for adaptation of local situation to need.

5. EXISTING SITUATION

5.1 GENERAL PROJECTS

The expert committee on Rural Water Supply Programme (with special reference to the Mini-Missions and Sub-Missions)was constituted by RGNDWM. After extensive touring of various states including Rajasthan, it submitted its report in April 1994. It has been reported that no viable module of community participation is existing in the state except that of SWACH. Only consultations with Panchayat or local people regarding location of spot source like HP,Public stand post or Ground level reservoir are made. It has reported that even in those states where Panchayats have been entrusted with the task of running local water supply systems, the involvement of the community is only marginal. This is due to beaurocratisation of Panchayats rather than democratisation of the programme. They have reported only two success stories of community participation - one in Midnapore in West Bengal and another of SWACH in Rajasthan.

5.2 SWACH PROJECT

5.2.1 KEY INGREDIENTS

The key ingredient in the success of this project was community participation . This was accomplished by :

1. Village contact drive
2. Village contact team consisting two male and two female members, with adequate training
3. Well structured strategies for involvement of the community like door to door contact,filling of questionnaires , indigenous cultural programmes to convey the messages
4. Well designed didactic materials
5. Well selected women animators
6. Training & orientation courses for grass root level functionaries, teachers and NGOs.
7. Selection & training of women as HP mechanics

5.2.2 TRAINING OF WOMEN TO UNDERTAKE O & M JOBS

In the SWACH project HP mechanics were trained to do the repair jobs of hand pumps in Dungarpur, Banswara & Udaipur districts. 174 Women animators working in the SWACH project were selected for training for this job. In 1995 , 86(49%) women mechanics had been absorbed as hand pump 'mistries' of which 3 have since left service. Following are the major findings of an evaluation study:

1. Women have an average of 10-20 hand pumps allotted to them, while men have 30-50 Hps.

2. Beneficiaries stated that there was no difference between male & female mechanics in the time lag to repair a HP reported out of order. 29% women attended.HP immediately vs. 27% men.
3. Mean time for HP remaining out of order was 7.68 days for women mechanics; where as it was 4.13 days for men mechanics.
4. Average annual income was 2090 rupees.
5. The women mechanics were married and their average age was 25 years
6. Their main reasons for taking up the job were income generation and to know more.
7. They had moderate problems in household chores , child rearing and socio-religious matters after taking up the job.

It can thus be concluded that there is no difference in male & female mechanics as far as time taken to respond to a HP which is out of order. However, this finding contradicts with beneficiaries report saying that meantime for HP remaining out of order is large for women. Reasons for this should be explored. Replication of such measures will depend upon social, cultural and economic background of the community.

5.3 GERMAN AIDED PROJECT IN CHURU, GANGANAGAR & JHUNJHUNU DISTRICTS

5.3.1 GENERAL FEATURES

This integrated water supply , sanitation & health education project was prepared by consultants appointed by the Govt. of Germany (represented by its development bank-the KfW). In its global shape, it proposes to cover 956 villages and 11 towns in three districts covering a design population of about 26.0 lacs spread in a area of about 20,000 sq.kms . The estimated cost of this total project is Rs. 847.50 crores.

While finalising the assistance package it was decided to take up a part of this project covering 325 villages and 2 towns for an estimated cost of Rs. 253.01 cores. This was done in view of limitation of the resources. The agreements between GOI and KfW and between GOR and KfW were signed on 17th June 1994 in Frankfurt.

Water will be taken from branch of Indira Gandhi Canal in Ganganagar distt. & will be treated & pumped to various clusters of villages. The project provides for technical works of the water supply system and partial sanitation works in the towns to be done by a separate cell in PHED called Project Management Cell (PMC) headed by a Chief Engineer; efforts for mobilising community participation, building awareness, giving basic health education and implementing low cost sanitation measures through an independent organisation called Community Participation Unit-CPU, (a consortium of 5 NGOs); and concurrent consultancy by an Indo--German consortium to PMC and CPU. The project is targeted to be completed by the year 2000. The entire financial package is as below :

(Amt. in Crores)

S.No.	Measures	GOR Share	Share of Govt. of Germany (KfW)				Total
			Assistance	Loan	Assistance (amt. in Million DM)	Loan (Amt. in Million DM)	
1.	Technical (Through PMC)	55.00	88.06	72.00	48.92	40.00	215.00
2.	Non Technical (Through CPU)	-	18.47	-	10.26	-	18.47
3.	Consultancy	-	19.48	-	10.82	-	19.48
	TOTAL	55.00	126.01	72.00	70.00	40.00	253.01

The agreement signed presently provides for 55.00 million DM assistance and for the balance 15.00 million DM, agreement is likely to be signed shortly. The KfW has also committed to compensate extra cost of pipes that may have to be incurred in order to avoid usage of AC pipes. Apart from other conditions , there is a condition of ensuring full cost recovery for maintenance from beneficiaries or by cross subsidy at the state level . 30% of this should be achieved before starting the 2nd construction phase of the project.

The sanctioned project provides for trunk mains of 93.5 kms. length of 1100 m.m. dia. PSCC pipe line from Dhannasar to Sardarsahar, 900 m.m. dia. PSCC line 36.5 kms. length from Karamsana to Sahawa and for other smaller lines to connect the villages in the area. It provides for a dedicated feeder of 33 KV and a communication system apart from other regular features of water supply systems like pumping stations, treatment plants,tanks,quarters etc.

The detailed engineering of the main pipe line system, electrical feeder system, office building, and residential complex in Churu have been completed and technical sanctions are being issued . Construction work is in progress on the office building and the residential complex and Rs. 5.00 crores have been paid to RSEB for their works . They are likely to complete work in three years time. The detailed engineering of one treatment plant and the voice communication system are complete and the rest are in progress.

The PMC has spent Rs. 575.70 lacs and the CPU has spent Rs. 31.00 lacs upto end of March 1995. The consultants have been paid 1.09 million DM directly by KfW. The KfW has given following assistance upto March 1995 :

Amount in Rs.

S.NO.	PARTICULARS	LOAN	ASSISTANCE	TOTAL
1.	Technical works (PMC)	2,70,48,551.00	2,27,64,678.00	4,98,13,229.00
2.	Non technical (CPU)	-	1,49,43,871.00	1,49,43,871.00
3.	Consultancy	Dm.	10,93,768.00	10,93,768.00

It is proposed to spend Rs. 16.0 crores on the technical measures in the year 1995-96.

In this project, which is in the initial stages of implementation, slightly different model for community participation is envisaged. This project will cover 325 villages & 2 towns up to 2000, with pumped water supply systems, public taps & house connections.

The technical tasks of the project will be accompanied by corresponding promotional & educational activities in order to impart knowledge & social awareness & to empower the target groups. The implementation of these measures will be done by an autonomous organisation set up within the project and named 'Community Participation unit (CPU)'.

Participation of the community is to ensure sustainability of the scheme by creation of civic sense, & sense of responsibility. Improvement of human behavior is another main point ,which will be done through a comprehensive education & mobilisation programme, for better knowledge & more adequate attitudes. This will contribute to empowerment of the people as far as water supply & sanitation & health matters are concerned. For this, population will be organised in self help or action groups . The main specific target groups are

- Water consumers represented by water watch groups
- Households
- Women represented by women health groups

5.3.2 PRINCIPAL GOALS

The principal goals are :

- To create awareness & a sense of responsibility for consumption of water
- To launch women development activities .

5.3.3 STRUCTURE OF CPU

The structure of the CPU will be :

Steering Team (5 members)
Operation Team (7 members)
Field Teams (33 members)(in 10 teams)
Steering Team : It will perform conceptual tasks
Operation Team : It will perform prepare & supervise field work & give support to field workers & conduct training camps. These are organisational tasks.
Field Teams : They will conduct activities on spot: to introduce project components in the villages, mobilise & organise the target groups . Workload is characterised by communicative tasks. Each field team will have 3 members of which at least 1 will be woman. 1 member will be experienced in community participation , 1 in hygiene and health education and 1 in construction of sanitation facilities.

5.3.4 MODULES OF FIELD WORK

There are 5 main modules of the field works :

(i) COMMUNITY PARTICIPATION

Consists of several meetings with local influencers, different social groups/castes to achieve continuous support for all activities to be undertaken & to eliminate obstacles.

(ii) WATER WATCH GROUP

Establishment & training of a self help group for

1. Caring for water distribution facilities & to pay for water
2. Learn to save/conserve water & know the risks of pollution

iii) CONSTRUCTION OF LOW COST SANITATION FACILITIES

(iv) WOMEN GROUP

Women development activities will be carried out in order to develop women's knowledge on health & hygiene problems. Many women should become members of water watch group. The following topics would be discussed in the meetings of the women groups , which shall be conducted by the woman member of the field team.

- How to improve water hygiene from tap to the mouth

- How to improve household hygiene every where from the roof to the ground
- How to improve the outside hygiene in compound and kitchen garden
- How to improve child/baby hygiene for girls & boys
- How to prevent ,diagnose & treat the most prevalent diseases in the village
- How to prepare healthy food by better & cheaper cooking.

(v) AD-HOC MEASURES

These include other measures to effect improvements in health conditions like storm water drainage, school latrine, traditional water sources etc.

DIDACTIC MATERIALS

Films, posters, booklets containing drawings & sketches will be prepared.

NGOs

Members of steering team will come from the NGOs.

6. PLANS & PERSPECTIVE

RGNDWM has decided to take up measures for community participation under its new programme COSMOS - which stands for Community Owned & Supported Maintenance and Operation System. It is to be operationalised very soon.

Its main features are : Watsan committees in villages - with authority to raise resources, transfer of HPs & PSPs after improvement of source surrounding

- Formation of water user committees at Panchayat level & at habitation level
- Sensitisation of Minister,Secretaries. & Chief Engineers, familiarisation of Zila Parishad Presidents, Distt Collectors,BDOs,PHED EEs - 2 day workshop
- Awareness campaigns & village contact drives
- 2 tier O & M system with self employed mechanics
- Passing of resolution by Panchayat for accepting ownership & fund raising for O & M
- Transfer of ownership
- Training of Self Employed Mechanics
- Training for community support mobilisation and for hygiene promotion and health education (to grass root workers) by State HRD cells.

14. SYSTEMIC PROBLEMS & INSTITUTIONAL ISSUES.

Various patterns of institutional arrangements have been working in different states in the country in the water supply sector e.g. local bodies for individual towns, Panchayats for villages, Board or Corporation at State level. In Rajasthan apart from the PHED, other organisations working in the sector are GWD, Directorate of RIGEP and the Panchayati Raj Institutions. GWD drills about 200 tube wells annually for PHED water supply schemes, RIGEP has been coordinating the implementation of Guineaworm Eradication Project and Panchayats are maintaining the HPs.

Some aspects need adequate attention by the main organisation i.e. PHED. Management of special functions should have been done by specialists. Some examples are legal matters and personnel management. Engineers cannot understand the best policies and details of these disciplines.

There should be an expert wing in PHED for design of big or complex water supply projects. Also duties, responsibilities and performance targets at each level should be properly defined so that management by objectives and proper performance appraisal is possible.

Proper placement policy for professionals should be there so that each gets posted in different geographical areas with varied water supply spectrum and problems. It will develop the person's professional knowledge, competence and experience and the organisation will also benefit from his wide experience. There should be structured institutional arrangements for dialogue between PHED and beneficiary community. Meaningful discussions on policies and programmes of PHED should take place.

The system of fighting elections for Panchayati Raj institutions on the basis of political parties, has created cleavages among rural population. This has made effective transaction with all the segments of the community difficult. To realise the object of participatory management, some system or institution at Panchayat level should be set up to cut across the various segments.

15. APPLICATION OF TECHNOLOGY

1. Since 1986 when RGNDWM had started its operations in the sector, many R&D and Science & Technology inputs such as Defluoridation and Desalination plants, remote sensing for identifying potential areas of ground water etc. have been made.

The areas which are suitable for technology inputs in rural areas are :-

1. Defluoridation 2. Desalination 3. Pumping by solar energy through Solar Photovoltaic cells; 4. Water harvesting structures 5. Artificial recharge of ground water.

2. **Defluoridation:**

Two processes have been subjected to field trials after having been developed by NEERI. These are Activated Alumina process and Nalgonda process. Comparison between the two is given below :-

S.No.	Characteristic	Nalgonda	A.A.
1.	Capital cost of 200 cu.m/d plant	Rs.11.20 lacs	Rs.13,80 lacs
2.	Cost of treated water	Rs.4 to 34/- per cu.m for plant capacity 480 to 10 cu.m.per day.	Rs.8 to 53/- per cu.m. for plant capacity 480 to 10 cu.m
3.	Application in rural area.	Technology adopted for fill and draw type plants	Technology needs more field evaluation.
4.	Chemical used handling & availability	Alum used; handling & availability easy.	Alkali & acid used once in a couple of months, handling & availability difficult.
5.	Energy required	Daily mixing of alum manually.	None

Some other patented processes have also been developed by entrepreneurs based on the principle of ion exchange and needing regeneration of the media periodically.

In Rajasthan, 18 F & D type plants and 28 HP attached D/F plants have been commissioned since 1990; but only about 30% have been working. The reasons are :

1. Technology of HP attached D/F plants needs review. The plants demand constant monitoring and skilled operator.
2. Lack of management and training to staff for operation and maintenance of Fill and Draw type plants.
3. Lack of awareness on the part of community.

3. Desalination.

Two processes have been in use in the state. These are Reverse Osmosis and Electrodialysis. Comparison between the two is given below:

S.No.	Characteristic	E.D.	R.O.
1.	Average capital cost.	Rs.38,000/-per cu.m/day plant	Rs.33,000/- per cu.m/day plant
2.	Cost of treated water per cu.m	Rs.25 to 38/-	Rs.93/-
3.	Range of TDS (salinity) in raw water	1500 to 5000 mg/l	Greater than 5000 mg/l

47 plants based on R.O. process have been installed in Rajasthan and were operated by manufacturers for 3 years since 1990. They remained non-operative after that due to lack of proper personnel and finances. Now, O&M of some plants has been entrusted to qualified private parties and some are to be rectified and handed over to the Deptt. by manufacturers.

Similarly 41 plants based on E.D. process have been installed, out of which about 7 are reported to be in operation in Barmer distt. and for remaining, O&M contract for some is being given to qualified private parties. Some are yet to be rectified and handed over to the Deptt. by manufacturers.

Continuous R & D support is needed to bring down the cost of desalination and defluoridation. The cost per cu.m. is very high when compared to the usual cost of Rs.2/- per cu.m of piped water where it is from a nearby chemically suitable source.

4. **Solar photovoltaic cells**

In unelectrified rural areas, solar energy is stored by means of SPV and is converted into electrical energy to run motor driven pump in a well or tube well. 34 SPV plants have been installed in Rajasthan and about 50% are reported to be working. Others have been non-functional due to damage to the structure by dust-storms, hailstorms or otherwise . This is only a stop gap arrangement, till the villages are electrified. However, they require very little O & M.

5. **Water harvesting structures.**

It involves collection and storage of rain water and also other activities aimed at harvesting surface water and ground water, with minimisation of losses through evaporation and seepage. It can be accomplished by:

(i) In-situ harvesting e.g. through village ponds, 'Tanka', sand filled reservoir, rooftop collection.

(ii) Underground storage e.g. through percolation tanks, 'Khadins', check dams, sub-surface barriers.

(iii) Soil conservation measures e.g. gully plugging, contour bunding, afforestation.

(iv) Run off enhancement measures through treatment of catchment area and through reduction in evaporation and seepage losses.

For arid and semi arid areas like Rajasthan, in-situ harvesting structures like pond and 'tanka' have been recommended as more useful. These structures although traditionally deployed, need technological improvements. CAZRI Jodhpur has done some R&D work on these. Proper computation about catchment area and volume of 'Tanka' based on variation of rainfall, improvement of run off from its catchment through cost effective surface treatment are some aspects needing R&D efforts. Per capita capital cost of a 'Tanka' which is an underground masonry storage tank, is quite high viz. Rs.2500/- to Rs.4000/- per capita; but the O&M cost is negligible.

A pond or 'Nadi' can be properly designed with minimum surface area per unit volume to minimise evaporation losses. For ponds, which last for major part of the dry season, slow sand filters can be installed to filter the water and to make it bacteriologically safe for human consumption, after disinfection by bleaching powder. Some such plants have been installed and reported to be popular in Nagaur distt.

State Govt. and PHED should adopt construction of water harvesting structures as a regular priority item of the water supply programme.

6. Artificial recharge of ground water.

Declining water table calls for artificial recharge. Its purpose is to conserve water for future use, filter the water naturally and to dispose off surplus or waste waters. The factors governing the feasibility of artificial recharge are:

i) geological and hydraulic boundaries controlling inflow and outflow of water;

ii) storage capacity of underground formations

iii) water resources available for recharge e.g. surplus waters of another river basin or suitably treated sewage or industrial effluents.

Artificial recharge is done through spreading basins , injection wells, recharge pits, percolation tanks, check dams, gully plugs, contour bunding, sub-surface dykes.

Waste water after some treatment can be used for recharge through direct injection into wells, water spreading or irrigation application. Some treatment is offered by the soil itself. In such systems called SAT (Soil aquifer treatment) systems, percolated water can be collected from drains or wells at safe distances away from the recharge area. No artificial recharge works have yet been taken up in Rajasthan and there has been limited application elsewhere in the country. This field affords promising opportunities for technology inputs and pilot projects should be undertaken immediately to arrest declining water tables in the State.

17. WATER QUALITY AND TREATMENT

1. Surface water .

Only 18 out of 222 towns in the State have surface water supplies. 95% of the State's population has supplies from ground water and therefore its quality assumes significance.

For surface water supplies, except in remote rural areas of Ganganagar and Hanumangarh distt. treatment through filtration plants is reported to be satisfactory. Proper O&M of slow sand filtration plants in rural areas needs training of operators and supervisors.

2. Ground water quality.

Ground water supply is usually disinfected except where direct pumping into the distribution net work is done from a dug well or tube well. Bacteriological quality can be monitored by rural community through a simple test for presence or absence of chlorine in water or by means of a small bottle containing culture media for certain organisms, which render the water black within 16 hours, if water was contaminated.

Regarding chemical quality of ground water, 56% villages of the state have chemically unsuitable water. The water has either excess TDS, excess nitrates or excess fluorides or a combination of these. As per the survey of Habitations conducted by PHED between 1991 and 1993, 25% villages have TDS (measure of salinity or brackishness) more than the limit of 1500 mg/l. 26% villages have fluorides more than the limit of 1.5 mg/l and 41% villages have Nitrates more than the limit of 45 mg/l. Since many villages are common in these three groups; 56% villages have either or a combination, of these constituents in excess. Districts affected by excess salinity are mainly Barmer,Jaisalmer, Jodhpur, Jalore, Bikaner, Churu, Bharatpur, Nagaur, and Pali. Districts affected by fluorides are mainly Ajmer, Jaipur, Nagaur, Tonk & Bhilwara.

Ground water pollution due to industrial effluents is occurring in areas of Udaipur, Pali, Jhunjhunu, Kota and Jodhpur districts due to effluents of dyeing, textile, distilleries, mining and mineral processing, and fertiliser industries in these areas.

For tackling the problem of salinity, GOI has been sanctioning desalination plants. Their capital and O&M cost to be considered. Recently GOI has sanctioned such a project to cover some villages at a cost of about Rs.33 crores for Barmer Distt. where the plants will be based on ED process. For tackling fluorosis, D/F plants are being sanctioned by GOI and this effort has to be supplemented by domestic level defluoridation system which is simple and cheap.

3. Water quality surveillance.

Each of the 30 districts has a PHED laboratory for physical, chemical and bacteriological tests of water samples. Policy of regular water quality monitoring to cover all towns and villages with due frequency of sampling has to be established. Voluntary organisation, laboratories of schools and of other educational institutions can be given support for this so that there is a net -work of such surveillance and data base is generated.

It is estimated that Rs. 800 crores will be needed to tackle the problem of fluorosis alone. To tackle the problem of salinity as well as nitrates, a sustained increase in plan funds is necessary over 2 to 3 decades.

18. REGIONAL DISPARITIES - PEOPLE YET UNSERVED.

A problem village was defined as one which had any of the following problems :

(a) Source beyond 1.6 Km. in distance or more than 15 m. in depth.

(b) Water chemically or bacteriologically unsuitable. 93% villages of Rajasthan came under problem category and water supply schemes begin to be implemented since about 1977. Due to limitation of funds and high cost of treatment or carriage of water for areas having chemically unsuitable water, rural population of the problem villages could not be covered to the same extent everywhere. This has given rise to regional disparities for the present.

Districts which have got lesser coverage than others are Barmer, Jaisalmer and Ganganagar. In these districts only about 52 to 57% population has been benefited. The reasons are :

(i) These are desert districts large in area with habitation sparsely located. Thus many habitations do not have a source within 1.6 Km.

(ii) The schemes are costly regional schemes from distant sources. In Ganganagar, the schemes are costly because of the need for 30 days' storage and treatment plant for canal water.

(iii) Large portion of funds was diverted to the districts where low cost solutions, such as H.P. were feasible.

Tribal areas of Udaipur, Banswara, Doongarpur, Chittorgarh and Kota have been provided with 1 source for about 130 population (as against the normal 1 for 250) and are thus better covered. Although directive exists that first H.P. in a village will be installed in a S.C. locality, yet if the H.P.. is to be used by other communities as well, there are instances of the traditional discrimination. This imbalance is sought to be removed by additional exclusive allocation of funds for S.C. habitations. Role of UNICEF and progress and sustainability of water supply programme in various districts of the state has been shown in the annexure with reference to some parameters.

19. IMPACT OF INDIRA GANDHI CANAL ON DRINKING WATER

Indira Gandhi Canal project is under implementation to bring 76 lac Acre feet of water of Ravi-Beas rivers to four distts. of Ganganagar, Hanumangarh, Bikaner & Jaisalmer. The total length of 445 kms of main canal has been completed and other related works of stage I have also been completed. Work of distribution system of stage II is in progress.

Due to following reasons, problems of water logging & salinity have been occurring in the commanded area :

(i) Non development of drainage system

(ii) Permeable sandy soils underlain by impermeable layer at shallow depth (2 to 10 meters)

(iii) Excessive application of water for irrigation due to non-development of full command area.

(iv) Absence of conjunctive use of ground water & surface water for irrigation.

Remedial measures are being taken. Nevertheless, hand pumps in those areas where quality problem has cropped up, are being abandoned. Surface water systems with adequate treatment will have to be installed , which are costly as far as capital & O&M costs are concerned.

20. IMPACT OF PANCHAYATI RAJ ON WATER/PHED/COMMUNITY

With the enactment of Rajasthan Panchayati Raj Act 1994 in April 1994, a change towards enhanced empowerment to the Panchayati Raj Institutions has been sought. After the recent elections to these, one third members are women & one third of all are from SC & ST communities.

Under the new Act, Panchayats have been empowered to levy taxes to raise resources & one of these is water tax for management of drinking water supply. This is a important factor for ensuring sustained water supply facilities to the villages.

O & M of hand pump & other simple water supply schemes is also to be handed over to the Panchayats. Following steps are necessary to ensure that the systems run successfully after they are handed over :

1. Preparation of a plan of action in consultation with these institutions

2. Prior arrangement of operating personnel such as HP mechanics (who should be already trained) in adequate numbers

3. Provision of adequate funds which is to be more than the presently given amount of Rs 400 per HP per month for hand pump schemes.

4. Formation of local water committees with at least 50% women members.

For community based management system, one block of a district can be chosen for a pilot project with all necessary inputs & close monitoring . UNICEF is willing to support this.

The Panchayati Raj Act is an enabling step for self management by rural community. Participatory approach, provision of technical know how & funds seem to be prerequisites for its success.

21. RESEARCH & DEVELOPMENT

RGNDWM is seized with the problem of providing more R&D & S&T inputs in the programme. It has issued a document entitled 'Policy guidelines on Research & Development for Rural Water Supply & Sanitation Sector'.

Priority areas mentioned in the document are :-

(i) Resource exploration (remote sensing, geophysical methods, exploitation of newer resources like ponds, dew, evaporation interception)
(ii) Water extraction (better hand pump, improvement in bore rejuvenation techniques)
(iii) Water scarcity reduction (artificial recharge, evaporation reduction, desalination, water reuse & recycling)
(iv) Water quality enhancement & pollution abatement (development of pollution detection kit etc)
(v) Rural sanitation
(vi) Water shed management
(vii) Water health interaction in the Socioeconomic cultural set up.

R&D projects approved for Rajasthan in the past couple of years by RGNDWM are relating to :

(i) Severity of fluoride pollution in Dungarpur distt.
(ii) Fluorosis in children in rural areas of Rajasthan
(iii) Epidemiologic study of fluorosis in Jaipur distt.
(iv) Fluoride & related elements in Ajmer distt.

PHE Deptt. has also perceived some R&D topics based on the problems that they have been facing. Some of these are :

(i) Modification of PVC HP
(ii) Problem of termites in pipe joints
(iii) Prevention of scale formation in pipe lines

RGNDWM, PHED & R&D institutions should have regular meetings to assess the needs in this sector, formulate the projects & identify the institutions which can carry out the studies.

22.

CHILD'S ENVIRONMENT: WATER, SANITATION & HYGIENE

Context

22.1 Safe water and clean surroundings combine to create a healthy environment for children, in both rural and urban settings. Environmental decline impacts adversely on the child such that growth is retarded and health impaired. The child's environment is influenced by factors both within as well as beyond the control of the child and her family. Thus, adoption of hygienic habits occupies the central role in behaviour change in the individual - leading to safe practices such as hand washing; safe handling of food and water; sanitary means of excreta and garbage disposal; drainage of waste water and overall cleanliness in the house resulting in a healthy environment for everyone in the neighbourhood and in the community. Beyond the settlement, the management of natural resources such as land, forests and river basins has a direct bearing upon the living conditions of local people. Over-exploitation of natural resources, neglect of the micro-watershed and of simple environmental protection measures, cause a decline in ground water levels and contamination of the aquifer. This results in reduced water availability and quality and a less sanitary condition for the child.

22.2 Beyond the micro-watershed, which impinges upon the lives of the whole community, lie watersheds at the macro-level. Mismanagement of these vast resources influences water availability further afield and interferes with the quality of life of all people who are ignorant of the cause of their deteriorating habitat and their right to natural resources. Therefore, a healthy environment for the child is dependent upon the proper management of a series of "zones" within the "Water Environment", each of which influences the other. Centered on the child, they extend to the household, to the neighbourhood, to the settlement, to the micro-watershed and thence to the macro-watershed. Thus, Water and Sanitation have an inherent linkage with the community's environment in general and that of the child in particular.

22.3 India's Rural Water Supply and Environmental Sanitation Programme has seen a continuum of activity from 1969 to date. Successful experiences gained over time have been consolidated in line with the key UNICEF tenets of affordability (low cost and appropriate); replicability (the potential to go to scale); sustainability (achieving lasting results); capacity building (thorough community participation, ownership and empowerment); and assessment, analysis and action (responding to communities' changing needs).

Progress 1991-95 .

22.4 By 1994, some 82 per cent of the rural population was estimated to have access to a safe water supply. Community-based management of handpumps, an important policy direction supported by UNICEF, has strengthened sustainability. The programme has also moved beyond simple monitoring systems for drilling and handpump installation to those that aim to assess use. Apart from the unserved 18 per cent of the population, there are serious disparities between and within States in sustainability and quality of supply. Groundwater depletion and degradation by competing consumers, bacteriological contamination through imperfect well design and unclean surroundings, water that is high in salinity, iron, fluoride, arsenic and other substances, all present challenges that need to be urgently addressed.

22.5 With respect to sanitary means of excreta disposal, coverage (in terms of access to latrine) is estimated to have increased from 11 to 19 per cent of rural population during 1990-94. This progress was possible because of the shift in emphasis in the national policy from hardware input such as sanitary latrine to software such as promotion of hygiene education, from a single design to a range of technological options, from full subsidy for latrine construction to low or no subsidy through alternate delivery system using the commercial principles. Concurrently, the concept of sanitation has in practice expanded in its inherent dimensions, such as safe handling of food and drinking water, personal hygiene, disposal of waste water, human excreta and garbage, home and village sanitation (as the first step towards *primary environmental care*). UNICEF is a partner in this conceptual evolution as well as its translation on the ground through non-government organizations and community groups, supported by communication for their awareness and action. Promising models include: Alwar (Rajasthan), Periyar (Tamilnadu), Allahabad (Uttar Pradesh), Mednipur (West Bengal) and Mysore (Karnataka).

22.6 The success achieved in the near-eradication of guineaworm disease is an example of technical and social inputs combining through community-based processes, particularly case management and the village contact drive as demonstrated by the SWACH Project. Under the CDD-WATSAN strategy, in addition to bringing water supply and sanitation operationally together to serve common aims, the 1991-95 experience of relating the programme to diarrhoea control in the same community has improved the feasibility of forging linkages with health and education, contributing to the child's nutrition and growth.

Objectives

22.7 The Bridging Programme supported by UNICEF will continue to address three goals. These are:

- Universal access to safe water by 2000;
- Universal access to sanitary means of excreta disposal by 2000; and
- Eradication of guineaworm disease.

Overall Strategy

22.8 Four major strategies to achieve these goals are proposed. These are: disparity reduction (including gender); decentralization; sustainability; and integration at community level with other social inputs.

In spite of an impressive achievement in the drinking water supply, there are still pockets devoid of a safe water source. These are the areas where the poor and the disadvantaged live. As regards sanitation, the urban-rural differential is very conspicuous. Even within the urban areas, the slum dwellers are in no way better than those of their rural counterparts. Besides these spatial differences, there is a gender inequity so far as the involvement of women as a partner of the programme. These issues need to be addressed.

The present system of centralised planning and management is not adequate to take care of the needs fully. In a programme where the beneficiaries are at the grass root level, the present system does not allow their active participation. The 73rd and 74th Constitution Amendments have created a favourable environment for the decentralization process. This opportunity has to be capitalised upon.

Sustaining the facilities already created is as important as providing new facilities to reach the unreached. With 2.5 million handpumps existing in the country, their maintenance poses a serious problem particularly when the community ownership and management are at a low ebb. Added to this is the threat from a depleted ground water table due to over exploitation caused by competing users. The future of the programme depends to a large extent how conditions are created to make it sustainable over a longer period.

There is an increasing need to converge water and sanitation with other sectors particularly health and nutrition, and education. The stress has to be on the impact, not the use of amenities alone. Hygiene education alongwith provision of water and sanitation facilities can bring about the desired behaviour change resulting in a decline in morbidity and mortality. There are evidences of a clean environment having a positive impact on a child's growth. Similarly, the schools provide an effective forum to promote improved sanitary practices among children and through them among the families and finally in the community.

In recognition of 26 years of programme implementation, four development phases are identified:

- New areas for UNICEF cooperation (R&D, demonstration projects);
- Scaling up a proven activity or strategy (community based handpump maintenance, CDD-WATSAN strategy, Rural Sanitary Marts);
- Modifying, consolidating and sustaining an activity or strategy (sanitation package); and
- Phasing out of an activity (drill rigs, quality control of handpumps, direct subsidy).

22.9 In order to translate the proposed strategies into action, emphasis will be on the following:-

(a) Sanitation and hygiene education;

(b) Community management of the "Water Environment"; and

(c) Household water security.

These will call for:-

- Consolidation of the progress made towards community management and convergent services through integration of sanitation and water supply and inter-linkages with health, nutrition and education.

- Capacity building of women's groups and community-level functionaries as well as elected representatives of village, block and district levels through communication, orientation and training, in collaboration with health and education, focused on behaviour change in the community.

- Exploration of new directions of cooperation, such as sanitation in urban slums and peri-urban areas; and management of the "Water Environment" at the local level, focused on problems related to water conservation, water quality protection and solid and liquid waste management.

- Continued monitoring of quality control of hardware and a diminishing UNICEF role in its supply, especially handpumps.

Areas of Intervention

22.10 During the Bridging Programme, UNICEF will continue to focus primarily on rural areas. However, in recognition of the increasing poor and disadvantaged population, living in a deteriorating urban environment, substantial effort will also be made to assess the nature and magnitude of the problem and to try out alternative approaches in order to identify ways of working that will be brought to scale during the period 1998-2002.

Activities for Rural Communities

22.11 ***Sustainable drinking water supply:*** The sustainability of drinking water sources already created will be a high priority area to consolidate the gains achieved so far. This will call for peoples' participation and community management of water sources. Making the community acquainted with the technology appropriate to the local conditions and motivating them for sharing at least the operation and maintenance cost will be an important component of this activity. Establishment of community-based maintenance systems using the approach successfully demonstrated in Banda, Ranchi and Mednipur districts will be advocated. Expected output: *Maintenance and repair of handpumps with community participation extended to selected areas of 15 major states.*

22.12 ***Protection of Drinking Water:*** Research demonstrates that a safe drinking water source is subject to contamination, if the environment around it is not kept clean. Also, lack of proper water collection, transport, storage and handling practices at household level can contaminate water from a safe source. While the protection of drinking water at source level can be ensured through correct well construction techniques, by providing adequate drainage around water points with construction of platform; at household level, contamination can be prevented through effective communication and motivation strategies. Expected output: *Well construction techniques advocated and sanitation package extended to 15 major states.*

22.13 ***Environmental Protection and Management:*** Depletion of ground water due to over exploitation of the source mainly for irrigation and industrial purposes (but also urban pressure), and lack of adequate aquifer recharge caused by extensive deforestation is a major concern. A balanced development of ground water will therefore be advocated to prevent further deterioration of drinking water sources. Studies on ground water use and assistance in establishing monitoring facilities to prevent environmental degradation of ground water sources in terms of quality and quantity will be carried out to promote micro water shed management and sustain fresh water sources. Lessons learnt from the on-going fresh water studies supported by UNICEF in different regions of the country will be capitalized upon. Expected output: *Environmental protection and management studies in 8 states.*

22.14 ***Alternate Delivery System for Sanitation:*** Direct subsidy to provide sanitary facilities will be phased out and private initiative will be encouraged through establishment of alternate delivery systems which will include Rural Sanitary Marts, Production Centres and Credit. This will call for looking at sanitation beyond the government subsidized programme so as to make sanitation a "Way of Life". Expected output: *RSMs/Production centres established in 20% of blocks in 15 major states.*

22.15 *Hygiene Education:* The need for promoting hygiene education to bring about a behavioral change among the people both in terms of water use and adoption of improved sanitary practices has been well recognized. The recently developed IEC strategy by the Government of India for the WATSAN sector and its resolve to earmark a certain percentage of the outlay for communication and social mobilization is a step in the right direction. In order to supplement these efforts, UNICEF will provide support to develop appropriate communication materials for their use as a part of the multi-media approach. While doing so, the weakness noticed in the implementation of the communication strategy developed and implemented earlier will be kept in mind. Support for the establishment of IEC cells and strengthening the sanitation cells with appropriate linkages with similar structures for sectoral interventions related to Health, Nutrtion and Education (where water and sanitation are looked after by two separate departments) will be required. Expected output: *IEC cells at national and state levels established and expanded sanitation concept introduced in 15 major states.*

22.16 *Involvement of Schools and Anganwadis:* Schools and anganwadis can be the appropriate platform to create hygiene awareness among children in the younger age group and motivate them for its adoption. Besides advocating to include these institutions in the programme at the national level, UNICEF will support area-specific projects to gain experience and replicate the same on a wider scale. All these will call for enrichment of the school curricula and the training module for anganwadi workers, involvement of teachers and anganwadi workers, active participation of Bharat Scouts & Guides and NGOs. Institutions already involved in the training of teachers and anganwadi workers will be actively involved. Expected output: *Demonstration projects in 5 States. School sanitation to become a part of National Sanitation Policy.*

22.17 *Mainstreaming Gender Issues into the Programme:* So far, water and sanitation interventions aimed, mainly, at improving the condition of women who were considered as the major beneficiary. Their involvement in the planning, decision making and implementation has been rather sporadic and confined to a few demonstration projects. It is necessary to shift this approach to include activities which will improve the position of women and raise their status in the community. The new opportunities available for associating women in the Panchayati Raj System has opened up new vista for bringing in gender equity in the water and sanitation sector. The proposed interventions will include, advocacy at Panchayat level and with emerging women's groups, to encourage greater participation of women in the planning and decision making and to prepare women undertake income generating activities linked with the WATSAN interventions. The latter will call for skill transfer through organizing training on maintenance of water sources (including handpumps), masonry and management of alternate delivery systems like RSM. Expected Output: *Mainstreaming gender into the programme to be promoted in 15 major states.*

22.18 ***Working with WATSAN Committees:*** The 73rd Constitution Amendment provides an excellent opportunity to advocate for community participation in the Water & Sanitation Sector. This could be done through formation of village level Water and Sanitation Committees. The interventions will include not only awareness generation, community mobilization and motivation but also cost sharing and infrastructural support to promote the various interventions proposed. Development of training and advocacy materials will be an important component of UNICEF support. Expected output: *WATSAN training and communication materials developed for panchayat members. Formation of WATSAN committees advocated in 15 major States.*

22.19 ***Guineaworm Surveillance:*** While support to case surveillance will continue in the currently endemic states, inter-agency evaluation will be carried out in the states where zero cases have been reported for the past three or more years. UNICEF will closely monitor the case containment strategy so as to secure zero transmission. Expected output: *Zero guineaworm cases by 1997.*

Activities for Urban Communities

22.20 Some of the interventions proposed for the rural community also have a lot of relevance for the urban poor. These include activities pertaining to sustainable drinking water supply, protection of drinking water, alternate delivery system for sanitation, hygiene education and involvement of schools and anganwadis. The feasibility and the modality of introducing these for the urban poor will be explored. Besides, special studies on the situation of the urban poor related to Water, Sanitation and the Environment will be the basis for advocacy and a learning experience for future support. Expected output: *Identify approaches to be adopted in the next Plan of Operations.*

22.21 Interventions in urban poor communities will include area-specific water and sanitation projects for the poor, with effective community involvement in the planning, implementation and maintenance of facilities through the UBSP community structures and other existing community mechanisms. Replicable and sustainable strategies based on the experiences gained will be identified through systematic assessment. Expected output: *Assessment on implementation of WATSAN activities particularly those affecting the quality of life of poor communities in 5 cities.*

Technology

22.22 The overall aim in technology choice for Water and Sanitation during the period 1996-97 is to accelerate coverage and sustain the existing facilities through community participation and management. The following will be supported :-

22.23 *Water Supply:*

- *Research and development:* Support to R&D activities will continue, such as further development of village level operation and maintenance (VLOM) handpumps, to facilitate repair and maintenance by the users themselves. Efforts will concentrate on reducing cost by using alternative materials and optimizing designs. Expected output: *Development and standardization of improved low cost India Mark III and TARA handpumps.*

- *Quality assurance and standardization:* UNICEF support to BIS in developing national standards and capacity building have shown encouraging results. UNICEF has now handed over the responsibility for handpump quality assurance to BIS, whereas, this will be progressively achieved for spare parts over the next two years. However, UNICEF support to handpump standardization and quality checks at the consignee-end will continue. Expected output: *National handpump standards and sustainable quality assurance mechanism.*

- *Water quality improvement*: Defluoridation of drinking water through low-cost domestic units will be promoted, researched and developed. Similarly, improved low-cost iron removal plants will be promoted for community-use linked to handpumps. Water quality surveillance will be promoted and institutionalized through capacity building, reducing incidence of diarrhoea and fluorosis in affected districts. Expected output: *Water treatment at community level.*

- *Rejuvenation of borewells:* Borewells used for water supply normally reduce in yield over time. Rejuvenation of wells, using tractor-mounted compressors and hydrofracturing, are proven cost-effective technologies to re-claim low yield wells in hard-rock formations. These will be promoted through demonstration and replicated through advocacy as cost-saving and environment-friendly technologies. Expected output: *Capacity created to sustain successful borewells.*

- *Indigenisation of equipment:* While UNICEF will discontinue the procurement of locally available drill rigs, the purchase of special application drill rigs not available in India for use in geographically disadvantaged places will be considered. UNICEF will advocate import substitution through local manufacture of spare parts and phase out maintenance support to previously supplied drill rigs older than 10 years. Expected output: *Progressive reduction in real cost of UNICEF hardware support.*

- *Scientific source finding:* To reduce the failure rate of drilled wells, support to promote scientific water source finding as a cost-saving intervention will continue. UNICEF will advocate for greater use of remote earth sensing techniques together with improved geophysical equipment, as an integrated approach to reduce the failure rate of drilled wells in hydrogeologically difficult areas. Expected output: *Increase success rate of drilled wells.*

22.24 ***Environmental Sanitation:***

- *Research and development:* Undertake R & D for designing facilities under the sanitation upgrading approach and their impact on the environment. Assist in the development of state-specific guidelines for identifying cost-effective technology options. Expected output: *Guidelines developed on cost-effective and environment-friendly technology.*

- *Range of technological options:* Support, develop and promote a range of technological options for sanitation to suit geo-hydrological and socio-economic conditions. Demonstrate location-specific designs in selected areas by adopting presently affordable technologies but with flexibility for improvement. Expected output: *Various range of technology options for sanitation.*

Monitoring and Evaluation

22.25 ***Monitoring the Goals:*** The internal monitoring system developed to track progress made towards achieving the goals will be strengthened. Data gaps will be filled through surveys supplemented by National Sample Surveys and Census records, updated annually through the multi-sector coverage evaluation surveys. Expected output: *Updating WATSAN data.*

22.26 ***Community Monitoring:*** In order to keep a watch on the progress at grass root level, a simple monitoring system will be developed for use by the community through the village panchayats and the Nagar Palikas. This will give a feed back on the status of certain crucial interventions already undertaken so that timely measures could be taken up to improve the situation. The parameters to be looked at will include quality of installations, drainage, use of safe water sources and latrines, handpump breakdown rate and so on. Expected Output: *Monitoring format developed and introduced in areas covered under community convergent action.*

22.27 ***State-specific Management Information System (MIS):*** To enable timely decision-making on programme issues, the Ministry of Rural Areas and Employment, in collaboration with National Informatics Centre (NIC) has developed a computerized monitoring system using the state and district based computer network. This facilitates data retrieval for the WATSAN sector. In addition, some states have embarked upon MIS development for their own specific requirements. Sharing of State experiences and development of computerized MIS for the national programme will be an important component of UNICEF support during 1996-97. Expected output: *Computerized MIS operation.*

22.28 *Consolidation and decentralization:* Rig Monitoring System (RIMS), previously a centralized system, will now be adopted at the state level, not only to reduce the time needed for collecting and analyzing the data originating from the respective states, but also to provide quick feedback to the state governments on rig performance to enhance their efficiency. Attempts will also be made to extend the system to include government rigs and if possible, those operated by private parties. Expected output: *RIMS decentralized and extended.*

The decentralized Spare Parts Management System (SPMS) introduced during 1991-95 has become operational in 14 states. Attempts will be made by GOI with UNICEF assistance to further strengthen the capacity of the state governments in this regard. A similar exercise for the spare parts of government rigs will be explored. The newly developed Hydrofracturing Monitoring System (HMS) will be established in States having hydrofracturing units. Expected output: *SPMS and HMS decentralized to all concerned States.*

Convergent Community Action:

22.29 All of the foregoing activities will be carried out in an intensive manner, conjointly with each of the other programmes in this Plan of Operation, on the basis of an annual plan of action for each of the selected areas. The aim is to achieve the goals, universally and sustainably in these areas, well ahead of the decade through adequately supported local planning with focus on the poor and the disadvantaged. This would include participatory monitoring and evaluation by the community in terms of 'process' and 'impact' indicators. The inter-sectoral group of functionaries has to work in close association with the community as a team. This will call for strengthening the skill of the team members on social communication and community participation. The demonstrated process will be a basis for planning the next cycle of cooperation in 1998-2002. These will be displayed, against baseline data, as a measure of progress periodically achieved through the Community-led process.

Government Commitment

22.30 The Ministry of Rural Areas and Employment will continue as UNICEF's main counterpart in the WATSAN Sector, while the Ministry of Women and Child Development, Ministry of Environment and Forests, Ministry of Urban Affairs and Employment, Ministry of Human Resources Development, Ministry of Health and Family Welfare and Ministry of Water Resources will be consulted on specific interventions and in matters related to inter-sectoral convergence. The counterpart departments at the state level and the district administration will provide the necessary technical, institutional and other resource support.

Annexure

Role of UNICEF :

Attainment of the objective of Universal access to safe water supply poses a major challenge to the State, district and local administration. A synergy needs to be created through coordinated work of government departments, academics and voluntary organizations and communities.

UNICEF's cooperation in Rajasthan started in the decade of the seventies. It has been supporting the Government and communities in planning and implementing development programmes directly benefiting women and children. The assistance is in the form of select and critical technical and financial inputs for capacity building, programme management, innovative approaches, alternate strategies, training, workshops, social mobilization, public awareness and education and support to monitoring evaluation and action research. UNICEF cooperation is essentially catalytic in nature given the limited resources and the organizational objective of using these in an optimally efficient manner.

To achieve the objective of universal access to safe water supply, UNICEF has been supporting the Rural Water Supply programme of the State Government in the following major areas:

I. Supply of spare parts for the maintenance and repairs of the 25 drilling rigs supplied by UNICEF. Supply of accessories and tools for rigs and hydrofracture machines.
II. Capacity building of the drilling wing of PHED through trainings within the country.
III. Introducing innovative technologies through pilot projects, e.g., pilot project of defluoridation at domestic level by using Activated Alumina and pilot project of supply and installation of new improved 50 mm India Mark III hand pumps in Jaipur district.
IV. Evolving alternate strategies for management of repair & maintenance of hand pumps through workshop, training, supply of tool kits and pilot project.
V. Being partners in the implementation of guineaworm eradication project in the State.

Indicators used for determining dimensions and degree of problem in Rural Water Supply in different districts :

Due to diverse climatic and topographical features in various parts of the State, some districts were endowed with good resources of water supply and others were not so fortunate. Rural Water Supply programme has made large inputs in all the districts towards solving the drinking water supply problem, but due to interplay of the various

factors like poor rainfall, poor chemical quality of ground water, non-feasibility of hand pumps, absence of surface water sources or canal systems, dispersal of population and hamlets etc., there are significant regional disparities. These disparities become apparent when key parameters relating to these districts are monitored and the situation is critically viewed in that context.

This report draws attention to current levels of achievement and highlights disparities and the differential pace of progress among the districts of the State. The indicator parameters have been chosen so as to depict the status of rural water supply in various districts of the State in terms of its access to the rural population residing in hamlets around villages, its reliability for being available without breakdowns, its quality which affects the health of the people, its sustainability in the long run, and ongoing externally aided projects for rural water supply.

The indicator parameters are:

- **Coverage of hamlets (other habitations) with safe water supply.**
- **Coverage of main villages (main habitations) with water supply.**
- **Overall chemical quality of the water supply.**
- **Presence of fluoride in the water supply.**
- **Rate of breakdown of hand pumps.**
- **Decline in ground water levels since 1984.**
- **Ongoing externally aided projects.**

Each map shows the status of different districts with respect to one of the parameters named above. Best served districts have been marked and coloured as Category I and least served districts have been marked and coloured as Category IV. The last map shows the comparative status of the districts with respect to all the parameters combined, i.e., those districts which have fallen in Category IV (poorest served) for most of the indicator parameters have been shown in red, the better ones as blue and yellow and the best ones as green.

This ranking gives the reader some idea as to where a particular district stands vis-a-vis other districts and in which of the key indicators it stands good or poor. This leads to the conclusion as to which key interventions are needed on priority in any particular district with regard to rural water supply.

The indicators do not attempt to cover every issue but, highlight some of the major areas of interventions and concern. These are designed to raise more questions than they can answer and to stimulate activity on priority areas.

Conclusion :

A look at the map No.7, which is the map displaying combined risk parameters regarding water supply, shows that the severity of the water supply problem, as indicated by the combined effect of the aforesaid indicators, varies in the different districts. Following table lists the districts grouped according to the severity of the problem in ascending order i.e., the most problematic districts being at the bottom of the list.

I Category	1.	Banswara
	2.	Dungarpur
	3.	Udaipur
	4.	Rajsamand
	5.	Bikaner
II Category	1.	Baran
	2.	Bharatpur
	3.	Bundi
	4.	Chittorgarh
	5.	Dhaulpur
	6.	Ganganagar
	7.	Hanumangarh
	8.	Jhalawar
	9.	Kota
	10.	Jodhpur
	11.	Sirohi
	12.	Sawai Madhopur
	13.	Churu
III Category	1.	Alwar
	2.	Jaisalmer
IV Category	1.	Dausa
	2.	Bhilwara
	3.	Jalore
	4.	Pali
	5.	Tonk
	6.	Sikar
	7.	Jhunjhunu
	8.	Barmer
V Category	1.	Ajmer
	2.	Jaipur
VI Category	1.	Nagaur

It is hoped that the future programmes of rural water supply will be geared to minimize the imbalances between various districts. Emphasis on those activities and parameters will also be desirable which the particular district needs the most. This approach is likely to lead to optimization of the use of financial and other resources of the State and towards prioritization in conservation and augmentation of water resources where it is most needed.

Some suggestions to improve the scenario with respect to rural water supplies are as follows:

1. *Community financing and management* :

Hand pump is the single most important safe source of water for about 25,000 villages, i.e. about 65% of the rural population.

It is a well-accepted principle that mechanical equipment with moving parts needs about 10% of its capital cost for its annual maintenance. Accordingly, a hand pump installation, which (excluding the borehole) costs about Rs.11,000 (hand pump + riser pipe + platform and drain + installation) needs about Rs.1,100 per year for its proper maintenance. As the currently provided funds appear to be much less than this (around Rs.700 including expenditure in repair campaigns), the required funds should be provided either wholly by the Government or partly by the beneficiaries and partly by the Government. In many districts of the state, people spend for their water supply through camel carts in scarcity season. They can be motivated to pay for the installed system by educating them through adequate IEC activities. Simultaneously, community should be empowered at the Panchayat level by giving them funds, knowledge, manpower and the capacity to carry out the community-based hand pump maintenance system. As women in the rural areas manage the household water supply, they should be involved to the maximum in siting the hand pump, training them as caretakers, training them as hand pump mechanics and in management through Pani Panchayat.

2. *Water legislation* :

Regarding declining water table, it is well known that 90% of ground water is extracted for irrigation and industrial use. If the trend has to be arrested, suitable legislation has to be brought to control the exploitation of ground water. Some other states like Maharashtra, Gujarat and Andhra Pradesh have already done so.

3. *Micro watershed development and management* :

Conservation of water and recharging of ground water aquifers should be undertaken in a large way through properly designed micro watershed development projects and water harvesting structures like ponds, tankas, sub-surface dykes etc.

4. *Community-based monitoring of water quality* :

The State Plan of Action for Children 'Promises to Keep' was released by the Chief Minister last year. As a follow-up, the Task Force, consisting of Secretaries to the Government, has approved the District Plan of Action for Children formulated by the Department of Women & Child Development.

Under the District Plan of Action, some key indicators have been identified for monitoring the progress and status of water supply systems. These key indicators include (i) percentage of population having regular access to safe water; (ii) percentage of functional hand pumps; (iii) number of pumped water supply systems satisfactorily working; (iv) reduction in percentage of water borne diseases etc.

The idea is that these simple indicators should be monitored by the community Pani Panchayat, Panchayat and Panchayat Samiti inclusive. For monitoring of water quality bacteriologically, very simple field technique is now available, which is cheap and can be used even by an illiterate villager. A structured decentralized system of regular monitoring of these indicators at the required levels in Panchayati Raj Institutions would help in achieving the objectives.

5. *Decentralized capacity building :*

There are many areas in provision of safe drinking water supply to rural areas which can be best managed at the community level. Some such areas are hand pump maintenance and repairs, environment protection and management of water resources involving micro watershed development, rainwater harvesting structures like ponds, 'tankas', 'khadins', sub-surface dykes etc.

Many community-based maintenance projects implemented in 12 states of the country, over the last 3 years, have shown that stress on increasing women's participation has resulted in the formation of village WATSAN (Water & Sanitation) Committees, which have been able to manage and maintain their water supply and sanitation facilities.

For this, creation of awareness through social mobilization activities and empowerement of women through development of skills related to management of the water related environment, structures and facilities is essential. Training of women, local NGOs and orientation of grass root functionaries, training of Village Water Sanitation Committees are some of the measures which will strengthen and increase the capabilities of local community in managing the aforesaid water related environmental matters, structures and facilities.

6. *Strengthening traditional systems :*

Storage of rain wter in village ponds has been a traditional system of water conservation. But due to poor design and many times incorrect location, the ponds dry up within a few months say upto December or January and thus they do not hold any water during the remaining months of dry period. Proper depth to surface area ratio (in order to minimize evaporation losses), proper location & management of their catchment area; and providing an impervious polyethylene layer in the bed, may result in their holding water throughout the year.

Another traditional system in desert areas has been to collect rain water from some small catchment areas into 'Tankas' built of masonry. Here too, improvement in the design of 'tanka' (e.g. 'Tanka' made of ferrocement is cheaper than that of masonry) and treatment of surface of the catchment area by certain indigenous materials leading to greater run off, can make the 'Tankas' cheaper and the water inflow greater.

Similarly, siting and construction of open wells, where tubewells are not successful due to underground hydrogeological formations, lends itself to adoption of new techniques leading to economy and increased water yield.

Thus, there is ample scope for strengthening of traditional systems of water conservation, storage and supply.

Data for Map No.1 for
No source main villages

(i.e. excluding 'other habitations or hamlets')

I. Achieved II. On track III. With effort IV. Problem

Category I : i.e. where all main habitations provided with water supply system

1.	Udaipur	2.	Tonk	3.	Rajsamand

Category II: i.e. where 99% or more of main habitations provided with water supply system.

1.	Ajmer	2.	Alwar	3.	Banswara	4.	Bharatpur
5.	Bhilwara	6.	Churu	7.	Dholpur	8.	Dungarpur
9.	Jaipur	10.	Jalore	11.	Jhunjhunu	12.	Nagaur
13.	Pali	14.	Sikar	15.	Sirohi	16.	Dausa

Category III: i.e. where 90% to 99% of main habitations provided with water supply system.

1.	Bikaner	2.	Bundi	3.	Chittorgarh
4.	Jaislmer	5.	Jhalawar	6.	Jodhpur
7.	Kota	8.	Baran	9.	S.Madhopur

Category IV: i.e. where less than 90% of main habitation have got water supply system.

1.	Barmer (74%)	2.	Ganganagar	(88%)
3.	Hanumangarh (88%)			

Notes of caution :

The above does not present a true picture because of the following factors :

1. Above figures mean that the water supply system was provided once. But, does not mention if the service level has now decreased from the norm (40 liters per capita per day in non-desert districts and 70 lpcd in desert districts) or not. As a rule, rather than exception, service level of majority of villages is less than two thirds of the norm.

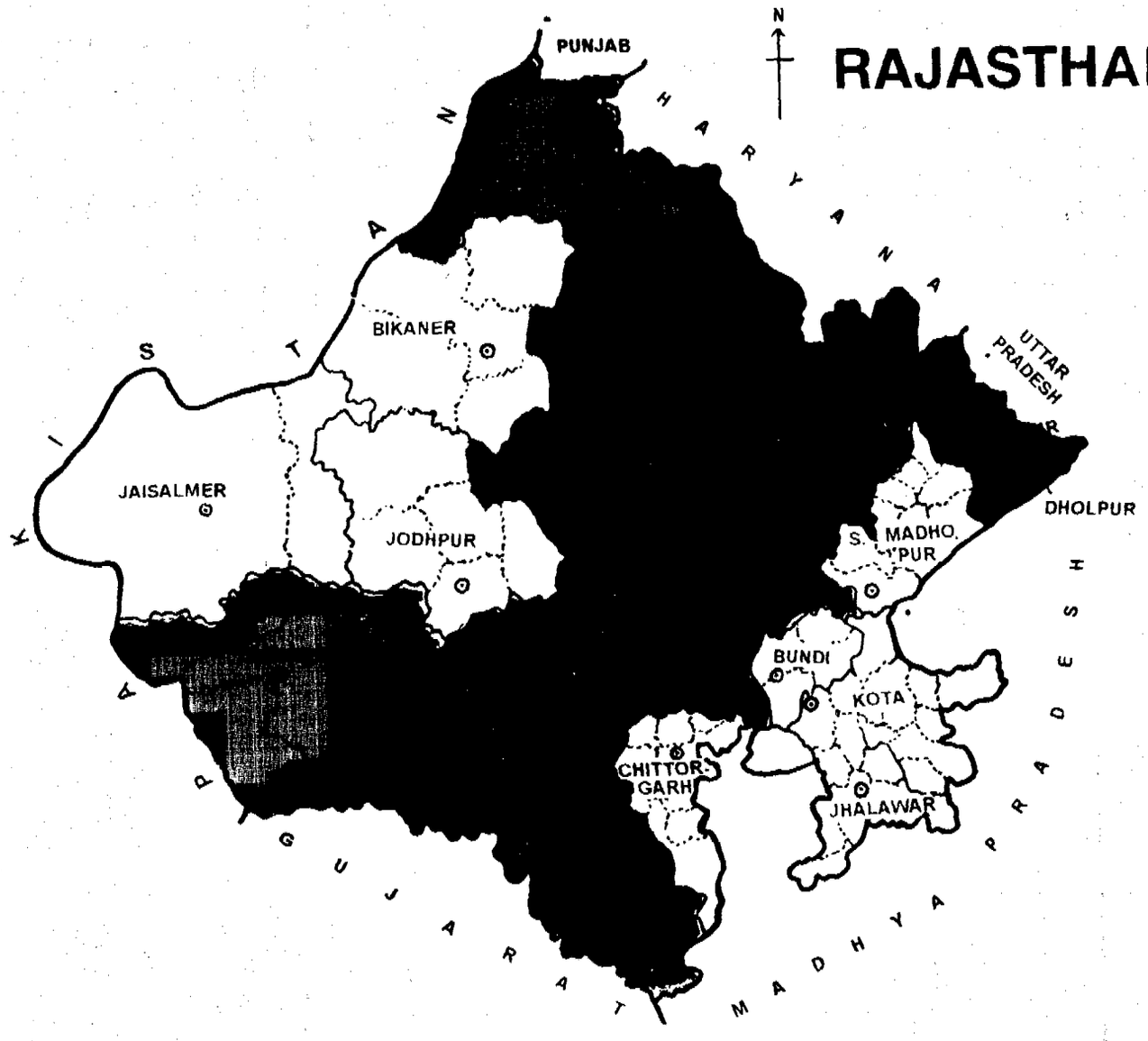
2. Most of the areas of 11 desert districts are covered with regional water supply schemes i.e. system with one source (tubewell) serving a number of villages through long pipelines. Generally, tail end villages of these regional schemes do not get any water or may get

water once in a week or in a month. Yet such villages have been shown as covered in the above figures, because once they were supplied with water and the system was implemented.

3. More than half of the covered villages have chemically unsuitable water. The State Government in its anxiety to give at least some sort of safe water supply to the people of this arid and semi-arid zone, relaxed the norms of chemical quality of water and sanctioned and implemented water supply schemes - 95% of which are based on ground water, whose quality is not as per the national and international norms.

Map No. 1

RURAL WATER SUPPLY - RISK PARAMETERS



No SOURCE VILLAGE S

LEGEND :

GREEN CATEGORY I	100% Village with water supply
BLUE CATEGORY II	> 99% Village with water supply
YELLOW CATEGORY III	90 % To 99% Village with water supply
RED CATEGORY IV	< 90% Village with water supply

Notes of Caution :

Please see page 9 - Data for Map No. 1

Data for Map No.2 for
No source hamlets

I. Achieved II. On track III. With effort IV. Problem

Category I : 100% hamlets provided water supply - Nil

Category II : **i.e where 90% or more hamlets have been provided with water supply system.**

1.	Ajmer	2.	Banswara	3.	Dungarpur
4.	Jhalawar	5.	Jodhpur		

Category III: **i.e. where 70% to 90% hamlets have been provided with water supply system.**

1.	Alwar	2.	Bharatpur	3.	Bhilwara
4.	Bikaner	5.	Bundi	6.	Chittorgarh
7.	Dholpur	8.	Ganganagar	9.	Hanumangarh
10.	Kota	11.	S. Madhopur	12.	Sirohi
13.	Tonk	14.	Udaipur	15.	Rajsamand
16.	Baran				

Category IV: **i.e. where less than 70% hamlets have been provided with water supply system.**

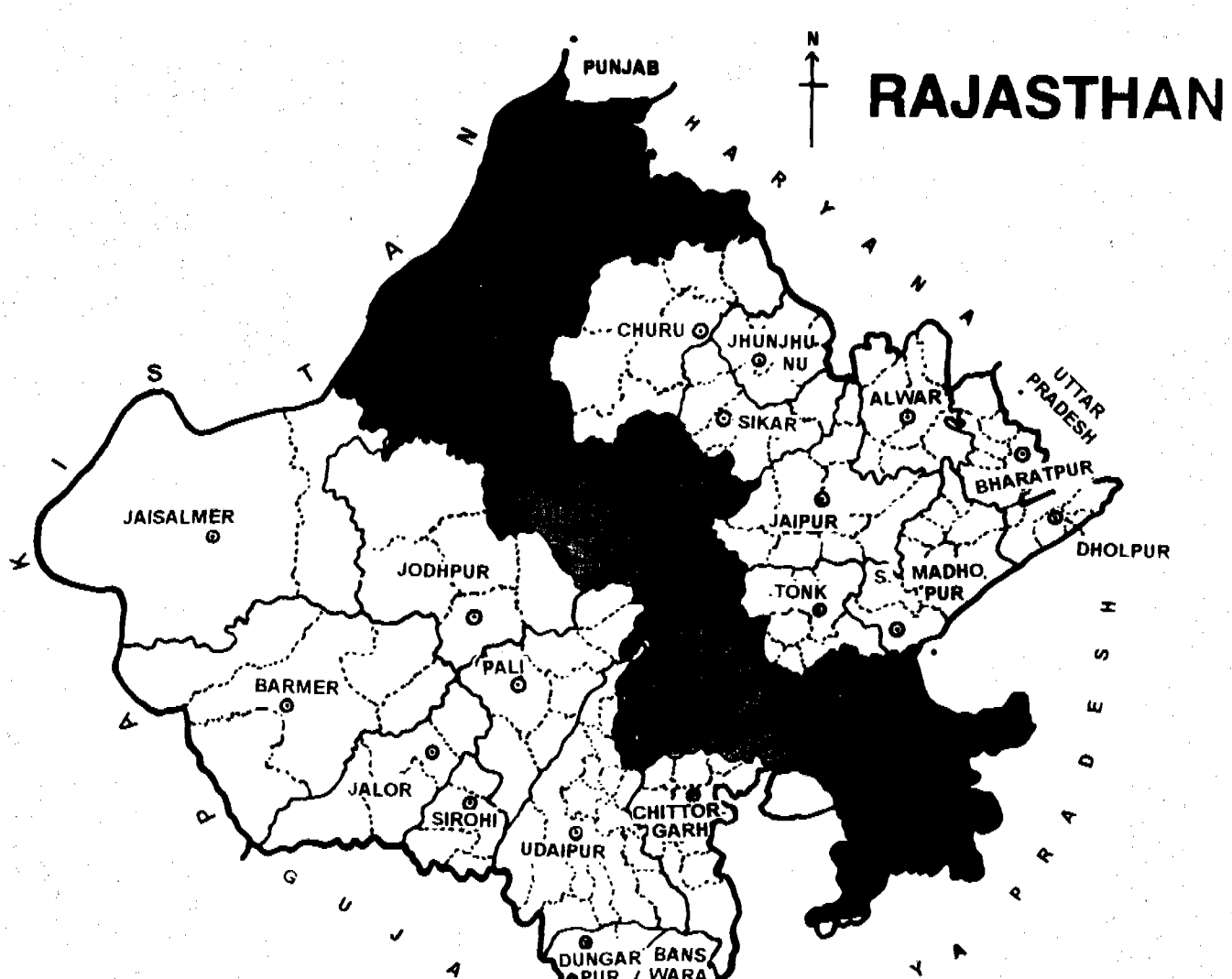
1.	Barmer	2.	Churu	3.	Jaipur
4.	Jaiselmer	5.	Jalore	6.	Jhunjhunu
7.	Nagaur	8.	Pali	9.	Dausa
10.	Sikar				

Notes of caution :

1. Same as for no source main villages.
2. Please note that practically all districts in Category IV are desert districts, because there hamlets are spread far away and ground water or surface water is scarce.

Map No. 2

RURAL WATER SUPPLY - RISK PARAMETERS



CHEMICAL QUALITY

LEGEND :

GREEN CATEGORY I	< 25% VILLAGES WITH CHEMICALLY UNSUITABLE WATER
BLUE CATEGORY II	25% to 50% VILLAGES WITH CHEMICALLY UNSUITABLE WATER
YELLOW CATEGORY III	51% to 75% VILLAGES WITH CHEMICALLY UNSUITABLE WATER
RED CATEGORY IV	> 75% VILLAGES WITH CHEMICALLY UNSUITABLE WATER

RURAL WATER SUPPLY – RISK INDICATORS

SC/ST Population based on 1991 Census and progress as of 1995 in relation to MDG/DG

Sr.No.	District	Population (91 Census)	Scheduled Castes	% age to total population	Scheduled Tribes	% age to total population	Total No. of villages (Inhabitated)	Total No. of hamlets	Total No. of HPs	Risk indicators								
										% age of Hand Pump breakdown **	% age of 'No Source' villages	% age of 'No Source' hamlets	Fluoride content > 1.5 ppm		Fluoride content > 3 ppm		No. of chemically suitable water villages	% villages having chemically unsuitable water
													% age of villages	% age of hamlets	% age of villages	% age of hamlets		
1	Ajmer	1729207	319934	18.50	397641	2.30	985	952	5322	47.00	0.3	9.1	66.4	39.0	35.7	24.4	109	59
2	Alwar	2296560	405311	17.79	1850481	8.06	1946	2449	7470	45.00	0.7	28.9	27.8	14.0	9.0	2.8	529	73
3	Banswara	1156000	57813	5.00	849050	73.47	1431	3175	5446	34.00	0.3	4.0	38.5	17.4	2.4	1.9	482	56
4	Baran*	1100251	153034	13.89	1712251	21.13	1070	Incl. in Kota dt	3685	57.00	Incl. in Kota dt	Incl. in Kota dt	NA	NA	NA	NA	Incl.in Kota	Incl.in Kota
5	Barmer	1435222	225324	15.70	842321	5.87	1625	2780	532	34.00	25.8	93.7	43.3	32.9	25.0	23.5	567	54
6	Bharatpur	1551564	357349	21.64	382121	2.31	1345	5491	4688	52.00	0.2	14.2	39.3	14.8	11.3	2.0	332	75
7	Bhilwara	1593128	272714	17.12	1437481	9.02	1565	3681	7925	46.00	0.6	19.5	45.3	32.9	25.0	23.5	356	77
8	Bikaner	1211140	225795	18.64	3195	0.26	580	3681	0	No Hpst	2.6	24.6	14.5	0.5	1.2	0.0	2941	49
9	Bundi	770248	144759	18.79	156001	20.25	825	3321	3484	58.00	2.1	18.7	5.1	2.7	0.4	0.0	5301	24
10	Chittorgarh	1484190	217099	14.63	300971	20.28	2172	3041	7330	37.00	1.1	15.7	5.3	5.3	1.5	1.0	10531	52
11	Churu	1543211	310694	20.13	7919	0.51	928	1991	0	No Hpst	0.4	72.0	25.0	4.0	2.9	0.5	2651	71
12	Dausa*	2944311	212223	21.34	251912	26.34	1009	Incl. in Jaipur	4212	53.00	Incl. in Jaipur	Incl. in Jaipur	NA	NA	NA	NA	Incl.in Jaipur	Incl.in Jaipur
13	Dhaulpur	749479	151158	20.17	34429	4.59	551	983	3520	44.00	1.0	30.0	25.8	16.0	4.0	1.8	262	52
14	Dungarpur	574549	40299	7.01	575605	55.84	946	581	7135	22.00	0.5	9.3	15.0	34.5	3.5	9.1	328	51
15	Ganganagar	2522777	775800	29.56	8945	0.34	44381	4190	2429	29.00			29.3	9.6	10.0	3.4	3.1	3444	22
16	Hanumangarh*	Incl.in G.Ngr.	Incl.in G.Ngr.	Incl.in G.Ngr.	Incl.in G.Ngr.	Incl.in G.Ngr.	Incl.in G.Ngr.	Incl.in G.Ngr.	1336	20.00								Incl.in G.Nagar	Incl.in G.Nagar
17	Jaipur	3887695	590092	15.18	307958	7.92	2131	7618	9936	56.00	0.6	35.0	37.8	26.1	15.6	9.7	1198	52
18	Jaisalmer	344517	50141	14.55	16697	4.85	518	1172	606	12.00	2.9	51.8	57.9	15.7	18.5	5.5	130	75
19	Jalore	1142565	203241	17.79	263241	8.43	565	825	484	37.00	0.3	58.1	55.4	13.0	17.3	5.5	215	58
20	Jhalawar	356971	164868	17.23	113834	11.90	1448	124	5461	47.00	1.3	3.2	2.9	4.0	1.0	2.4	978	32
21	Jhunjhunu	1582421	243267	15.37	30528	1.93	824	208	1699	47.00	0.9	98.3	11.7	1.4	1.8	0.5	3191	91
22	Jodhpur	2153485	328920	15.27	90819	2.52	980	2901	1273	47.00	2.5	5.3	36.5	47.6	6.9	0.3	281	57
23	Kota	1220505	247429	20.27	117142	9.60	811	288	3216	84.00	1.9	15.2	2.3	0.0	5.9	0.0	18390	3
24	Nagaur	2144810	423273	19.73	47061	0.22	1374	1972	9581	52.00	1.0	54.0	58.0	7.5	16.3	2.1	204	95
25	Pali	1486432	269736	18.15	80265	5.40	904	651	3315	38.00	0.3	37.4	28.8	13.5	10.6	5.2	438	52
26	Rajsamand *	522721	103776	12.61	105512	12.82	367	Incl.in Udaipur	5940	32.00	Incl. in Udaipur	Incl. in Udaipur	NA	NA	NA	NA	Incl.in Udaipur	Incl.in Udaipur
27	S.Madhopur	1803471	393361	21.67	405251	22.47	1464	2191	5857	58.00	1.4	22.2	30.9	12.2	5.5	3.1	528	64
28	Sikar	1842914	258102	14.01	48887	2.65	931	2401	4901	50.00	1.0	41.6	35.6	19.2	13.4	3.0	252	73
29	Sirohi	554029	125863	19.24	153005	23.39	446	92	2569	50.00	0.2	21.7	36.5	5.4	3.6	1.1	156	55
30	Tonk	975006	196936	20.20	115648	11.89	1019	981	4444	50.00	0.0	22.1	50.5	23.7	19.5	5.1	339	57
31	Udaipur	2066580	136488	6.60	957559	46.34	2212	5561	12965	28.00	0.0	25.0	15.6	6.9	2.3	1.5	257	70
	TOTAL	44005990	7607820	17.29	5474861	12.44	37689	45311	131060	44.00	3.2	31.5	25.7	15.0	8.6	4.8	16577 (44 %)	58

* denotes new districts not covered by 1991 Census

** denotes at the beginning of a repeat campaign after about 4 months. (21st repeat campaign in 1994)

Source of data : Census Publicasions and Habitasions Survey by PHED – 1994.

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Data for Map No. 3 for
Fluoride content in drinking water
more than 3 ppm in villages
(i.e. main habitations)

Category I. **Districts where 1% or less villages have 3 ppm or more `F' in drinking water.**

1.	Bundi	2.	Jhalawaar

Category II. **Districts where 1% to 5% villages have 3 ppm or more `F' in drinking water.**

1.	Banswara	2.	Bikaner	3.	Chittorgarh
4.	Churu	5.	Dholpur	6.	Dungarpur
7.	Ganganagar	8.	Hanumangarh	9.	Jhunjhunu
10.	Udaipur	11.	Rajsamand		

Category III. **Districts where 5% to 15% villages have 3 ppm or more `F' in drinking water.**

1.	Alwar	2.	Bharatpur	3.	Jodhpur
4.	Kota	5.	Baran	6.	Pali
7.	S.Madhopur	8.	Sikar	9.	Sirohi

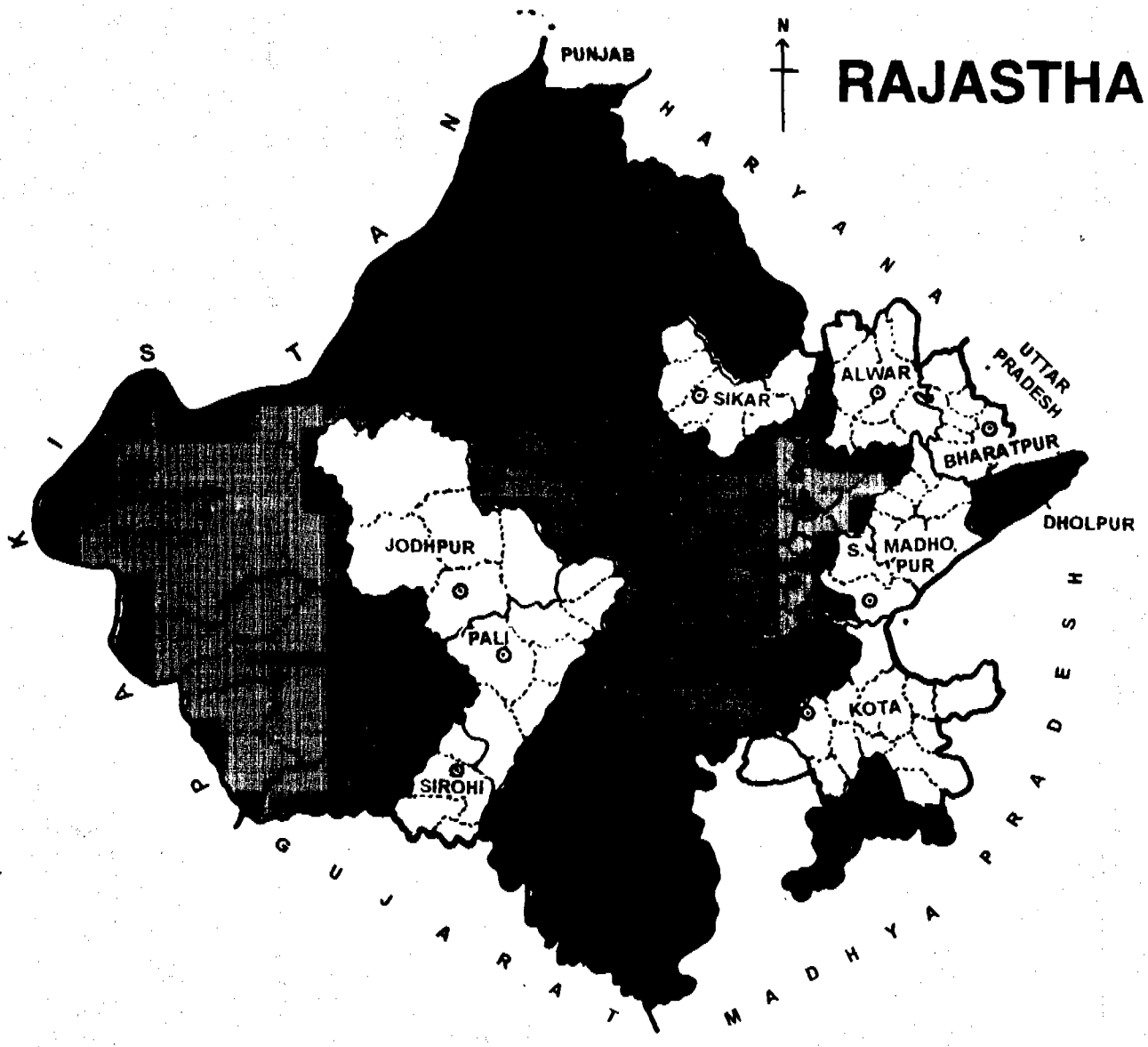
Category IV. **Districts where more than 15% villages have 3 ppm or more `F' in drinking water.**

1.	Ajmer	2.	Barmer	3.	Bhilwara
4.	Jaipur	5.	Jaiselmer	6.	Jalore
7.	Nagaur	8.	Tonk	9.	Dausa

Note : Although a `F' content of more than 1.5 ppm (parts per million or milligrams/liter of water) begins to cause adverse effect on human body, but the State Government has relaxed the norm to 3 ppm in the first phase. More than 3 ppm fluoride inevitably causes dental, skeletal (and possibly other physiological) disorders.

Map No. 3

RURAL WATER SUPPLY - RISK PARAMETERS



FLUORIDES MORE THAN 3 PPM

LEGEND :

GREEN CATEGORY I	**< 1% Villages having F more than 3 PPM**
BLUE CATEGORY II	**1% to 5% Villages having F more than 3 PPM**
YELLOW CATEGORY III	**5% to 15% Villages having F more than 3 PPM**
RED CATEGORY IV	**> 15% Villages having F more than 3 PPM**

Note : Although a 'F' content of more than 1.5 ppm begins to cause adverse affects on human body, but the State Government has relaxed the permissible limit to 3 ppm in the first phase. More than 3 ppm fluoride inevitably causes dental, skeletal (and possibly other physiological) disorders.

Data for Map No.4 for
Chemical quality of drinking water

In the ground water of Rajasthan, usually the following chemical constituents are found exceeding the maximum limits, which apart from the brackish taste, cause physiological, and sometimes skeletal, disorders in the long run.

1. Nitrates (max. prescribed limit 45 mg/liter)
2. Fluoride (max. prescribed limit 1.5 mg/liter)
3. Total dissolved solids (max prescribed limit 1500 mg/liter)

In totality, there are 16,577 (44%) villages, out of total 37,889, which have drinking water of unsuitable chemical quality. Distribution among various districts is as follows :

Category I : **Districts where less than 25% villages have chemically unsuitable water.**

1.	Bundi	2.	Ganganagar
3.	Hanumangarh	4.	Kota
5.	Baran	6.	Jhalawar

Category II : **Districts where 25 to 50% villages have chemically unsuitable water.**

1. Bikaner

Category III : **Districts with 50 to 75% villages have chemically unsuitable water.**

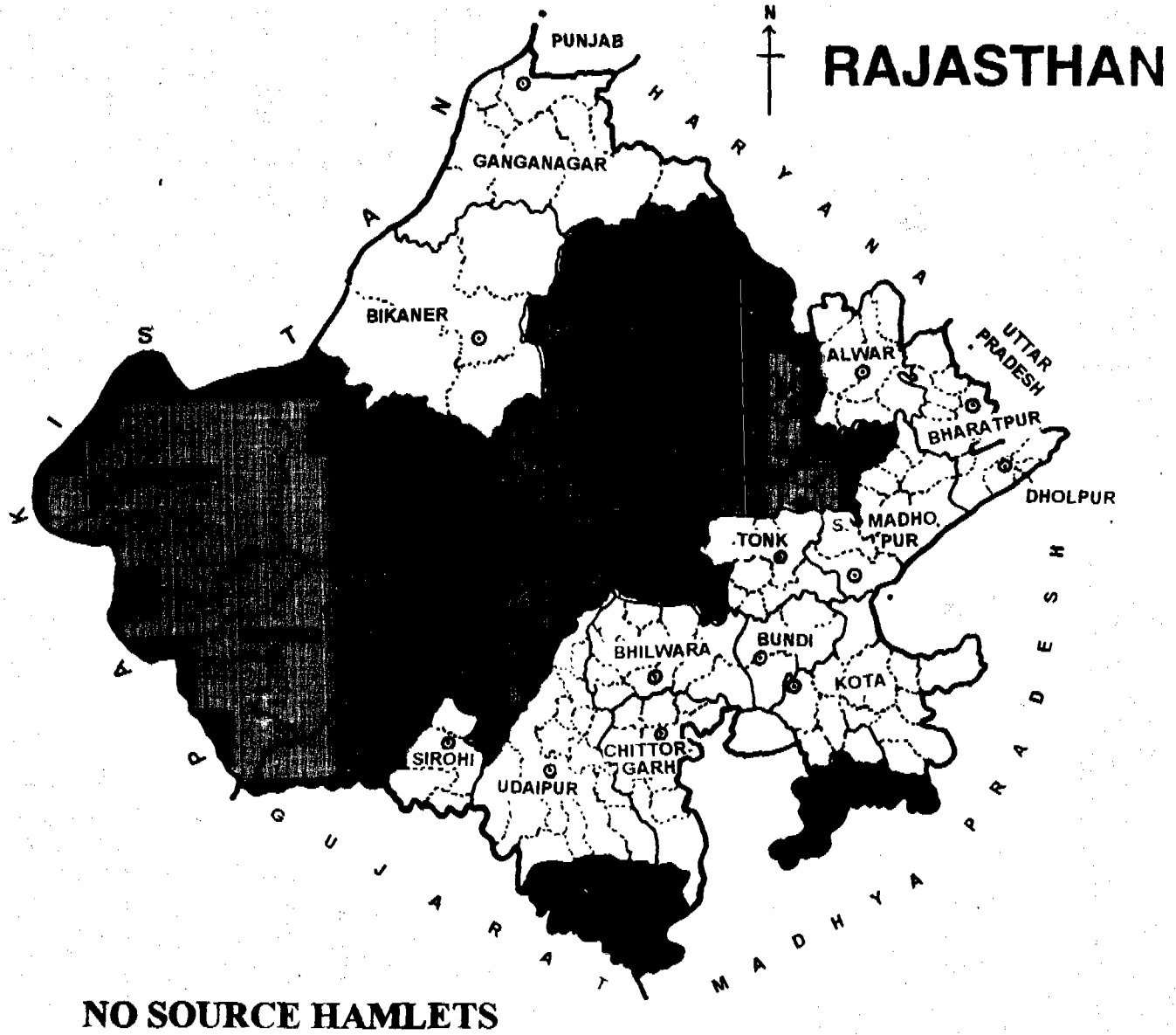
1.	Alwar	2.	Banswara	3.	Barmer
4.	Bharatpur	5.	Chittorgarh	6.	Churu
7.	Dholpur	8.	Dungarpur	9.	Jaipur
10.	Dausa	11.	Jaisalmer	12.	Jalore
13.	Jhunjhunu	14.	Jodhpur	15.	Pali
16.	Sawai Madhopur	17.	Sikar	18.	Sirohi
19.	Tonk	20.	Udaipur	21.	Rajsamand

Category IV : **Districts where more than 75% villages have chemically unsuitable water.**

1.	Ajmer	2.	Bhilwara	3.	Nagaur

Map No. 4

RURAL WATER SUPPLY - RISK PARAMETERS



NO SOURCE HAMLETS

LEGEND :

GREEN CATEGORY I	**100% Hamlets with water supply**
BLUE CATEGORY II	**> 90% Hamlets with water supply**
YELLOW CATEGORY III	**70 % To 90% Hamlets with water supply**
RED CATEGORY IV	**< 70% Hamlets with water supply**

Notes of Caution :

1. Same as for no source main villages.
2. Please note that practically all districts in Category IV are desert districts, because there hamlets are spread far away and ground water or surface water is scarce.

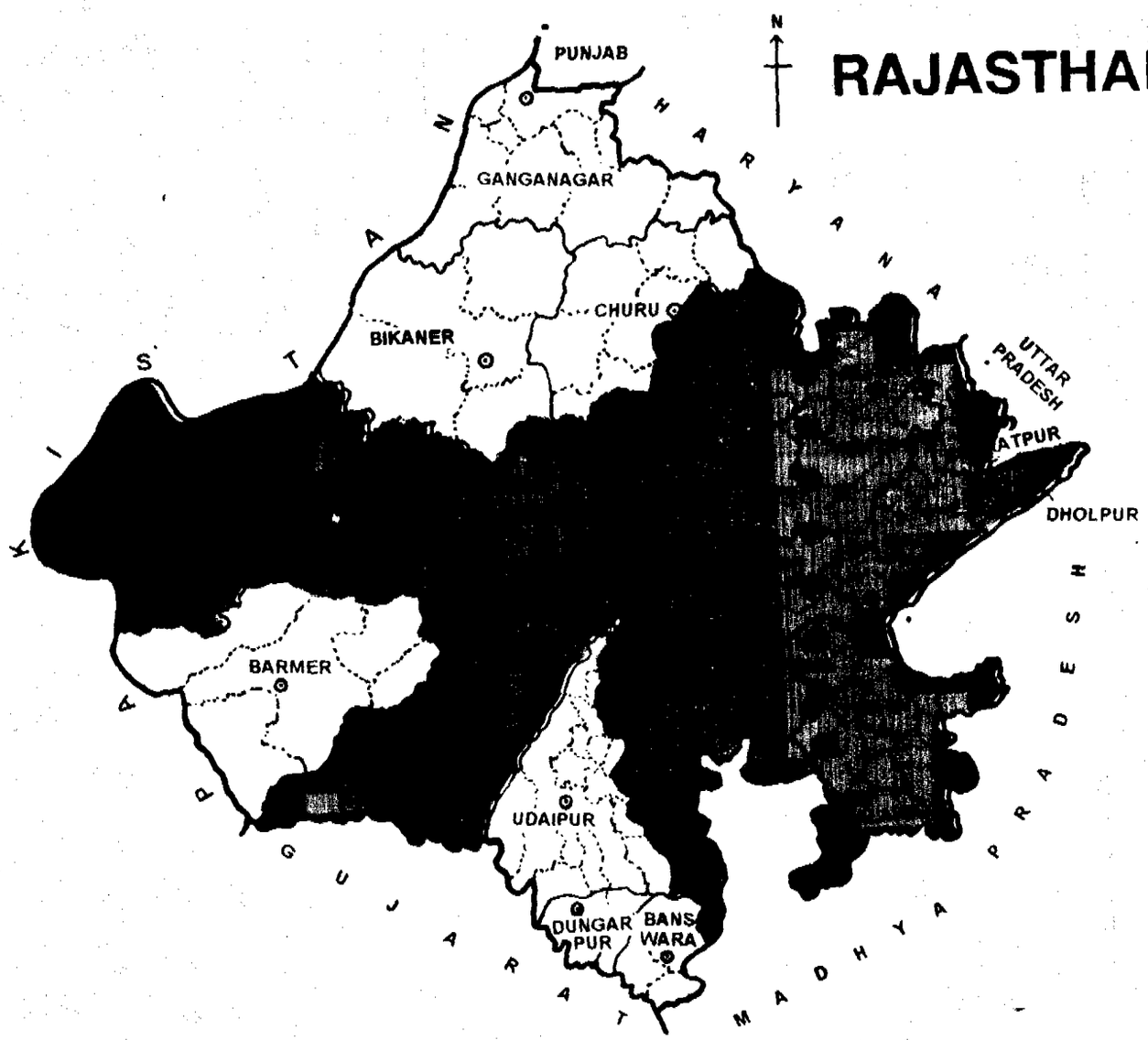
Data for Map No.5
Percentages of hand pumps found out of order at the beginning of a repair campaign after about 4 months

Category	Quantitative assessment	No.	District	Percentage
I	Less than 10 %	1.	Nil	Nil
II	Between 10-20%	1.	Jaislmer	20
III	Between 20-35%	1.	Barmer	34
		2.	Banswara	34
		3.	Rajsamand	32
		4.	Ganganagar	28
		5.	Udaipur	26
		6.	Dungarpur	22
		7.	Hanumangarh	20
IV	More than 35%	1.	Kota	84
		2.	S.Madhopur	68
		3.	Tonk	60
		4.	Bundi	58
		5.	Baran	57
		6.	Jaipur	56
		7.	Dausa	53
		8.	Bharatpur	52
		9.	Nagaur	52
		10.	Sikar	50
		11.	Sirohi	50
		12.	Jhalawar	47
		13.	Jhunjhunu	47
		14.	Jodhpur	47
		15.	Ajmer	47
		16.	Bhilwara	46
		17.	Alwar	45
		18.	Dholpur	44
		19.	Pali	38
		20.	Chittorgarh	37
		21.	Jalore	37

Note : **2 districts viz. Churu and Bikaner do not have any hand pumps.**

Map No. 5

RURAL WATER SUPPLY - RISK PARAMETERS



HAND PUMPS

LEGEND :

GREEN CATEGORY I	<10% H.P.S. OUT OF ORDER AT START OF REPAIR CAMPAIGN
BLUE CATEGORY II	10% TO 20% H.P.S. OUT OF ORDER AT START OF REPAIR CAMPAIGN
YELLOW CATEGORY III	21% TO 35% H.P.S. OUT OF ORDER AT START OF REPAIR CAMPAIGN
RED CATEGORY IV	> 35% H.P.S. OUT OF ORDER AT START OF REPAIR CAMPAIGN
BLANK	NO HAND PUMPS

Data for Map No.6 for
Decline in water table during 10 years 1984-1994

1. There has been nominal change in water table in following districts where ground water is very little used for irrigation due to deep water table and poor water quality:

    1. Bikaner (+ 1.8 m)
    2. Churu (- 0.01 m)
    3. Barmer (+0.54 m)
    4. Jaiselmer (-0.22 m)

2. Category I : Increase in water table : 1.Banswara (0.36 m), 2.Ganganagar including Hanumangarh (3.68 m)

3. Category II: Decline in water table up to 1 m : 1. Dungarpur 2. Jhalawar 3. Kota 4. Sirohi

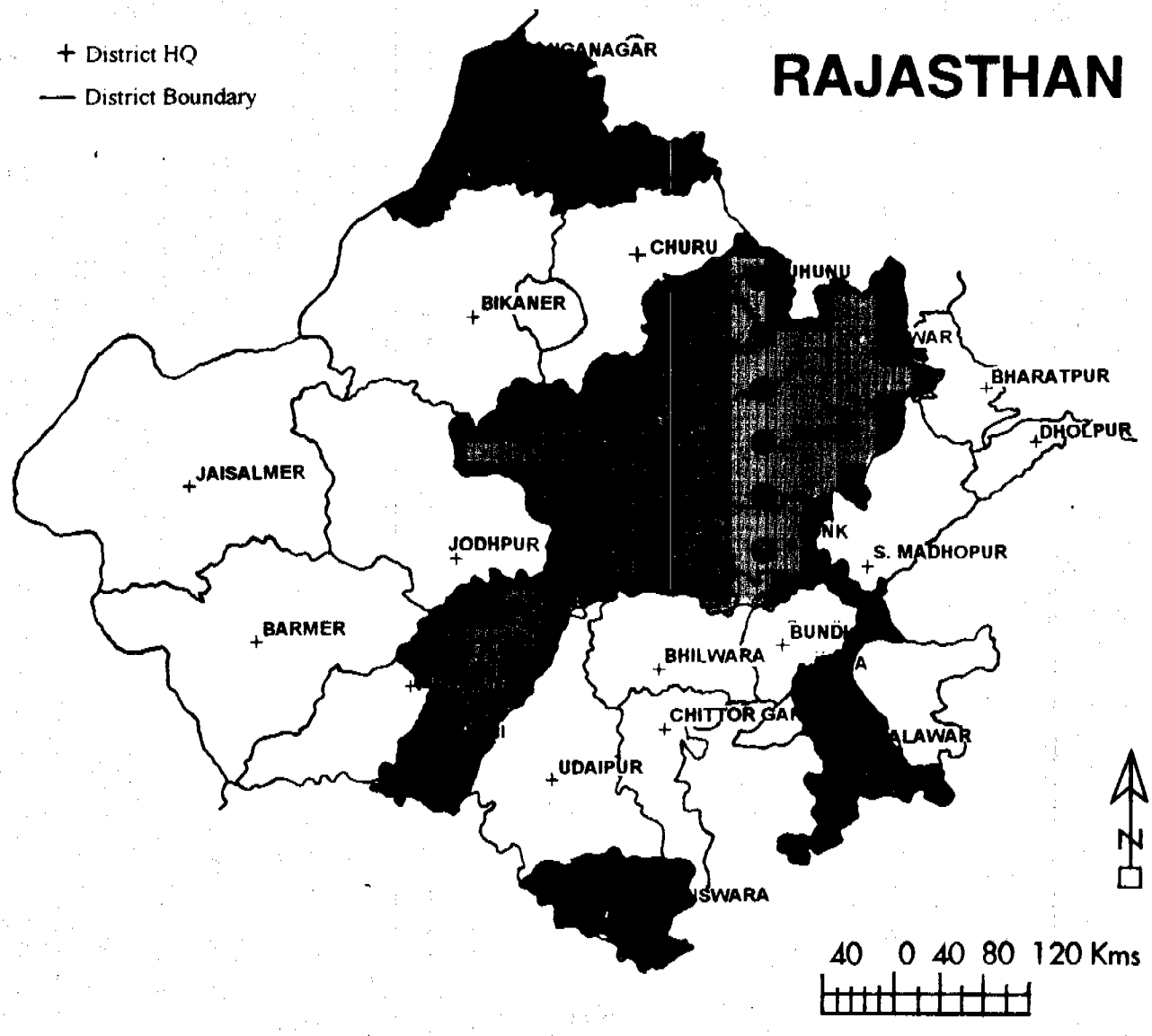
4. Category III: Decline in water table from 1 m to 4 m : 1. Baran 2. Bharatpur 3. Bhilwara 4. Bundi 5. Chittorgarh 6. Dausa 7. Dholpur 8. Jalore 9. Jodhpur 10. Rajsamand 11. Sawai Madhopur 12. Udaipur

5. Category IV: Decline in water table more than 4 m : 1. Ajmer 2. Alwar 3. Jaipur 4. Jhunjhunu 5. Nagaur 6. Pali 7. Sikar 8. Tonk

Source : 'Variation in Rainfall & Trend of Water level (1984-1994) in Rajasthan', Ground Water Department, Govt. of Rajasthan.

Map No. 6

RURAL WATER SUPPLY - RISK PARAMETERS



GROUND WATER LEVEL FLUCTUATIONS - 1984-1994

LEGEND :

GREEN CATEGORY I	INCREASE
BLUE CATEGORY II	DECLINE UPTO 1 MTR.
YELLOW CATEGORY III	DECLINE 1 TO 4 MTR.
RED CATEGORY IV	DECLINE MORE THAN 4 MTR.
BLANK	NOMINAL FLUCTUATION AS GROUND WATER NOT USED FOR IRRIGATION AS GRD. WATER LEVEL VERY DEEP

DATA FOR MAP NO. 7
FOR COMBINED RISK PARAMETERS

WITH CATEGORIES OF RISK PARAMETERS OF WATER SUPPLY IN DISTRICTS

DISTRICTS	Category H.Ps	Category No Source Hamlet	Category No Source Village	Category 'F'	Category Chem. Qual.	Category Dec.in Water Tab.	All IV Cat. parameters	5 parameters of IV Cat.	4 parameters of IV Cat.	3 parameters of IV Cat.	2 parameters of IV Cat.	1 parameter of IV Cat.	None parameters of IV Cat.
AJMER	IV	II	II	IV	IV	IV			X				
ALWAR	IV	III	II	III	III	IV					X		
BANSWARA	III	II	II	II	III	I							X
BARAN	IV	III	III	III	I	II						X	
BARMER	III	IV	IV	IV	III	–				X			
BHARATPUR	IV	III	II	III	III	III						X	
BHILWARA	IV	III	II	IV	IV	II				X			
BIKANER	–	III	III	II	II	–							X
BUNDI	V	II	III	I	I	III						X	
CHITTORGARH	V	–	III	II	II	III						X	
CHURU	–	V	II	II	II	–						X	
DAUSA	IV	IV	III	IV	III	III				X			
DHAULPUR	IV	III	II	II	III	III						X	
DUNGARPUR	III	II	II	II	III	II							X
GANGANAGAR	III	III	IV	II	I	I						X	
HANUMANGARH	III	III	IV	II	I	I						X	
JAIPUR	IV	IV	II	IV	III	IV			X				
JAISALMER	II	IV	III	IV	III	–					X		
JALORE	IV	IV	II	IV	III	II				X			
JHALAWAR	IV	II	III	I	I	II						X	
JHUNJHUNU	IV	IV	II	II	III	IV				X			
JODHPUR	IV	II	III	III	III	III						X	
KOTA	IV	III	III	III	I	II						X	
NAGAUR	IV	IV	II	IV	IV	IV		X					
PALI	IV	IV	II	III	III	IV				X			
RAJSAMAND	III	III	I	II	III	III							X
S.MADHOPUR	IV	III	III	III	III	III						X	
SIKAR	IV	IV	II	III	III	IV				X			
SIROHI	IV	III	II	III	III	II						X	
TONK	IV	III	II	IV	III	IV				X			
UDAIPUR	III	III	II	II	III	III							X

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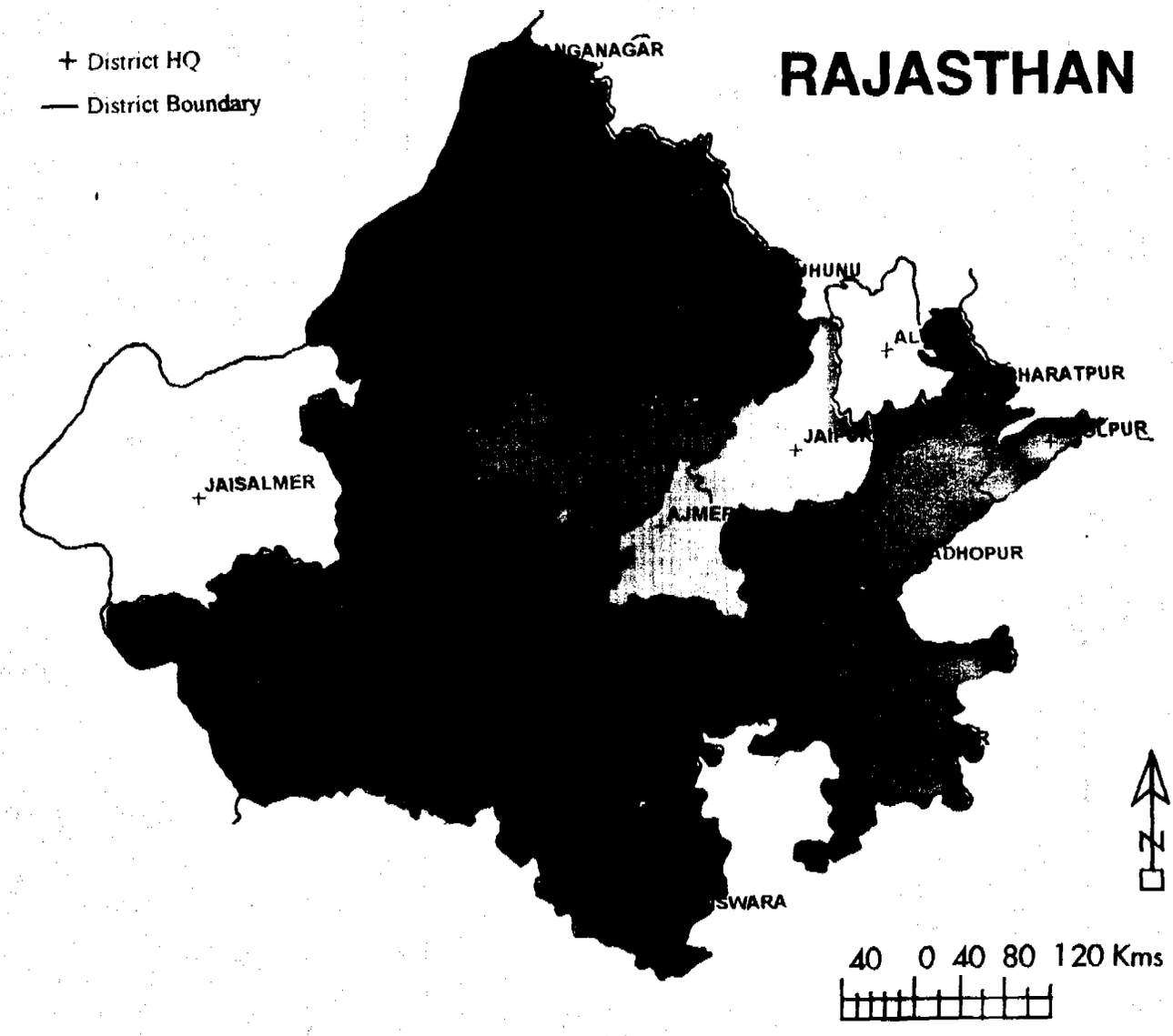
Map No. 7

RURAL WATER SUPPLY - RISK PARAMETERS



COMBINED EFFECT OF RISK PARAMETERS

LEGEND :

GREEN	Distt. where no parameter is of (worst) Category IV
BLUE	Distt. where 1 out of 5 parameters is of (worst) Category IV
YELLOW	Distt. where 2 out of 5 parameters are of (worst) Category IV
VIOLET	Distt. where 3 out of 5 parameters are of (worst) Category IV
ORANGE	Distt. where 4 out of 5 parameters are of (worst) Category IV
RED	Distt. where 5 out of 5 parameters are of (worst) Category IV

Map No. 8

RURAL WATER SUPPLY - RISK PARAMETERS