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ENVIRONMENTAL ASSESSMENT REPORT
(EXECUTIVE SUMMARY)

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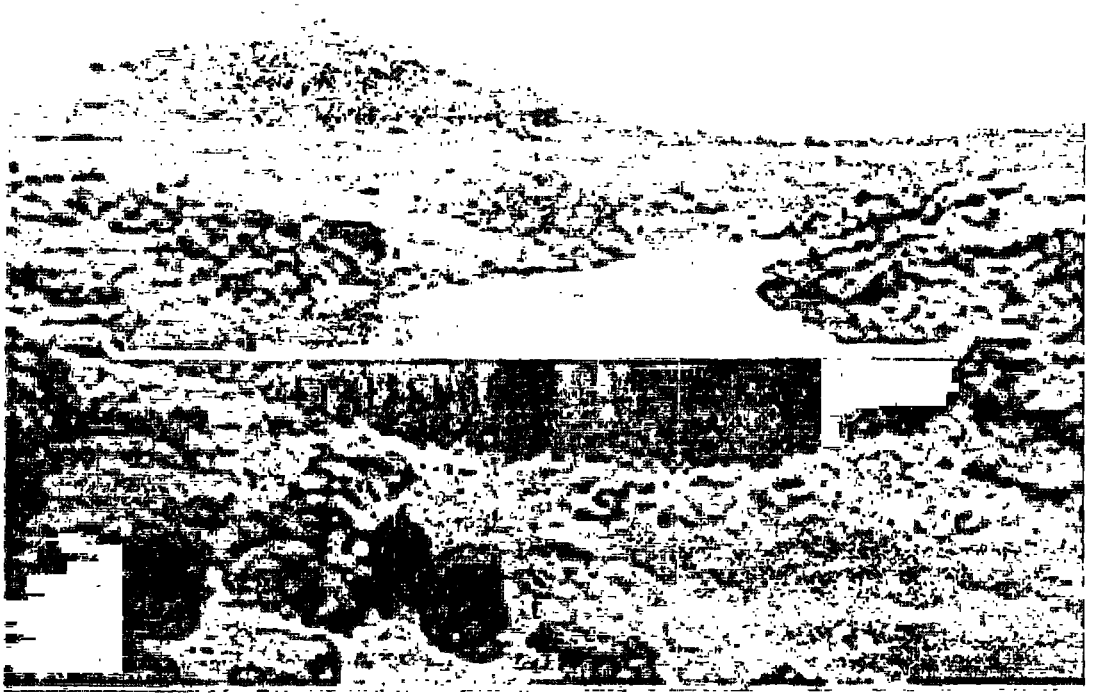

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MAHARASHTRA RURAL WATER SUPPLY AND ENVIRONMENTAL SANITATION PROJECT

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1.0 Preamble

Maharashtra is located in the Western India and has a total population of about 96.7 mn as per the 2001 census data. Out of this 55.7mn (58%) people reside in rural areas and 41 mn (42%) reside in urban areas. The State is sub-divided into 35 districts and 353 talukas. Two of the districts are urban districts and the remaining 33 are rural districts. The rural population resides in 40,785 villages and 45,528 habitations.

Despite implementing various programmes at a cost of Rs 166, 000 mn (USD 3,320 mn) till date for providing potable water supply to the rural communities, more than 26% of the habitations do not have assured supply of adequate potable water. Besides many more habitations face scarcity during summer months and depend of tanker supplies. The main reasons for this situation are:

- Non-involvement of communities in planning and management
- No focus on capacity building of communities to own and manage infrastructure
- Use of standard engineering designs and lack of technology options for varying needs
- No focus on source protection and augmentation
- Focus on physical infrastructure building rather than delivering water in a sustainable manner

Based on these lessons learnt, the Government of Maharashtra (GOM) has adopted a *'reform policy'* across the state in the rural water and sanitation sector in the year 2000 and is the only State in India to do so. The reform policy is based on the principles advised by the Government of India's (GOI) Sector Reform Programme. The key principles of the GOM's reform policy are (i)community ownership and management of water supply facilities (ii) strengthening of decentralized service delivery and management through the Panchayati Raj Institutions (PRI) and (iii) long term sustainability of the services through appropriate technical and management options that involve local communities. This policy earmarks a radical departure from the past policies and programmes that were centralized and supply led and did not involve communities in any manner.

2.0 Project Setting:

2.1 Rationale for the project

Out of the 33 rural districts four are supported by Government of India's (GOI) Sector Reforms Programme (SRP) and three are supported by KfW for water supply only. The GOI is supporting the GOM for implementation of Total Sanitation Campaign (TSC) in all the districts. However, these programmes are for a limited period (3-4 years) and do not cover the water and sanitation issues in an integrated manner. Secondly, these programmes do not incorporate provisions for state wide sector strengthening and experiment with other related initiatives (like over all PRI capacity building etc). Thus, GOM lacks adequate resources to implement water supply programmes in remaining 26 rural districts, strengthen the intuitional capacity across the state and pilot innovative approaches like integrated water resource management by communities. Therefore, GOM approached the World Bank to support the statewide implementation of the reform policy in a holistic manner.

2.2 Project Objectives and Scope

The objectives of the project are :

(i) **Increase rural community's access to improved and sustained drinking water and sanitation services, and**

(ii) **Decentralise RWSS service delivery to Panchayati Raj Institutions (PRIs).**

The project is designed to cover about 3730 GPs (out of 20,753 GPs in these 26 districts) , selected on a composite set of criteria based on poverty level, water scarcity and preparedness of the GPs in 26 districts over a 6-year period. Selection of water supply source would be demand driven guided by water quantity, quality as well as capital and O&M costs. However, considering the cost effectiveness and easy accessibility, the project envisages more demand for groundwater source than distant surface water source except where adequate and acceptable quality water is not available. A total investment of approximately Rs.15,000 mn (USD 300 mn) is estimated of which 10% of the hardware cost of approximately Rs. 1200 mn(USD 240 mn) would be contributed by the beneficiaries. In addition, 100 % O&M cost would be contributed by the beneficiaries. Activities taken up under the pilot project from May 2002 onward till signing of the Project would be eligible for retroactive finance. As agreed with the World Bank mission, the proposed project is proposed to be one in a series of dovetailed RWSS projects.

2.3 Project Components

The following are the key project components.

2.3.1. Community Development and Infrastructure: This component has the following sub-components.

2. 3.1.1 Community Development: The capacity of the community would be built for undertaking participatory planning, project execution and taking care of the O&M of the services Support Oragnisations and District Facilitation team would provide necessary capacity building to members of GP, VWSC and other para-professionals in the village.

2.3.1.2 Women Empowerment Fund: This aims at skill development of poor women as identified in the gender strategy and providing access to credit, through an empowerment fund, to improve their livelihoods.

2.3.1.3 Community Water Supply Infrastructure: The project aims to finance improved drinking water supply facilities in about 3730 GPs. The community would share 10% of the capital cost and 100% of the O&M cost, based on the option chosen by them.

2.3.1.4 Personal Hygiene, Household and Environmental Sanitation: The project would support the GOM's new strategy aimed at encouraging the communities to eliminate the practice of open defecation and adopt safe sanitation and hygiene practices. Besides, school sanitation, lane improvements, drains, soak pits, garbage and compost pits, and IEC for hygiene behaviour would be promoted.

2.3.2 Institutional Strengthening: The following are the sub-components.

2.3..2.1 PRI and State Agencies Capacity Building: In order to experiment with the concept of empowering the PRIs to address development needs beyond WSS, pilots would be undertaken to build the overall management capacity of about 150 GPs and three ZPs which will demonstrate outstanding performance in the implementation of the water supply and sanitation component of the project .

2.3.2.2 IEC: The Development Communication strategy would focus on institutional as well as behaviour change relating to sanitation and hygiene practices.

2.3.2.3 Monitoring and learning: The M&L system would enable the management team to regularly monitor the progress of the project, capture the key lessons and disseminate the learning to all the stake holders

2.3.3 RWS Sector Strengthening: This component would support GOM to strengthen its capacity for implementing sector reforms across the state and improve the overall management of the sector. The sub-components are: knowledge management system, piloting of integrated ground water aquifer management in six identified watersheds and water quality monitoring.

2.4 Project period and phasing: The project is designed to be implemented over a period of 6 years during 2003-2009. All physical activities would be implemented during the first five years and the last year would focus on sustainability issues. The project intends to cover 450 GPs in three districts during the first year, 900 GPs in 6 districts in 2ndyear, 900 GPs in 6 districts in the third year, 900 GPs in 6 districts in fourth year and 580 GPs in 5 districts during the 5th year of the project thus totalling 3730 GPs .

3.0. Baseline Environmental Status

3.1. Water Quantity issues

3.1.1Groundwater Potential and Extraction: The Groundwater Survey and Development Agency (GSDA), a nodal agency for groundwater planning and development in the State, has classified the State into 1505 watersheds and 2415 sub units based on irrigated and non-irrigated areas and estimated the groundwater potential.

Based on the stage of ground water development and pre and post monsoon water level trends, out of 1766 watershed subunits in the project area 1428 (81%) subunits are safe. Out of the remaining, 69 (4%) sub units are over exploited, 40 (2%) sub units are critical, 170 (10%) sub units are semi-critical and in 59 (3%)sub units (3%) quality of groundwater is saline and unsuitable for drinking and irrigation[1].

The current availability of total water resources in the state is estimated as 154137 MCM/year (70% surface water and 30% ground water). The total utilisation by all the sectors in the state is estimated as 39484 MCM/year, being 26% of the total water resources available. Out of this rural drinking water consumes only 1062 MCM/year. It is estimated that by year 2030 the total water demand would go up to 103704 MCM/year, being 67% of the available resources. However out of this, the demand for rural drinking water is estimated at 1943 MCM/year[2].

Secondly, the total groundwater availability in the state is 46454 MCM/year out of which availability in the project area is estimated at 28751 MCM/year. The total current annual extraction of groundwater in the project area is estimated at 7768.91 MCM/year,being 27% of the utilizable recharge. Out of this 7095.87 (91%) MCM/year is for irrigation and only 673.04 MCM/year (9%) is for drinking purpose[3]. The demand for drinking water in the project areas in the year 2030 is projected to be 1373 MCM/year (as against 673 MCM/year in 2002).

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[1] Provisional revised groundwater assessment by GSDA and CGWB, 2002.

[2] Analysis carried out by GSDA using the data from the Second Maharashtra Water and Irrigation Commission, 1999 and the Provisional revised groundwater assessment by GSDA and CGWB, 2002

[3] Provisional revised groundwater assessment by GSDA and CGWB, 2002

However, the GSDA's trend analysis in the project area indicates that water tables are declining in over 68 talukas located in 19 districts over the last ten years[4]. If the current trend of over-extraction of groundwater, especially for irrigation purposes, continues without any control there could be a possibility that out of the total demand of 1373 MCM/year in 2030 only about 1263 MCM water per year could be available for drinking purposes in these districts[5]. The GOM would educate the community about better irrigation practices, balanced use of groundwater resources for competing demands and also conservation of groundwater through IEC. While the irrigation related IEC does not form part of this project, the WSSD would liaison with the irrigation and agriculture departments for necessary coordination. Secondly, the project plans to address this very issue of holistic water resources management by the communities on a pilot basis in six select watersheds. The lessons learnt during these pilots would be useful in scaling up the approach to all the watersheds in the state.

Thus, it can be concluded that through scientific planning and judicious use of available water resources by different sectors, availability of water for human consumption in rural Maharashtra would not be a constraint.

3.1.2. Impact of Sugarcane Irrigation: About 18.8% (6,99,200 ha) of the total irrigated area (37,19,149 ha) in the State is under sugarcane and is over irrigated. About 50% of this (349, 600 ha) falls under project area, mainly concentrated in Kolhapur, Sangli, Satara, Nashik, Latur, Beed, Osmanabad and Solapur districts. Excessive irrigation and use of chemical fertilisers for sugarcane has led to progressive decline of groundwater tables and contamination of groundwater at shallow depths with Nitrates, thus deteriorating the groundwater quality. The GOM would educate the farming community about the use of appropriate irrigation measures (such as drip irrigation, sprinklers etc) and also use of organic fertilisers through IEC. However, this IEC is beyond the scope of the project and WSSD would liaison with the Irrigation and Agriculture departments for the same.

3.1.3. Surface water: Total surface water availability in five major river basins covering the project area is estimated at 107683 MCM/year of which present utilization is 30635.67 MCM/year (28.5%). Per capita availability of surface water is lowest in Tapi river basin (477 cubic meters/year) and highest in Konkan sub basin (3497 cubic meters per year).

3.2. Water Quality issues: Ground water Quality in the State particularly in shallow acquifer is generally good and potable. However, in certain areas concentration of Fluoride, Nitrate, Iron, and salinity due to exposure to rocks is higher than permissible limit.

3.2.1.Fluoride: Chemical analysis of water samples from wells and bore wells by GSDA, CGWB, PHD and NEERI shows that in project area, ground water in parts of 52 talukas in 17 districts has higher concentration of fluoride than permissible limits and most of the affected areas are in Yavatmal, Chandrapur, Satara, Beed, and Solapur districts.

[4] Based on data of water table monitoring by GSDA and CGWB between 1992-2002 and the also the Hydrology project data

[5] Provisional revised groundwater assessment by GSDA and CGWB, 2002 This analysis indicates a 'worst case' scenario for some parts of the 68 talukas in the 19 districts, if the current irrigation practices continue In such a scenario, the GOM would allocate an additional 110 MCM/year (the projected shortage) for drinking water purposes, curtailing other uses, as drinking water has the first priority for water use in both the national and state policies

Concentration of fluoride is more in deeper aquifers tapped by bore wells than at shallow depths. GOM is in the process of developing a strategy to address fluoride related issues, with assistance from Water and sanitation Programme-South Asia (WSP-SA). The WSP-SA consultants have reviewed the prevailing field situation in four districts: Yavatmal, Chandrapur, Nagpur and Nanded (excepting Nanded all the three are project areas) and are in the process of formulating their recommendations. A brainstorming session would be organised to discuss the recommendations and agree upon on the broad strategy components during May/ June 2003. These components would then be detailed to formulate the state wide strategy by July 2003. After that the strategy would be implemented through out the state, including the project area.

3.2.2.Nitrate: High concentration of Nitrate in groundwater is reported mainly in Sangli, Solapur, Satara, Nagpur, Yavatmal, Bhandara, Beed, Osmanabad, Thane and Parbhani districts due to excess application of chemical fertilizer in large areas irrigated under paddy, sugarcane, banana, cotton, orange and grape. The excess use of chemical fertilisers leads to concentration of nitrate in groundwater at shallow depths. Secondly, composting of solid waste and cow dung close to the water sources also leads to concentration of nitrates in shallow water tables. Despite high concentration of nitrates, no case of blue baby syndrome is yet reported in any part of the state. As explained in 3.1.2 above, the WSSD would liaise with the irrigation and agriculture departments to educate the farmers about using organic fertilisers. Secondly the project IEC would educate the community about safe methods (including site selection) of composting solid waste.

3.2.3. Salinity: Salinity in groundwater is observed in 3 different areas of the State (i) Tapi-Purna river alluvium (ii) Water logged areas in the canal command , and (iii) Coastal areas Groundwater in the areas covering southern parts of Purna alluvium in Amravati (Daryapur, parts of Achalpur and Anjangaon talukas) Akola (parts of Akot, Akola, Murtizapur and Telhara taluka), Buldhana (Nandura, Khamgaon and Mehkar talukas) have high salinity, making it unfit for drinking purpose. The villages in this zone are supplied drinking water from safe surface water sources. Intervention through rainwater harvesting would also be undertaken.

3.2.4.Iron: High concentration of iron is present in groundwater in Ratnagiri, Chandrapur, Sindhudurg, Gadchiroli, Bhandara, Solapur, Nagpur, and Kolhapur districts due to high iron mineral in the geological formations. In areas where iron content is high in groundwater, storing water before use and allowing it to settle has reduced its impact. The iron contamination has no severe health impact except for some occasional stomach disorders.

3.2.5. Bacteriological Contamination: Sampling of drinking water sources by PHD across the State indicates contamination of about 32% sources over last three years i.e. 2000-2002. As per PHD reports an average 1.2 million (1.2%) people are affected every year and about 350 people die due to bacteriological contamination of drinking water. However, the trend analysis of attacks and deaths due to water borne diseases between 1997 and 2002 indicate a progressive decline, due to intensive IEC undertaken under the Sant Gadge Baba Campaign. The IEC covered safe sanitation practices and protection of drinking water sources from contamination and chlorination of water.
The prevailing unsafe sanitation practices of open defecation and not washing hands is a major cause for the bacteriological contamination and diseases. The project would undertake intense IEC to encourage communities to shift over from the practice of open

defecation to safe sanitation and adopt safe sanitation practices such as hand washing. Other environmental sanitation intervention like drains, solid waste management would also contribute to the reduction of diseases. Further, the community would be trained to regularly check the water quality, either directly or through PHC (using field test kits) and regularly chlorinate the water as per need.

3.3.Sanitation and Hygiene: Presently out of 11mn rural families about 2.46 mn have been provided latrines by GOM under different programs. However, while about 22.5% of rural families have access to latrines only about 11.5% use the latrines and others continue the practice of open defecation. Therefore the project aims at achieving zero open defecation instead of focusing on 'latrine building'. Out of 53171 primary schools 27% have sanitary facilities.

4.0.Policy and Legal Framework

The GOM adheres to the National Water Policy laid down by the government of India and gives first priority to drinking water supply over other water uses. Besides, Government of Maharashtra has passed following Acts dealing with protection of Environment and natural resources.

- Maharashtra Act XVI of 1970 viz. Maharashtra Prevention of Water Pollution Act 1969
- Maharashtra Act XLVIII of 1976 viz. Maharashtra Water Supply and Sewerage Board Act 1976 (as amended twice).
- Maharashtra Ground water (Regulation) Act 1993 for protecting drinking water wells.
- Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act 1993 prohibition to employ manual scavengers
- Maharashtra Electricity Regulatory Commission Act1998 recommending lower electricity tariff charges for RWS Schemes
- Bombay Police Act (punishment for spoiling environmental sanitation)

5.0.Public Consultations and issues identified: Public consultations were held in four villages in each of the five districts selected for the study. The issues emerging from the public consultations are as follows:

5.1.Water quantity and quality issues:

- Adequate drinking water supply is not available in summer
- Surface water supply also depletes during lean period.
- In many places, drinking water sources are polluted and contaminated.
- Lack of awareness about residual chlorine in water and use of chlorine tablets.
- Quality of water is not regularly monitored.
- During water scarcity period, beneficiaries are willing for dual water supply system

5.2.Household and environmental sanitation issues:

- There was lack of individual latrines and practice of open defecation causes inconvenience, particularly to women.
- Disposal of organic waste close to water supply source causes contamination.
- Scarcity of water is cited as main reason for non-use of latrines.
- Lack of sullage and storm water drains and soak pits causes environmental problems.

5.3.Personal health and hygiene:

• Using polluted/contaminated water causes frequent attacks of diarrhoea, malaria, jaundice and other gastrointestinal problems.

6.0.Hot Spots and Issues

The following is an analysis of hotspot areas.

6.1 Sanitation hotspots: Only 22 4% households have access to latrines. Only 27% of primary schools have sanitary facilities. In most of the villages disposal of sullage, wastewater, and cattle dung is improper. Thus, all the 26 districts in the project area fall under hot spots category.

6.2 Water hotspots: For identifying water related hotspot areas the declining water tables and presence of excess fluoride and TDS has been considered (TDS includes salinity also) as primary indicators. As presence of nitrates and iron in the drinking water did not have any recorded health impact in the state they have not been considered as indicators for water hotspot areas.

The taluka wise information has been plotted for the above three parameters, in Table 1 below. The districts that have presence of any two parameters and more than 5 affected talukas have been prioritised a hot spot areas. Accordingly, the following 12 districts fall under the category of hotspots: *Akola, Beed, Buldhana, Chandrapur, Jalgaon, Nagpur, Nashik, Sangli, Satara, Sindhdurg, Solapur, and Yavatmal. There are a total of 102 affected talukas in these 12 districts.*

A second level of analysis reveals that there are about 35 talukas in 15 districts (11 out of the above 12 (excepting Buldhana) and additional districts of Hingoli, Osmanabad, Ratnagiri and Thane) that have more than 2 indicators and thus qualify to be considered as hotspot talukas. However, it may be noted that not all the villages in these talukas/ districts are affected.

A tertiary level of analysis would be required to identify exact hot spot villages. Specific criteria would be identified and detailed information collected to identify exact hotspot villages during the initial project period. PPMU would contract experienced consultants for this exercise.

Table-1: Analysis of Water Quantity and Quality Hot Spots Districts:

District	Talukas	Declining WT	Fluoride	TDS (including salinity	No of parameters	Total talukas
Akola	Akola	*		*	2	
	Akot	*			1	
	Telhara	*			1	
	Takali	*			1	
	Balapur			*	1	
	Murtizapur			*	1	
	Patur			*	1	
		4	0	4		7
Beed	Beed	*	*		2	
	Ashti	*	*		2	

	Gevarı	*	*	*	3	
	Kaıj	*			1	
	Manjalgoan	*	*	*	3	
	Dharur			*	1	
		5	4	3		6
Bhandara	Mohadı	*			1	
	Bhandara		*		1	
	Sakolı		*		1	
		1	2			3
Buldhana	Motala	*			1	
	Khamgoan	*			1	
	Sangrampur	*			1	
	Malkapur	*			1	
	Chıkhalı			*	1	
	Lonar			*	1	
	Mehekar			*	1	
	Nandura			*	1	
		4	0	4		8
Chandrapur	Mul		*		1	
	Rajura		*		1	
	Bhadravatı		*		1	
	Korpana		*		1	
	Warora		*	*	2	
	Gondpımprı		*		1	
	Chandrapur			*	1	
		0	6	2		8
Gadchırolı	Aherı		*		1	
	Sıroncha		*		1	
		0	2	0		2
Gondıa	Deorı		*		1	
	Amgoan		*		1	
		0	2	0		2
Hıngolı	Basmat			*	1	
	Kalamnurı		*	*	2	
		0	0	2		2
Jalgoan	Yawal	*			1	
	Chopda	*		*	2	
	Erandol	*			1	
	Amalner	*			1	
	Bhusaval	*			1	
	Jamner		*		1	
	jalgoan			*	1	
	Raver			*	1	
		5	1	3		9
Jalna	Jalna	*			1	
	Badnapur	*			1	
	Ambad	*			1	
	Bhokardan	*			1	
	Ghansavlı	*			1	
		5	0	0		5
Kolhapur	Karveer		*		1	

	Chandgad		*		1	
	Hatkangale			*	1	
	Shirol			*	1	
		0	2	2		4
Latur	Udgir		*		1	
	Latur			*	1	
	Renapur			*	1	
	Ausa			*	1	
		0	1	3		4
Nagpur	Kamptee	*	*		2	
	Nagpur	*	*		2	
	Mauda		*	*	2	
	Hingana		*		1	
	Umred		*		1	
	Bhiwapur		*		1	
	Saoner		*		1	
	Parsevni		*	*	2	
	Katol		*		1	
	Kalmeshwar		*	*	2	
	Kuhi			*	1	
		2	10	4		11
Nashik	Dindori	*			1	
	Chandwad	*			1	
	Yoela	*		*	2	
	Nandgaon	*			1	
	Surgana	*			1	
	Baglan			*	1	
	Nasik			*	1	
	Niphad			*	1	
	Sinnar			*	1	
		5	0	5		9
Nandurbar	Shahada	*			1	
		1	0	0		1
Osmanabad	Paranda		*		1	
	Tuljapur	*	*		2	
	Osmanabad	*			1	
		2	2	1		3
Parbhani	Gangakhed		*	*	2	
	Hingoli		*		1	
	Pathri		*		1	
		0	4	1		3
Ratnagiri	Rajapur		*	*	2	
	Guhagar			*	1	
	Ratnagiri			*	1	
		0	1	3		3
Sangli	Tasgoan	*		*	2	
	Atpadi	*		*	2	
	Jat	*		*	2	
	Miraj	*		*	2	
	Khanapur	*	*		2	
		5	1	4		5
Satara	Khatav	*	*		2	
	Man	*	*		2	

	Khandala	*			1	
	Patan		*		1	
	Phaltan		*	*	2	
		3	4	1		5
Sindhdurg	Kudal		*		1	
	Vengurla		*		1	
	Sawantwadi		*	*	2	
	Malwan		*	*	2	
	Kankavali		*		1	
		0	5	2		5
Solapur	Barshi	*	*		2	
	Karmala	*			1	
	Malshiras	*			1	
	Pandharpur	*		*	2	
	N. Solapur		*	*	2	
	Mangalwedha		*	*	2	
	Madha		*		1	
	Sangole			*	1	
	S. Solapur			*	1	
		4	4	5		9
Thane	Vasai		*		1	
	Dahanu			*		
	Palghar			*		
	Thane			*		
		0	1	3		4
Washim	Balapur	*			1	
	Manora			*	1	
	Risod			*	1	
		1	0	2		3
Wardha	Ashti	*			1	
	Karanja	*			1	
	Seloo	*			1	
		3	0	0		3
Yavatmal	Ner	*		*	2	
	Pusad	*			1	
	Umarkhed	*			1	
	Maregoan	*	*		2	
	Digras	*		*	2	
	Wani		*		1	
	Pandharkawada		*		1	
	Maregoan		*	*	2	
	Darva			*		
	Kelapur			*		
		5	4	5		10
Total		54	52	59	133	

Source: A synthesis of data from GSDA, CGWB, WSSD, NEERI, PHD, and 2000 to 2002.

7.0 Strategies and Technology Options for addressing Hotspot issues

7.1 Strategies: The following are the specific strategies to address environmental aspects related to different project interventions.

7.1.1.Strategies for Water Quantity issues

- Rejuvenation and rehabilitation of existing sources
- Promote concepts related to ground water recharge, source protection/ strengthening and balanced extraction for different uses.
- Rainwater harvesting and roof top rain water harnessing
- Create supplementary safe source
- Promote aquifer management groups and educate communities in total water resources management, on a pilot basis.
- Regular monitoring of ground water

7.1.2. Water Quality Issues

- Provide potable drinking water from alternate sources
- Promote shallow open wells
- Continuous chlorination of water supply to maintain a minimum residual concentration at each stand post and individual connection.
- Mixing contaminated water with fresh water to lower the concentration of fluoride, nitrate, iron and salinity
- Promote household or community treatment systems
- Continuous IEC programs

7.1.3 Water Quality Monitoring: The water quality monitoring in rural areas is carried out through a three-tier strategy involving following actors in the table below.

Table-2: Three-Tier Water Quality Monitoring:

Village Level	GP/ VWSC /CBOs	Regular testing for bacteriological contamination, residual chlorine
Primary Health Centre and District Level	i.Primary Health Centre/ ii.District Public Health labs.	Water quality Surveillance consisting of a minimum 10% random quality check of all the sources in the district. Co-ordinate and supervise other water quality testing activities entrusted to private or other laboratories. Maintain MIS for various sources in the District.
State Level	WSSD/ PHD	Policy and strategy formulation and monitoring of the same. Organising water quality tests for 100% sources in high problem districts/ hotspot areas. Maintain state level MIS

7.1.4. Strategy for Household Sanitation:

- Community based incentive for zero open defecation through collective action.
- Effective IEC through Sant Gadge Baba campaign
- Propagate safe and low cost technology options for poor stake holders

7.1.5.Strategy for Environmental Sanitation

- Provide sullage and storm drains with proper disposals
- Promote household/community compost pits for waste disposal

- Identify suitable sites away from drinking water source for disposal of excreta , village garbage and cattle dung
- Construct internal lanes and pavements
- Effective IEC campaign for peoples participation and attitudinal change

7.2 Technology Options: Considering the nature, type and severity of the problems in the project area, a menu of environmentally safe technology options for various quantity, quality, hygiene and environmental sanitation issues have been provided (refer Annexure-VII, VIII, IX and X in the main report for details). Further, appropriate 'Technical Guideline Manuals' are prepared to guide the process of selection, implementation and O&M for all the suggested technical interventions. The communities would select an appropriate option based on the technical need, capital cost, O&M cost, preference, and availability of technology and skills in a demand driven approach.

7.2.1 Technologies for Water Quality: The generic preferred technology options where drinking water in the existing sources is contaminated are: alternate safe source, use of limited safe water for drinking and cooking and use of contaminated water for other purposes, dilution by adding low/ nil contamination water, domestic filter treatment and community level treatment through appropriate technology. Besides these, the following specific technology treatment options are also available for specific contamination.

Fluoride:

- Nalgonda Model (Complexion Method) and fill and draw defluoridation plant technology
- Dilution with low fluoride water
- Roof Rain water harvesting structures to provide for drinking and cooking water

Iron:

- Aeration of water and settling of the iron oxide sludge.

Bacteriological:

- Chlorination of water at source/ household as the case may be.

7.2.2 Groundwater Recharge: Various conventional and non-conventional measures such as check-dams, deepening/ de-silting of tanks in the former category and jacket wells, bore blast technique and fracture seal cementation in the later category. Selection of one or a combination of more than one technology depends on the local hydro-geological conditions.

7.2.3 Household Sanitation: A range of safe pit latrines varying from VIP to single pit pour flush to twin pit pour flush latrines shall be propagated. The household would choose a desired option based on local soil conditions, their preference, cost and ease of availability of materials and construction skills.

7.2.4 Environmental Sanitation: The technology options for solid and liquid waste are: Sullage drains, soak pits leach pits, open drains, household and community composting pits, disposal of biodegradable wastes through Vermiculture for various regions.

8.0 Environmental Management Plan (EMP):

Critical analysis of the baseline environmental data, feed back from the public consultations, information gathered through MIS for the current schemes as well as the issues emerged during discussions with various functionaries and organizations participating in the rural water supply program has brought out key environmental issues that need to be addressed along with mitigated measures while designing and

implementing the project. The important environmental issues are classified into four different categories (I) Water Quantity issues (ii) Water sources management (iii) Water quality issues, and (iv) Environmental sanitation and hygiene issues

Table-3 Environnent Management Plan (EMP):

Project Interventions	Environmental Issues	Expected Impact	Mitigatory Measures
1.0 Community development and infrastructure: **1.1 Community development** through capacity building of the GP/ VWSC and other informal groups within the project villages to plan, design, execute and manage various project interventions.	Lack of adequate capacity within the project villages to own and manage their watsan services.	Community ownership and management of watsan services would lead to sustainability of project interventions.	
1.2 Women empowerment fund aimed at skill development and improving livelihoods of poor women in the project villages, as a part of the overall gender strategy.	Poor women (and their families) lack access to watsan services due to gender and poverty inequity and thus, suffer more than others.	The economic and social status of poor women improves and leads to an improved access to watsan services specifically and better life generally.	
1.3 Community water supply infrastructure: **1.3.1 Water Quantity Issues** i.Rejuvenation and rehabilitation of Existing water supply sources ii. Provision of new drinking water supply systems through a range of options. iii. Source protection /strengthening measures	a.Drinking water scarcity b.Less water during summer c.Declining water level d.Silting of tanks/ponds	Adequate and safe water supply *Incremental/ adequate water availability leads to more waste water on the streets causing mosquito breeding and health impact.*	*Communities would be advised to adopt appropriate waste water disposal measures such as soak pits.*
1.3.2 Source sustainability and Strengthening i. Water conservation and ground water recharge through a range of technology options suitable for the area ii. Implementation of Shivkalin Pani Sathwan Yojana for scientific estimation and planning of water. iii. Monitoring of groundwater by para-professionals at village level and the DFT at the district level and GSDA/PPMU at State level and also through	a.Over-extraction of groundwater and drying of drinking water wells b.Lesser or non-availability of drinking water, especially during summer months. c.Progressive decline of water level.	Increased availability of drinking water even during summer. Ensures source sustain-ability. Leads to increase of groundwater tables. *Some times, such measures encourages competing users (agriculture, industry) to start extracting more ground water for quick economic gains.*	*Educate the community about the need to maintain groundwater balance and control such over exploitation collectively.*

data generated by the Hydro geology Project. iv. Periodic review and revision of groundwater assessment.			
1.3.3 Piloting of 'Integrated Water Resources Management' in Six watersheds/ aquifers.	Holistic approach for water resources management on aquifer basis	Adequate & sustainable availability of water sources for human consumption and other competing demands.	
1.3.4 Water Quality Issues: **1.3.4.1 General issues:** i. Alternate source of fresh water supply from surface water ii. Dilution of contaminated water by safe water. iii Limited supply of fresh water for drinking and use of contaminated water for other uses like washing, bathing iv. Rooftop rainwater harvesting for drinking & cooking purposes	a.Limited availability of potable water b.Adverse health impacts.	Availability of accepted quality of drinking water. Improved health status.	
1.3.4.2 High Salinity: Promotion of shallow open well as safe source of water supply in coastal areas.	Saline water below 5 meter depth due to sea water ingression in coastal area.	Availability of accepted quality of drinking water.	
1.3.4.3 High Fluoride: Promotion of a range of defluoridation techniques such as Nalgonda and Ion-exchange, for treating fluoride infested water-	Health problem due to fluorosis, mottled teeth, knock knee and calcified ligaments	Reduction in diseases and health expenditure. *In case of treatment plants, residual aluminium and lack of safe disposal of chemicals leads to more health risk.*	*The 'Technical Manuals' developed will provide guidelines for environmentally safe disposal methods.*
1.3.4.4 High Iron: i. Allow iron in drinking water to settle in the container/delivery cistern before use/ distribution ii. Treatment for removing Iron before distribution	Corrosion and encrustation of water supply bore well/tube well Un acceptable colour and odour of the water.	Availability of accepted quality of drinking water. Reduction in diseases and health expenditure.	
1.3.4.5 High Nitrate: i. Promote use of organic fertilizers and reduce application of nitrogen fertilizers dose through IEC ii. Select site for water supply source away from irrigated fields and sewage/ garbage disposal sites iii. Denitrification treatment	Possible 'Blue Baby' syndrome in infant babies due to high nitrate. However, blue baby cases have not been detected so far in Maharashtra.	Availability of accepted quality of drinking water.	

1.3.6 Bacteriological Contamination: i. Continuous chlorination of water supply to maintain minimum residual chlorine ii. IEC for locating various liquid and solid waste disposal/ treatment systems away from water sources. iii. Promotion of water quality monitoring by community, especially women, children and youth.	High incidences of attack of diarrhoea , hepatitis, cholera, gastro and typhoid due to contaminated water	Availability of accepted quality of drinking water. Reduction in diseases and health expenditure.	
1.4 Personal hygiene, Household Sanitation and environmental sanitation: **1.4.1 HH sanitation:** i. Intense IEC for attitudinal changes ii.100% stopping of open defecation and adopting other safe sanitation practices. iii. Community latrines for women/ men to be constructed as a last option in the process of elimination of open defecation	a.Large scale practice of open defecation. b.Contamination of water sources due to open defecation causes health hazards.	Creates clean sanitation and hygiene conditions in the habitation. Reduction in contamination of drinking water sources and disease burden.	
1.4.2 School water supply and sanitation i. Safe Sanitation complexes would be provided in all the schools as per need along with assured water supply. ii. Impart hygiene education to school children for behavioural changes	Lack of water supply and toilets in school leads to un-hygienic learning atmosphere.	Instil good hygiene and sanitation habits among children. *Lack of proper maintenance of newly created sanitary facilities exposes children to greater health risk.*	*Build the capacity of the community/ school to properly maintain facilities provided*
1.4.3 Env. sanitation **1.4.3.1 Waste Water** i. Promote safe and appropriate sullage drains, soak pits, kitchen gardens and lane improvements as appropriate.	Lack of sullage drains leads to problem of ponding of water and piling of sullage become breeding places for mosquitoes	a.Brings cleanliness in village. b.Protects drinking water source. c.Reduces incidence of vector diseases.	
1.4.3..2 Solid Waste i. Promote waste disposal in pits away from water supply source. ii. Promote composting cattle dung/ household solid waste	Unhygienic and in-sanitary conditions Contamination of surface and	Creates sanitary and hygienic living environment in the habitation.	

into manure.	groundwater.		
2.0 Inst. strengthening: i. Build capacities of selected 150 GPs and 3 ZPs. ii. Design and implement a communication strategy with a focus on institutional behavioural change. iii.Develop and implement monitoring and learning systems.	Lack of adequate capacity within the ZPs and GPs to manage WATSAN and other development related interventions in a sustainable manner.	Capacity of the select ZPs and GPs would be built, through the project, to manage sustainable development. This will also create a model for GOM to replicate in other ZPs and GPs.	
3.0 RWSS sector strengthening through capacity building and knowledge management.	Lack of adequate capacity within the Sate, ZPs and GPs to manage RWSS reforms in a sustainable manner.	Capacity of State agencies, ZPS and GPs is built to manage RWSS sector reforms in a sustainable manner, even beyond the project period.	

The negative impacts and their mitigatory measures have been shown in the EMP table in italics It may be noted that the project interventions have been designed to address all possible negative impacts. Thus, the overall impact of the project is positive and would improve health of the people and environment in the project area

8.1 Environmental Monitoring and Performance Indicators: The following Key Performance Indicators have been identified to monitor and evaluate the impact of the project interventions on the environment. These indicators have also been incorporated in the Project Implementation Plan (PIP).

Table-4: Key Performance Indicators:

No.		Indicator	Monitoring period	Monitored by
1.	Declining water tables	Number and percentage of sources where water tables have increased/ declined with regard to levels of base line year	Pre and post monsoon periods	GP, GSDA, DFT
		Number of additional areas that enter/ exit 'over exploited / critical' category with regard to status in year 2003	Pre and post monsoon periods.	DFT/ GSDA
2.	Water quality	Number and percentage of water samples that are 'not potable' and 'chemically unsafe' in the entire project area.	Pre and post monsoon periods	GPs/PHC and District Health Labs.
3.	Water quantity	Number of habitations in the project area that graduate to FC from PC/ NC/ scarcity status with respect to 2003 status	Once a year	District Facilitation team (DFT)/ PPMU
		Number of habitations in the project area that graduate to PC from NC/ scarcity status with respect to 2003 status	Once a year	DFT/ PPMU

		Number of habitations that regress back to PC/ scarcity status from the FC status with respect to 2003 status	Once a year in the month of May	DFT/ PPMU
		Number and percentage Reduction in the scarcity villages in the project area with respect to 2000-2003 average status.	Once a year	DFT/ PPMU
4.	Environmental sanitation	Number of habitations that achieved 100% shift over from open defecation to 'fixed point' defecation.	Half yearly	DFT/ PPMU
		Increase in percentage of households that have shifted to fixed point defecation	Half yearly	DFT/ PPMU
		Percentage reduction or increase in diarrhoea with respect to 2003 status.	Monthly	Health dept/ GPs
		Number and percentage of schools and other public institutions in the project villages covered by functioning sanitation facilities.	Annual	DFT/ PPMU
		Increase in number of lanes, sullage drains compared to 2003 position	Annual	DFT/ PPMU

The PPMU (WSSD) would be the overall responsible agency to coordinate with all the departments and ZPs to collect data and monitor the project progress.

8.2 Institutional Arrangements for the Project (including EMP):

The project, including the EMP, would be implemented through an institutional arrangement that would build up on the existing PRI structure as detailed below.

Village Level: The VWSC nominated by the Gram Sabha would be the project manager at the village level and functions as a sub-committee of the GP. The project funds would be transferred to a separate bank account managed by the VWSC. A separate 'Social Audit Committee' would ensure transparency, equity and quality aspects. Para-professionals in the village would be trained to monitor the water quality and also the ground water tables.

District Level: The revamped Water Conservation Committee of the Zilla Parishad would be the policy making body. The professional support would be provided by two inter connected but independent teams- Districts Facilitation Team (DFT) and District Appraisal and Monitoring Team (DAMT)- managed by the CEO of the ZP. The DFT would facilitate the processes and capacity building at village level and the DAT would monitor quality. The engineers, hydro-geologists and health specialists in the DFT would help the communities to choose an appropriate option for a given need (from a broad menu described in section 7). The Monitoring and Evaluation specialist in the DAMT will monitor the implementation of EMP based on the specific indicators listed in table 4 above. Further, special consultants with experience in environmental issues would be contracted to assist the DFT and DAMT as per need.

State Level: The PPMU at the state would have two sections. A reform management think tank that would monitor the progress of reform agenda in the sector and feed into the policy making of GOM. The project management team would provide managerial assistance to the District teams and monitor the progress of the project. The environment and health

specialists along with M&E specialist in the team would be responsible for monitoring the implementation of the environment management plan.

Other Line Agencies: The GSDA would be responsible for tracking the ground water trends through existing monitoring systems (state wide observation wells under the geo-hydrology project). The Public Health Department would continue to monitor the 'water quality' on a sample basis through its existing laboratories and PHC structures. Besides, the PPMU would contract other agencies for special purpose works like testing of 100% water samples in the districts, developing criterion for identifying hotspot villages, impact evaluations etc. Support Organisations (SOs) would also be contracted to work closely with the villages and build their capacity and also help them in the project processes.

The DFT/ DAMT at the district level and the PPMU at the state level would be responsible for coordinating with these agencies, collect regular data/ information and utilise it in the project implementation.

9.0 Budget for EMP:

All the project intervention components (community water supply infrastructure and personal hygiene, household and environmental sanitation) and staff positions at the district level and environmental training related budgets for state, district and villages have been incorporated in the Project Implementation Plan (PIP). In addition the following aspects are budgeted as supplementary environment budget in the EA.

- A new position of an 'Environment Specialist' at Project Planning and Monitoring Unit (PPMU) level.
- Specialist consultant for developing hot spot village selection criteria
- Specialist consultants to help DFT and DAMT on a need basis .

28th April 2003