KARNATAKA RURAL WATER SUPPLY AND ENVIRONMENTAL SANITATION PROJECT-II (WORLD BANK ASSISTED)

ENVIRONMENTAL ANALYSIS STUDY

EXECUTIVE SUMMARY

Preamble

1. The Government of Karnataka (GOK) has implemented during 1995-2000 an Integrated Rural Water Supply and Environmental Sanitation Project (KIRWS&ESP) in 1105 villages of 12 erstwhile districts (16 present districts) of the State with financial assistance from the World Bank. The implementation of the project has resulted in an encouraging trend of reforms in the rural water supply and sanitation sector in the State.

2. The Government of Karnataka has approached the World Bank for financial assistance for a ‘Follow-on’ project to be implemented in eleven districts of the State. With the objective of strengthening the democratic process of decentralized planning and development at grass root level, the GOK proposes to promote a demand responsive approach as against the hitherto adopted supply driven approach in the project implementation.

The Project Setting

3. The Karnataka Rural Water Supply and Environmental Sanitation Project-II (KRWS&ESP-II) is in the preparation stage and is aimed at improving the quality of rural water supply and environmental sanitation service delivery to achieve sustainability of investment and generate health and income benefits. This will be realised through (a) phased implementation of appropriate policy and institutional reforms and (b) delivery of demand responsive and sustainable water and sanitation services to the beneficiary communities in the project area. Active involvement and participation of the Panchayat Raj Institutions (PRI) and beneficiary communities through all stages of project implementation and its sustained operation and maintenance will be the key features of the proposed project.

Project Area

4. The KRWS&ESP-II (Follow-On Project) is proposed to be implemented in a contiguous area of 11 northern districts of the State viz., Belgaum, Bijapur, Bagalkot, Dharwad, Gadag, Haveri, Gulbarga, Bidar, Raichur, Koppal and Uttara Kannada (Ref. Fig. 4.1) The project is likely to cover 700 Gram Panchayaths (GPs) in the project districts. For the EA study Belgaum, Dharwad and Gulburga have been selected as the pilot districts.
Project Components

5. The components of the Karnataka RWS&ESP-II are as follows:

Water Supply: This includes rehabilitation / upgradation of infrastructure for rural water supply, Water Point and Habitat development and ground water recharge measures for sustainability of ground water sources of water supply.

Sanitation: This component comprises paving of internal roads and streets in the village, construction of efficient sullage and storm water drainage, provision of community compost yards and removal of manure pits from the dwelling areas of the village, provision of smokeless chulhas / bio-gas for all households, and construction of household latrines, group latrines with individual ownership, community latrine complexes and institutional latrines in schools.

Community Development and Institution Building: This component includes capacity building of User Groups / Women’s Groups / VWSCs/ GPs in social, technical and management aspects of planning, implementation and operation of RWSS infrastructure Targeted Women’s Development Programmes, GP Institutional Development Programmes, setting up and operation of state and district level project institutions and their capacity building, and sanitation and hygiene promotion.

Statewide Sector Development: This includes studies and programmes to enhance the state’s capacity in carrying forward and scaling up sector reforms statewide and in improved management and regulation of RWSS sector, and systematic learning from Karnataka IRWS & ESP-I and GOI supported pilot projects.

The estimated cost of the project which will be implemented over a period of 5 years is USD 200 Million.

Policy, Legal And Administrative Framework

Project Category and EA Requirements:

6. The proposed KRWS&ESP-II has been classified by the Bank as Category ‘B’ requiring Environmental Analysis (EA) only.

7. Bank’s OP:4.01 requires that the project affected groups and the local non-governmental organisations (NGOs) are consulted about the project’s environmental aspects and their views taken into account in the design of the project. This has been complied with by the project proponent (GOK) through public consultations organised in the pilot Gram Panchayats (GPs) of Belgaum, Dharwad, Gulburga and Gadag districts.
National Policy and Guidelines on Environment

8. The Indian Constitution (Article 48-A) enjoins the “States to take measures to protect and improve the environment and to safeguard the forests and wildlife of the country”. Article 51 A(g) of the Constitution also makes it a “fundamental duty of every citizen to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have ecological compassion for the living creatures”.

9. The statement of Industrial Policy issued on 24th July 1991 also stipulates that the pursuit of the objectives of the Policy will be tempered by the need to preserve the environment and ensure efficient use of available resources.

10. The National Water Policy (1987) for planning and operation of water resources projects stipulates, among other things, that

- ‘Water resource be planned, developed and conserved as such on an integrated and environmentally sound basis,’

- ‘The study of the socio-economic and environmental impact of a project should be an essential component of project planning. The adverse impact, if any, on the environment should be minimised and should be off-set by adequate compensatory measures.’

11. All developmental projects in the country fall within the ambit of the following Acts of the Ministry of Environment & Forests, GOI which provide for necessary environmental safeguards.

- Wildlife (Protection) Act, 1972
- Forest (Conservation) Act, 1980
- Water (Prevention and Control of Pollution) Act, 1974
- Water (Prevention and Control of Pollution) Cess Act, 1977
- Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Public Liability Insurance Act, 1991

12. As per the Ministry's Environment Impact Assessment Notification of 1994 (as amended on May 4, 1994) under the Environmental (Protection) Act of 1986, environmental clearance from the Central Government is mandatory for expansion or modernisation of any activity, if pollution load is to exceed the existing one and also for new projects listed in Schedule –1 (Annexure 2.1) of the Notification. By another Notification dated April 10, 1997 the MoEF, Government of India have made ‘Public
Hearing' mandatory for environmental clearance of projects and has laid down the procedure for the same.

13. Further, all developmental projects to be located in notified ecologically sensitive / fragile areas need to obtain environmental clearance from the Central Government irrespective of whether they are listed under Schedule – I of the EIA Notification or not.

State Level Requirements

14. The Government of Karnataka have adopted most of environmental legislations of the MoEF, Government of India as listed above. In addition, the State have enacted their own legislations as necessary.

Status of KRWS&ESP-II from Environmental angle

15. The proposed KRWS&ESP-II does not fall under any of the project categories listed in Schedule–1 of the Environmental Impact Assessment Notification. Neither the project area has been notified as ecologically sensitive / fragile under the Environment Protection Act, 1986. Thus, the project does not require any formal environmental clearance of the MoEF, Govt. of India. Likewise, there are no State level clearances required for the proposed project from environmental considerations.

Karnataka Policy on Rural Water Supply

16. The rural water supply sector policy of Karnataka has been evolving in tune with the developmental policy at the national level. As per, the Karnataka Panchayat Raj Act, 1993, the operation and maintenance of Rural Water Supply Schemes is now one of the statutory responsibilities of GPs.

17. The policy of promoting the ‘user pays’ principle is gaining momentum in the externally-aided and Government of India backed RWSS projects in the State, wherein capital cost sharing by the beneficiaries has been introduced.

18. In the new millennium, the GOK proposes to adopt a policy which will be a judicious mix of demand responsive approach instead of supply driven approach with due regard to the obligatory function of the Government in providing a vital service, such as potable water supply. The following elements will constitute the essence of the policy.

- Coverage and service level
- Order of priority
- Selection of sources
- Types of water supply schemes
19. Recognising the imperative to regulate the exploitation of ground water for the protection of public sources of drinking water the Government of Karnataka have passed the Karnataka Ground Water (Regulation for Protection of Sources of Drinking Water) Act of 1999.

The following is a summary of the regulatory measures proposed in the Act.

i) Sinking a well for the purpose of extracting or drawing water within a distance of 500 meters from a public drinking water source without obtaining permission of Appropriate Authority is prohibited.

ii) The Appropriate Authority, in times of water scarcity may declare an area to be a water scarcity area for such period as may be specified in the order, but not exceeding one year at a time.

iii) Upon declaration of any area as water scarcity area the Appropriate Authority may order for restricting or prohibiting extraction for any purpose where such a well is within 500 meters of the public drinking water source.

iv) The Appropriate Authority on the advice of the technical officer may declare a watershed as over exploited watershed.

v) The Appropriate Authority shall have powers to prohibit sinking of wells in over exploited watersheds.

vi) If the Appropriate Authority is satisfied that any existing well in area of an over exploited watershed is already affecting any public drinking water source may prohibit the extraction of water from such well during the period from February to July every year and other incidental matters.

20. The Ground Water Act does not provide for registration of existing wells as proposed in the Model Bill of GOI. Registration of existing wells, if made mandatory, will generate valuable information to the Authority regarding the number of existing wells so as to realistically estimate the ground water draft from these wells. This information will also enable the Authority to identify areas of over
exploitation and to initiate appropriate action under the provisions of the Act. The inclusion of this provision in the Act is, therefore, recommended.

21. Section 9 of the proposed Act provides for closing down of existing well in an area of an over-exploited watershed. The Section 12: Payment of Compensation stipulates that the payment of compensation to the owner shall not exceed the depreciated value of the well and the structure there on. This clause does not appear to be a fair dispensation to the owner of the well. The minimum compensation should be equal to the market value of the well and the structures there on, as provided for in the Maharastra Act.

22. The proposed Act is only regulatory in nature. It should be pro-active and include provisions for water conservation (ground water recharge) measures to be undertaken by the concerned department.

Rural Sanitation Policy of Karnataka

23. The Nirmala Grama Yojana (NGY) model of Mysore district was adopted at the State level in 1995-1996 with the launch of the State’s NGY on 2nd October 1995. Under the NGY, the GPs were given the responsibility of motivating rural households to build TPPF latrines which are economical in their requirement of water for flushing. Each GP was encouraged to motivate about one hundred households a year which should result in construction of over 5 lakh toilets per year with over 5600 GPs functioning in the State.

24. The launch of the NGY at the State level has proved a spectacular breakthrough for rural sanitation in the State. While the IEC campaign associated with the NGY increased people’s awareness about the need for building latrines, the subsidy / incentive provided under the programme has drawn a great deal of response from the rural households.

The Panchasutras of Rural Sanitation

25. In order to improve the environmental sanitation of the villages in Karnataka, the Government proposes to adopt an integrated approach of total sanitation for clean villages (Swachcha Grama). The scheme will consist of five elements — “Pancha Sutras”. These are:

1. Paving of internal roads and streets in the village;
2. Construction of efficient sullage and storm water drainage;
3. Provision of community compost yards and removal of manure pits from the dwelling areas of the village;
4. Provision of smokeless chulhas / bio-gas for all households;
5. Construction of household latrines / group latrines with individual ownership, community latrine complexes, and institutional latrines in schools.
Legislative Measures to Promote Rural Sanitation

26. The Karnataka Panchayat Raj Act, 1993 lists 'maintenance of general sanitation, cleaning of public roads, drains, tanks, wells and other public places, and construction and maintenance of public latrines' among the functions of the Grama Panchayats (Section 58 and Schedule I entry XVIII) 'Implementation of Rural Sanitation Schemes' and 'Promotion of drinking water and rural sanitation programmes' are also listed among the functions of Taluk and Zilla Panchayats respectively. (Schedule II entry IX and Schedule III entry X). The State Legislature amended the Karnataka Panchayat Raj Act in 1997 to make it mandatory for every elected Member of a Panchayat to provide a sanitary latrine for the use of his / her household. Those who did not provide the facility could suffer disqualification from their Membership of the Panchayat. Further, having a sanitary latrine at home is also made a mandatory requirement for contesting Panchayat elections in the State.

Rural Water Supply & Sanitation Sector Administration

27. At the state level, the subject of rural water supply and sanitation comes under the purview of the Department of Rural Development and Panchayat Raj (RD & PR). The RD&PR Department is the nodal agency for policy formulation, programme implementation and monitoring and evaluation of all rural development activities in the State. This department has several wings to look after the sub-sector programmes.

Water Quality Monitoring Systems and Facilities

Present Status

28. There is no agency in the State with a well defined mandate for routine water quality monitoring and control of rural water supplies. The RDED checks the potability of any newly established bore well / surface source by conducting all the tests on the water samples collected at the district level laboratories. If the quality parameters are within the prescribed limits, the source is developed and allowed to be used by the beneficiaries. If the water does not satisfy the quality requirements, new bore wells are drilled after conducting detailed geophysical survey. In areas where there is no source of good water supply people are allowed to make use of the same. Thereafter there is no regular programme of monitoring the quality of water supplies. Some of the district level laboratories are not adequately staffed / equipped with necessary facilities required for routine analysis of water samples.

29. The Office of the District Health and Family Welfare collects and analyses water samples from rural habitations during periods of epidemic outbreaks of diseases or only when public complaints regarding water quality are received. The 19 DHLs do not have the necessary equipment and trained staff for conducting chemical examination of water, while 6 DHLs do not have the facilities for bacteriological
analysis of water samples. The analysis of water samples is again restricted to the bacteriological quality only. In the year 2000, a programme of testing water quality for organized water supply schemes for 14 quality parameters has been carried out by the RDED through different agencies. This programme, however, does not include public tabs and traditional sources which are commonly used in villages.

**Water Quality Standards**

30. The RDED and H&FW Department have adopted the drinking water standards laid down by the Bureau of India standards (IS:10500 – 1991).

**Baseline Environmental Status**

**Physical Environment**

**Location**

31. Karnataka State, situated in the Western Deccan Peninsula is bounded by Maharashtra in the North, Andhra Pradesh in the East, Kerala and Tamil Nadu on the South, and Goa and Arabian Sea in the West. It lies between 11° 31’ and 18° 45’ N latitudes and 74° 12’ and 78° 40’ E longitudes. It is land locked on all sides except on the western side having the sea coast of about 400 km. It occupies an area of 1,91,791 sq. kms., which works out to 5.85% of the area of Indian Territory.

32. For the purpose of administration, the State is divided into 27 districts (Ref. Fig 4.1). There are 175 taluks and 56682 habitations (27076 villages and 29606 hamlets) in the State. Physiographically the State is divided into 4 divisions, viz., the Coastal Area, the Western Ghats or the Malnad, the Northern Maidan and the Southern Maidan regions.

**Rainfall & Drought**

33. The average rainfall in the state is about 1400 mm per year and varies between different regions from as low as 500 mm or even less in some northern districts such as Gulburga and Bidar to more than 2500 mm in Kodagu district. About two thirds of the area of the state receiving 750 mm or less annual rainfall is considered drought-prone.

**Ground Water Resources**

34. More than 95% of rural water supply schemes in Karnataka are based on ground water sources. The annual recharge of ground water from rainfall, seepage from canals, return recharge from surface and ground water irrigation, recharge from flood-prone areas, seepage from tanks and other water bodies, etc. as computed in
1994 for the State as also the gross recharge figures are 16290.4 and 13846.8 Mcm. respectively.

**Ground water Draft**

35. Ground water abstraction structures in Karnataka are mostly dug wells and bore wells. Bore wells form the mainstay for rural water supply and are also becoming increasingly popular for irrigation needs. The net ground water draft in the State has been steadily increasing from 247884 Ha.m as on 01/01/1983 to 355133 Ha.m in 1987 and to 496141 Ha.m as on 31/12/1994. However, there has been a decline in ground water draft in Uttara Kannada between the period 1987 and 1994. (Ref. Table 4.3) As on 01/01/1987, the distribution of net draft across the districts revealed that the percentage of net draft in the State’s total has declined compared to that in 1983. As on 1994, the percentage increased in case of Tumkur and Kolar districts.

**Ground Water Development**

36. The status of ground water development in the State as of 31/12/1994 is that there are 21 ‘dark’ taluks (3 in the project districts) and 20 ‘grey’ taluks (5 in the project districts) while the rest of the taluks are of ‘white’ category with scope for further development. (Ref. Table 4-4.)

**Ground Water Level Fluctuation**

37. The analysis of long term (1978-1997) trend in ground water level in the State (Ref. Table 4.6.) shows that the water level has been declining in almost all the project districts in varying degrees. The depletion of ground water between 1978 and 1997 in the State has been upto 7 meters in Bangalore district, with the exception of Kodagu district where the water level has increased by about 2 meters. The water level fluctuation in Gulbarga, Hassan, Mandya and Shimoga has not been significant.

**Socio-Economic Environment**

Population

38. According to 1991 Census, the population of Karnataka was 44,977,201 with 22,951,197 males and 22,025,284 females. Sixty nine per cent of the population live in rural areas and 31% in urban areas. The percentage growth rate during the decade 1981-1991 was 21.12 as against 26.75 during 1971-1981 (Ref. Table 4.7)

Pattern of Distribution of Rural Habitations

39. The total number of rural habitations in the State is 56682 comprising 27076 villages and 29606 hamlets. Out of the 56682 rural habitations, 31741 are located in
the Northern and Southern Maidan regions and account for 79% of the state’s rural population. The remaining 24941 habitations are located in the Coastal region and Malnad area.

State of Economy

40. Karnataka is predominantly rural and agrarian. About 69% of its population lives in rural areas, and about 71% of its working force is engaged in agriculture and allied activities which generate 49% of state income (Ref. Year Book 1992).

41. Among the agricultural crops, Karnataka accounts for 59% of the country’s coffee production. Other farm products are rice, jowar, ragi, millet, tur, groundnut and other oil seeds.

42. There are a number of big industries. Machine tools, air craft, electronic goods, watches and telecommunication equipment are some of the items produced.

Status of Rural Water Supply

Coverage

43. Organized rural water supply programme in the state was initiated during the First 5 Year Plan as part of the National Water Supply & Sanitation Programme. Since inception the programme has been implemented under different names such as Minimum Needs Programme, Accelerated Rural Water Supply Programme, Rajiv Gandhi National Drinking Water Mission etc. The total number of schemes completed under the various programmes till end of 31/03/2000 is as under:

<table>
<thead>
<tr>
<th>Scheme Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piped Water Supply Schemes</td>
<td>13237</td>
</tr>
<tr>
<td>Mini Water Supply Schemes</td>
<td>15533</td>
</tr>
<tr>
<td>Bore well schemes with hand pumps</td>
<td>166660</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>195430</strong></td>
</tr>
</tbody>
</table>

44. In addition, water supply schemes have been implemented under bilateral assistance programmes of the Netherlands in 204 villages of Dharwad, Gadag, Haveri, Bijapur and Bagalkot districts with an estimated cost of Rs.88.51 crores. Likewise, under DANIDA Assisted Rural Drinking Water Supply and Sanitation Project is in progress in 750 villages of 100 GPs in the districts of Kolar, Chitradurga, Bijapur and Bagalkot with an estimated cost of Rs.51.00 crores.

45. **Service level**: Despite the fact that almost all the habitations in the State have access to drinking water facilities, nearly 50% of the habitations are yet to be
provided with a per capita water supply of 55 LPD, the minimum design norm adopted by the Government of Karnataka (Ref. Table 4-9 / Fig.4.4)

**Water Quality Problems**

46. There are a number of habitations in the State which suffer from water quality problems such as fluoride and salinity in their water supply in concentrations much higher than the permissible level in drinking water (Ref. Table 4-10/ Fig.4.5)

**Coverage of Sanitation**

47. Access to sanitary latrines in rural Karnataka is extremely low. As per the 1991 Census, only 6.9% households in rural areas of the state have this facility. The Central Rural Sanitation Programme (CRSP) initiated by Government of India in 1985-1986 had limited impact, benefiting only 1.19 lakh households in the period 1985-1986 to 1994-1995. Although CRSP did not make much of a headway, with the introduction of Nirmala Grama Yojana (NGY), the pace of providing household sanitary latrines in rural areas of the State has been much higher. The NGY has succeeded in building an average of about 1.5 lakh household latrines per year.

48. Apart from the NGY, construction of substantial number of household latrines in the rural areas is undertaken as part of the World Bank Assisted Integrated Rural Water Supply and Environmental Sanitation project which is being implemented in sixteen districts of the State. Nearly 89000 latrines have been built under this project since 1993 and till August 2000. Smaller number of household latrines have been built as part of the Netherlands Aided Rural Water Supply and Sanitation Project (1730 latrines) implemented in five districts and the DANIDA Assisted Rural Drinking Water Supply and Sanitation Project (5719 latrines) in four districts.

**School Sanitation Programme**

49. Recognising the importance of inculcating appropriate sanitation practices among school children, the State Government is considering the extension of the successful Mysore experiment to all the districts in the State, keeping in view the recommendations of the Task Force on Primary Education.

**National Programme for Improved Chulhas (NPIC)**

50. The Department of Rural Development and Panchayat Raj, with financial assistance from Central Government, has been implementing the NPIC in Karnataka since 1983-1984 and the achievement during the last five years (1995-2000) has been 493493 units.
National Project on Bio-Gas Development (NPBD)

51. The Rural Development and Panchayat Raj Department, with part funding by the Central Government, has been implementing the NPBP under the 20 Point programme in the State since 1982-1983. During the last five years (1995-2000) a total of 106739 bio-gas plants have been installed in the State, the maximum number being in Belgaum District.

Morbidity due to water-borne / water-related diseases

52. The most commonly occurring water-borne diseases in the State are gastroenteritis, malaria, and typhoid (Ref. Table 4.11). Deaths due to gastroenteritis are the highest (although the number of deaths due to gastroenteritis has declined over the past decade) followed by mortality due to cholera, viral hepatitis and typhoid.

53. Incidence of water-borne and water related diseases in the State / project districts has been high. Deaths due to gastroenteritis have generally been comparatively higher in the districts of Gulbarga, Kolar, Raichur and Bidar. The only district to have recorded deaths due to cholera in 1998 is Kolar. Overall incidence of malaria appears to have reduced between 1995 and 1997 in Karnataka. However, the districts of Bijapur, Raichur, Kolar, Bellary, Mandya, Chitradurga and Dakshina Kannada record a fairly high incidence of the diseases in 1997. The data on the comparative incidence of water-borne / water-related diseases in the project districts during the period 1998 – 2000 is presented in Table 4.15/ Fig 4.6.

Public Consultations

54. In keeping with the World Bank’s OP 4.01, Public Consultations were organized, as part of the EA study, in two GPs in each of the three pilot districts of Belgaum, Dharwad and Gulburga. Two additional public consultation meetings were also organized in Virupapura village and Virupapura Tanda of Kalkere GP in Gadag district which is reported to have a severe problem of high fluoride in drinking water. The following are the major environmental issues that were brought up during these public consultations.

- Acute scarcity of potable water in summer months
- Water quality is highly brackish and hence not potable
- Excessive concentration of fluoride in drinking water as manifested by fluorosis among children
- Space constraint and lack of adequate water supply are major factors contributing to low household latrine coverage
- Sullage disposal - a problem in BC soil creating cesspools causing breeding of mosquitoes
- Easy movement of people, cattle and vehicular traffic difficult especially during rainy season due to BC soil
- Indoor air pollution due to use of smoke emitting fuels
- Poor environmental sanitation due to stagnation of sullage in lanes / streets / lack of washing platforms due to which public water points are facing water stagnation.
- Indiscriminate dumping of household solid waste due to absence of compost pits / yards resulting in unsightly conditions as well as attracting rodents and insects.
- Recurrence of GE cases, cholera and dysentery
- High incidence of worm infestation, scabies and upper respiratory diseases

**Impact Identification and Analysis**

55. The potential environmental impacts arising from the project interventions during the preparatory, construction and operation phases have been identified, classified as positive / negative and presented in a matrix form (Ref. Table 7.1)

56. The overall impact of the project on the beneficiary communities and the environment is expected to be positive resulting in an improvement in the health and quality of life of the people in the project area. Adverse impacts, if any, could be minimised / compensated by incorporating appropriate mitigation measures which could be readily designed and integrated with the project.
### Table 7.1: Karnataka Rural Water Supply and Environmental Sanitation Project-II

#### Environmental Impact Matrix

<table>
<thead>
<tr>
<th>SI No</th>
<th>Project Interventions</th>
<th>Potential Environmental Impact(s)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary</td>
</tr>
<tr>
<td>1</td>
<td>Preparatory activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Information Education Communication (IEC) campaigns to generate demand for the project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public consultations to identify issues of concern to the communities, their preferences and priorities regarding the proposed project</td>
<td></td>
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<tr>
<td></td>
<td>• Technology options for source, water treatment &amp; distribution and safe household and environmental sanitation systems</td>
<td></td>
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<tr>
<td></td>
<td>• Site identification /selection for location of source, WTP and service reservoirs</td>
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<tr>
<td></td>
<td>• Taking possession / acquisition of land for siting the common facilities</td>
<td></td>
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<tr>
<td></td>
<td>• Awareness on Capacity building of user group, women’s group, VWSCs, GPs</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Water Supply</strong></td>
<td><strong>Primary</strong></td>
</tr>
<tr>
<td>---</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation / upgradation of existing water supply systems</td>
<td>Availability of increased / demanded level of safe drinking water on a sustainable basis</td>
</tr>
<tr>
<td></td>
<td>Construction of new bore wells, pump houses, surface source water treatment plants, OHT and laying of distribution systems etc.</td>
<td>Labour, time and cost saving in fetching water</td>
</tr>
<tr>
<td></td>
<td>Construction of ground water recharge structures</td>
<td>Reduction in surface runoff, increase in ground water recharge, halt to declining water table and improved sustainability of water supply sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improvement in quality of ground water through dilution due to recharge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment opportunities for local technicians / artisans / NGOs and private sector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced financial burden on State</td>
</tr>
</tbody>
</table>

**Secondary**

- Reduction in water and sanitation related diseases, improved personal, family health and hygiene leading to improved quality of life of the people
- Opportunities for income generation especially by women
- Increase in overall development activities such as housing, transportation, education, and culture
- Increase in value of property
<table>
<thead>
<tr>
<th>3</th>
<th>Sanitation</th>
<th>Primary</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Installation of household sanitation systems / ownership based group latrines / community / institutional latrines</td>
<td>Reduction in soil and surface water contamination</td>
<td>Risk of ground water contamination from sanitation systems</td>
</tr>
<tr>
<td></td>
<td>Paving of internal roads and construction of drainage and sullage disposal systems</td>
<td>Reduction in water and sanitation related diseases, improved personal / family health and hygiene</td>
<td>Temporary increase in ambient noise level and dust concentration due to construction activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment opportunities for local technicians / artisans / NGOS &amp; private sector</td>
<td>Disruption of normal movement of people and vehicular traffic including diversion of traffic during street / lane paving and construction of sullage and storm drains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inculcating desirable healthy practices amongst children who can serve as catalyst to promote household hygiene. Secondary</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improvement in general health status of people</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enhanced environmental sanitation and hygiene status and general aesthetics of village</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Increase in value of property</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smooth flow of vehicular traffic, reduced maintenance of vehicles, reduction in dust level and improved aesthetics Secondary</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase in value of property</td>
<td></td>
</tr>
<tr>
<td>Construction of bio-gas plants, community compost yard &amp; provision of smokeless / improved chulhas</td>
<td>Primary</td>
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<td>---</td>
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<tr>
<td>Sanitary disposal of cattle dung / human excreta leading to improved environmental hygiene and aesthetics.</td>
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<tr>
<td>Reduction in breeding places of disease vectors</td>
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<tr>
<td>Reduction in indoor air pollution</td>
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<tr>
<td>Less consumption of cooking fuel due to higher fuel efficiency of smokeless / improved chulhas</td>
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<tr>
<td>Reduction in upper respiratory infection</td>
<td></td>
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<tr>
<td>Reduced financial burden on State</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement in general household environment</td>
</tr>
<tr>
<td>Decrease in medical expenses</td>
</tr>
<tr>
<td>Decrease in recurring expenditure on houses</td>
</tr>
<tr>
<td>Increase in value of property</td>
</tr>
</tbody>
</table>
### Community Development & Institutional Development

- Enhanced Community mobilisation for local development works
- Improved decision making process among the user community
- Improved self-reliance for planning, implementation and O&M of development works.
- Greater social interaction and collective responsibilities
- Improved community awareness / knowledge on water, health, hygiene and environment leading to positive behavioral changes

### State wide Sector Development

- Ground Water Act has been passed by GOK for regulation & control of over exploitation of ground water
- Enhanced capacity of the State in carrying forward and scaling up sector reforms
- Improved management and regulation of RWSS sector
Key Environmental Issues & Mitigatory Measures

57. A critical analysis of the base line data, observations during site visits, discussions with ZP and GP level functionaries and the public consultations clearly brought out the following key environmental issues that need to be addressed in the project design and implementation.

Water Quantity Issues

58. All the habitations in the state have access to organized water supply. The level of per capita supply, however, varies widely between the habitations (Ref. Table 4.9). The minimum per capita supply prescribed by the State is 55 lpcd. There are 26517 habitations in the State with a per capita supply less than 55 lpcd. Many of these habitations experience scarcity of ‘safe’ drinking water in summer and therefore need augmentation of supply.

59. During periods of scarcity and in areas with severe ground water quality problems, villagers prefer to use traditional water sources – namely large rain-fed village tanks. (Eg, Rottigwad, Nalavadi in Dharwad district, Yatnaballi, Huilgol in Gadag district and Gabbur in Koppal district). However, according to GOK estimate such villages account for only 10-20 percent of overall project villages.

60. Existing water supply schemes, especially in the salinity affected areas of Dharwad district, are mostly utilized to meet water needs for other than drinking purposes (washing, bathing, etc.) including water for cattle.

61. According to information available on long term (1978 – 1997) ground water level, there is a declining trend in water level in several project districts. This phenomenon is attributed to over exploitation of ground water for agricultural purposes and fluctuating rainfall. There are three taluks in the project districts which have been categorised as ‘dark’, five taluks under category ‘grey’ while the rest of the taluks come under the ‘white’ category (Ref. Table 4.4). But as far as the overall project area is concerned, there is much scope for further ground water utilisation.

Mitigatory Measures

62. Augmentation of existing water supplies can be achieved through one or more of the following options.

a) Augmentation through rehabilitation (eg. Betegera B) / uprating of existing systems / schemes wherever feasible

b) Identification of new sources (local / distant) of good quality and yield which do not require any treatment other than safety chlorination. These will be mostly ground water sources. In areas not affected by chemical contaminants,
new good yielding ground water sources could be identified using modern geophysical techniques (to minimize failure rate) or existing privately owned irrigation wells of good yield and potable quality could be identified and acquired.

c) Local surface sources (village ponds / streams/ canals) which require only simple treatment such as slow sand filtration (SSF) / river bed filtration and chlorination. Existing village tanks, if considered as an alternate source, need to be desilted / enlarged to increase their storage capacity and protected by fencing to prevent contamination from human / animal access. For villages located in the vicinity of seasonal rivers / streams, the feasibility of tapping sub-surface flow (riverbed filtration) could be explored.

d) Distant surface sources with simple treatment (SSF) and chlorination for a group of villages (multi village schemes)

e) Dual water supply – existing supplies (rejected by community due to quality problem) for purposes other than drinking, and potable water supply through any of the options listed above

f) Appropriate blending of water from existing sources (ground water) to obtain water meeting the drinking water quality standards.

g) Effective enforcement of Karnataka Ground Water Act to regulate and control ground water abstraction to accord priority for drinking water. Identified critical areas with falling water level should be notified forthwith by the Appropriate Authority and the Act enforced in all its earnestness to halt this trend.

h) Concurrent ground water recharge at the source to promote source sustainability: This activity should receive priority in order to achieve sustainability of water supply sources. The Watershed Development Department should conduct a detailed survey to identify potential sites and appropriate conservation structures best suited to the local conditions.

i) Regular monitoring of ground water level. The ZPED should regularly monitor the ground water level in the project area as an integral part of overall monitoring programme in collaboration with and technical support from the Mines & Geology Department.

63. The key consideration in deciding on the alternative should be to avoid, as far as practicable, the need for any treatment. A trade off analysis of the feasible options should precede the final decision in each case.
Water Quality Issues

64. The water quality problem in the project districts is essentially of two types (i) the presence in ground water of chemical contaminants such as fluoride, TDS, iron and nitrate of natural origin in concentrations exceeding the levels permissible in drinking water and (ii) the chemical / bacteriological contamination of water at the source, in the distribution system or during collection, handling, storage and consumption at the users end. The concern for ground and surface water contamination relate to:

i) Non-point sources of pollution in the catchment area due to the common practice of open air defecation, and possible agricultural and surface run off, especially during the rainy season;

ii) Washing, bathing and other domestic activities around the open dug wells/bore wells with hand pumps MWS schemes by the communities;

iii) Indiscriminate dumping of household solid waste near water points.

iv) Improper siting of public water points at low lying areas due to non-availability of Government site;

v) Uncovered cisterns / absence of regular / periodical cleaning of OHT/cisterns;

vi) Inadequate and irregular disinfection of drinking water supplies;

vii) Inadequate testing and irregular monitoring of drinking water quality.

viii) Unhygienic practice of collecting water by the households from pits dug in the ground due to inadequate residual pressure in the distribution pipe;

ix) Frequent breakage/leakage in rising main and distribution lines;

x) Frequent leakage at valve chambers;

xi) Misuse of valve chambers as defecation places by the community;

xii) Improper collection, storage and handling of water by the households;

65. The bacteriological contamination of water supply is confirmed by the persistent incidence of large number of water-borne / water-related diseases in all the project districts (Ref. Table 4.15)

66. Mitigatory Measures

j) Sanitary survey of existing and new sources of water supply to identify potential sources of contamination. The recommended procedure for sanitary survey is described in Annexure 8.1;

ii) Source protection - the measures will include conversion of existing dug/bore wells into sanitary wells and fencing of surface sources to prevent human/animal access, and catchment area protection. A technical note on sanitary protection of dug wells is at Annexure 8.2;
iii) Effective and continuous chlorination of existing and new water supplies to obtain a minimum residual chlorine of 0.5 mg/l. Details of a simple, effective system of chlorination of pumped water supplies using bleaching powder solution are included in **Annexure 8.3**;

iv) Preventive and corrective maintenance of water distribution system (leak detection / repair and control) and preparedness for crisis management during major breakdowns;

v) Regular water quality testing and control;

vi) Proper location of cisterns and measures to prevent misuse of valve chambers as defecation places;

vii) Ensuring adequate residual pressure at the distribution points;

viii) Promotion of household / group latrines and community latrine complexes / institutional latrines;

ix) For ground water sources with quality problem, identification of alternate / distant sources and in extreme cases treatment at community / household level (eg. Activated alumina / Nalgonda technique or any other proven, field tested method for fluoride removal);

x) Effective and sustained sanitation and hygiene promotion (SHP) programmes to bring about positive behavioral and attitudinal changes with special focus on women and children;

67. **Household Sanitation & Hygiene Issues**

i) The State level coverage of sanitation is only 6.9% as per 1991 Census. Open air defecation is still the most commonly prevalent practice in almost all the villages with its associated problem of soil and water pollution and public health risks. This situation is largely due to lack of awareness among the people regarding the inter relationship between health, water, sanitation and advantages of sanitary latrines.

ii) Poor ventilation in the dwelling houses combined with the use of smoke emitting fuels causes acute upper respiratory ailments and conjunctivitis, especially among women and children. During public consultations in Shiraguppi and Rottigwad, the women said that the presently available design(s) are not suited to the locally available cooking fuels and their way of cooking, particularly roti making.
iii) Another issue of hygiene concern in the pilot districts relates to the common practice of keeping the livestock within the owners household living area. This practice is reported to be common in other project districts as well.

68. **Mitigatory Measures**

i) Effective, sustained IEC programme with focus on women to generate demand for household latrines, smokeless / improved chulhas and bio-gas plants.

ii) Selection and installation of ‘safe’ sanitation systems to suit local soil types and user preferences. Low cost sanitation systems such as the twin pit pour flush (TPPF) latrines could be provided for individual households. A note on recommended construction practice and pollution safeguards for TPPF latrines is given in Annexure 8.4. Wherever there is a constraint of household space, ‘group of latrines’ could be considered on individual ownership basis.

iii) Identify and promote the type of chulhas preferred by local women and suited to locally available cooking fuels and style / method of cooking. Here again, an effective IEC programme should be launched to create awareness, especially among women on the need for better ventilated kitchen in order to reduce the incidence of upper respiratory diseases.

iv) The practice of keeping cattle within the household living area is a complex social issue and warrants a detailed study and sustained IEC programme to bring about a change in the mindset of the households and to provide a practicable alternative to the current practice – persuading the households to shift the cattle to the backyard wherever space is available or to shift them to allotted areas outside the village. The GP could play a lead role in framing appropriate rules / regulations in this regard.

69. **Environmental Sanitation and Hygiene Issues**

i) In most of the villages, stagnant pools of water were found around stand posts, as well as either at the back or in front of the houses due to absence of any drainage system. These pools were found to be breeding places for mosquitoes and incidence of malaria cases was reported to be very high in such areas.

ii) Lack of household / community latrines in most of the project districts - the entire village is commonly being used for open air defecation, especially children defecate indiscriminately.

iii) The internal roads in villages with black cotton soils such as in Gulburga and Dharwad are not paved and become slushy during rainy season and create
problems for smooth movement of people, bullock carts, tractors and other vehicles.

70. **Mitigatory Measures**

i) Effective, sustained IEC campaign to generate demand for ownership based group latrines, community latrines and institutional latrines and their proper use and maintenance;

ii) Construction of sullage drains including treatment and disposal works: A network of well planned drains for disposal of sullage from the village, including spill water from the public stand posts should be designed and constructed especially along the main roads / lanes in the village. Equally important is the safe treatment of the collected sullage and utilisation of the treated effluent. Stabilization ponds could provide the simplest method of treatment and the treated effluent could be used for agricultural purposes / grass farms for fodder. The GP can prepare an action plan for the purpose so as to generate income to the GP which can defray part of the O&M expenditure;

iii) Pavement of internal village roads for ensuring well drained village roads, and convenient movement of people, vehicles and tractors within the villages;

iv) Solid waste management programmes including identification of a common disposal site for sanitary disposal of household solid waste. The GP should identify a site where the solid waste could be composted and the compost produced could be sold to generate income to the GP.

v) Regular clearing of dust bins by the GP and transportation of wastes for sanitary disposal at a common site for which necessary hand carts should be provided by the GP to the village sweepers.

71. **Water and Sanitation Related Health Issues**

i) In almost all the project districts high incidence of GE cases has been reported, (Ref. Table 4.15). In addition, cholera and typhoid cases are also commonly reported. There is also the problem of high fluoride in drinking water in many project districts such as Gadag, Koppal, and Gulburga. A large number of cases of worm infestation and upper respiratory diseases have also been reported.

ii) The personal hygiene standards of the people in general, especially of the economically disadvantaged, is very poor.

iii) Health and hygiene education programmes are not effective.
iv) Lack of awareness and non-affordability to meet the medical expenses by some of the people who suffer from water-borne / water-related diseases aggravate the situation which leads to outbreak of epidemics.

72. **Mitigatory Measures**

i) Effective, sustained SHP programmes with special focus on women and children to create a felt need and demand for household latrines and also to promote desirable personal / family and community hygiene practices.

ii) Preventive and curative programmes including regular de-worming measures.

iii) An organized survey by well trained medical doctors and para / non- medical staff to identify fluorosis cases, especially among school children, pregnant women and lactating mothers to carry out a programme of curative medication including nutritional supplements in addition to supply of safe defluoridated drinking water.

73. In the light of the foregoing, the recommended frame work for mitigation action is summarised below.

**FRAME WORK FOR ACTION**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Project Component</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Water Supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quantity</td>
<td>- Rehabilitation / upgradation of existing infrastructure / to provide a service level of 55 lpcd</td>
</tr>
<tr>
<td></td>
<td>Quality</td>
<td>- Identify alternate / distant sources free from quality problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Treatment for fluoride / iron / nitrate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Continuous chlorination of water supply to ensure bacteriological safety</td>
</tr>
<tr>
<td></td>
<td>O&amp;M of Water Supply</td>
<td>- Capacity building of GPs for preventive / corrective and crisis management</td>
</tr>
<tr>
<td></td>
<td>Schemes</td>
<td>- Ensure 100% tariff collection.</td>
</tr>
<tr>
<td></td>
<td>Ground Water Recharge</td>
<td>- Construct check dams, subsurface dams, recharge trenches as appropriate to the local hydrogeology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Rejuvenate abandoned borewells.</td>
</tr>
<tr>
<td>II</td>
<td>Sanitation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Latrines)</td>
<td>- Promote household / group / community / institutional latrines</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>- Construct sullage / storm water drains, soak pits / promote kitchen garden for isolated dwellings</td>
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</table>
Environmental Management Plan

74. In the light of environmental impact identification and analysis, a summary of potential adverse impacts and the recommended environmental management plan along with the agency responsible is presented in a matrix form (Table 8.2).

Environmental Performance Indicators

75. In keeping with the identified environmental issues which need to be addressed due to the project interventions and the expected impacts, a list of environmental performance indicators has been identified along with the agencies responsible for monitoring (Table 8.3). These, along with the indicators for the other components of the project, could provide a basis for monitoring and evaluation of the project performance.
Table 8.1: Karnataka Rural Water Supply And Environmental Sanitation Project-II

Environmental Management Plan

<table>
<thead>
<tr>
<th>Project Interventions</th>
<th>Environmental Issues</th>
<th>Potential Negative Impacts</th>
<th>Mitigatory Measures</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Supply</strong></td>
<td><strong>Water Quantity Issues</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand pumps, Mini Water Supply,</td>
<td>Scarcity of drinking water during</td>
<td>Increased ground / surface water abstraction</td>
<td>Augment supply through rehabilitation / uprating of existing systems wherever feasible</td>
<td>GP/DSU</td>
</tr>
<tr>
<td>Piped Water Supply, Multi-village Schemes</td>
<td>summer</td>
<td>- Risk of lowering ground water level</td>
<td>Identify new sources (local / distant) of good quality and yield + safety chlorination</td>
<td>GP/DSU/M&amp;G .Dept</td>
</tr>
<tr>
<td></td>
<td>People resort to village tanks as</td>
<td>- Risk of hydraulic interference between</td>
<td>Local surface source (village tanks) + SSF + chlorination, desilt the tanks to</td>
<td>GP/NGO/DSU</td>
</tr>
<tr>
<td></td>
<td>alternate sources</td>
<td>existing and new dug / bore well sources</td>
<td>increase storage capacity and protect the source by fencing</td>
<td>GP/DSU/ID/ PWD</td>
</tr>
<tr>
<td></td>
<td>Per capita supply &lt; 55 lpcd in many</td>
<td>Increased generation of sullage</td>
<td>Distant surface sources + SSF + chlorination for single / multi village schemes</td>
<td></td>
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<tr>
<td></td>
<td>habitations</td>
<td>Temporary disruption in existing water supply</td>
<td>Dual water supply</td>
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<tr>
<td></td>
<td>Erratic power supply and voltage</td>
<td>services</td>
<td>Blending of water from existing sources</td>
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<td></td>
<td>fluctuations</td>
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KRWS&ESP-II Environmental Analysis Study – Executive Summary 27
**Water Quality Issues**

- Severe water quality problems in bore well sources due to excessive concentration of fluoride, salinity, TDS, iron, nitrate etc
- Water in traditional village tanks / ponds turbid
- Absence of residual chlorine in water supply
- Absence of water quality monitoring
- High incidence of water-borne / water-related diseases

<table>
<thead>
<tr>
<th>Ground water recharge measures</th>
<th>- Decline in ground water level due to over exploitation for agricultural purposes</th>
<th>- Drying up of dug / bore wells in summer</th>
<th>GP/DSU/M&amp;G Dept.</th>
<th>GP/NGO/DSU</th>
<th>GP</th>
<th>GP</th>
<th>GP/DSU</th>
</tr>
</thead>
</table>

- Identify alternate / distant sources
- Sanitary survey + source protection + treatment for iron / fluoride
- Continuous chlorination of water supply to ensure a minimum residual chlorine of 0.5 mg/litre
- Preventive and corrective maintenance of water distribution system
- Regular water quality testing + control
- Effective IEC campaigns

- Enforce Ground Water Act + monitor regularly ground water level

Table 8.1 Cont...
**Table 8.1 Cont...**

| Sanitation | - Lack of household latrines – coverage very low (1-3%)  
- Lack of space for household latrine  
- Constructed latrines not being used regularly  
- Open air defecation very common | - Risk of ground water contamination from sanitation systems | - Implement concurrent ground water recharge measures to promote source sustainability | GP/NGO/DSU  
- Sustained IEC programmes with focus on women to generate demand for household / group / community latrines  
- Install ‘safe’ sanitation systems to suit local soil type and user’s preference | GP/NGO/DSU  
GP/NGO/DSU |
| Paving of internal roads / streets in villages | - Roads become dusty during dry seasons, slushy during rainy seasons making vehicular movement difficult and creating unsightly conditions | - Temporary increase in ambient noise level and dust concentration due to construction activities  
- Disruption of normal movement of people and vehicular traffic including diversion of traffic during street / lane paving and construction of sullage and storm drains (These impacts being marginal need no mitigation action) | - Paving of internal roads / streets with appropriate locally available material to ensure proper drainage and all weather movement of vehicles | GP/NGO/DSU |
Table 8.1 Cont...

| Construction of sullage and storm drainage | - In areas with BC soil, sullage & storm water disposal is a serious problem  
- Village internal roads become slushy and slippery  
- Creation of breeding places of disease vectors | - Temporary increase in ambient noise level and dust concentration due to construction activities  
- Disruption of normal movement of people and vehicular traffic including diversion of traffic during street / lane paving and construction of sullage and storm drains ( These impacts being marginal need no mitigation action ) | - Construct sullage drains and provide low cost treatment / disposal / re-use systems for sullage  
- Design and install efficient storm water drains | GP/NGO/DSU  
GP/ DSU |
| Provision of smokeless chulhas and Bio-gas | - Indoor air pollution  
- High incidence of upper respiratory ailments  
- Unhygienic environmental sanitation conditions due to large number of manure pits | - Sustained IEC campaigns with focus on women to generate demand for smokeless / improved chulhas  
- Identify and promote the design of chulhas preferred by women and suited to locally available cooking fuels | GP/NGO/DSU  
GP/NGO/DSU |
| Provision of community compost yard and removal of manure pits from dwelling areas | Unhygienic practice of keeping cattle population within the household area
- Prevalence of unhygienic environmental sanitation conditions due to heaps of cattle dung and refuse dumps etc
- Creation of breeding places of diseases vectors | Sustained IEC campaigns to persuade the cattle owners to shift the cattle outside the living area
- Provide community compost yard for sanitary disposal of cow, dung and other biodegradable refuse | GP/NGO
GP/NGO/TP/DSU |
| Water point and habitat development | Lack of sanitation / water stagnation
- Bacteriological contamination of water supply
- Missing taps
- Lack of washing platforms
- Indiscriminate dumping of household solid waste
- Lack of sullage drains | Proper siting of the water points
- Provide well drained platforms
- Prevent vandalism to public taps
- Promote individual / community compost pits / yards | GP/NGO/DSU
GP/NGO/DSU
GP/NGO
GP/NGO |

GP – Gram Panchayath  
TP – Taluk Panchayath  
DSU – District Support Unit  
M & G D – Mines & Geology Department  
NGO – Non Governmental Organisation  
ID – Irrigation Department  
PWD – Public Works Department
Table 8.2: Karnataka Rural Water Supply And Environmental Sanitation (World Bank Assisted)

### Performance Indicators

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Project Interventions / Components</th>
<th>Performance Indicators</th>
<th>Monitoring Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Water Supply</strong>&lt;br&gt;Water Quantity</td>
<td>Access to safe water supply of a level* equal to that demanded by the user community&lt;br&gt;(Average 55 lpcd)</td>
<td>GP/DSU</td>
</tr>
<tr>
<td></td>
<td><strong>Water Quality</strong></td>
<td>Chemical contaminant level in water within the prescribed limit at the time of commissioning the source and subsequently when monitored twice a year&lt;br&gt;- A minimum of 0.5 mg/litre free residual chlorine in treated water tested daily&lt;br&gt;- Independent water quality surveillance once in 6 months to ensure quality compliance&lt;br&gt;- Decline in number of G.E, typhoid, infective hepatitis cases</td>
<td>PSU/HD&lt;br&gt;GP/DSU/HD&lt;br&gt;HD&lt;br&gt;HD</td>
</tr>
<tr>
<td></td>
<td><strong>Ground Water Recharge Measures</strong></td>
<td>Decrease in number of wells going dry in summer&lt;br&gt;- Trend in falling ground water level halted / reversed&lt;br&gt;- Karnataka Ground Water Act is enforced in notified ‘critical’ areas</td>
<td>GP/DSU&lt;br&gt;GP/M&amp;G Dept.&lt;br&gt;GOK/M&amp;G Dept</td>
</tr>
</tbody>
</table>

* This can be estimated based on power consumption by the clear water pumps over a known period of time (say a month) and the horsepower and discharge capacity of the pump.
## Table 8.2 Cont...

| 2 | Sanitation | - Increase in number / percentage of household / group / community / institutional latrines constructed and in use.  
- Decline in number of G.E, typhoid, infective hepatitis cases  
- Reduction in household medical expenditure | GP/TP/ DSU  
GP/HD  
HD |
| --- | --- | --- | --- |
|  | Paving of internal roads / streets in villages | - Percentage increase in length of roads / streets paved  
- Smooth flow of vehicular traffic  
- Decrease in annual maintenance expenditure of carts and vehicles | GP/DSU  
GP  
GP |
|  | Construction of sullage and storm drainage | - Percentage increase in length of storm drains constructed  
- Absence of cesspools, stagnant storm water  
- Reduction in malaria, filaria cases | GP  
GP  
GP/HD |
|  | Provision of smokeless chulhas / bio-gas | - Increase in number of smokeless chulhas / biogas installed and in use  
- Decline in number of upper respiratory infection cases | GP/DSU  
GP/HD |
|  | Provision of community compost yard and removal of manure pits from dwelling areas | - Number of compost yards provided and in use  
- Reduction in number of household manure pits | GP  
GP |
| 3 | Community Development and Institution Building | - Improved sustainability of village water and sanitation facilities  
- Number of women’s groups gainfully engaged in income generation activities  
- Number of SHP programmes organized and attendees, and simple pre and post evaluation tests to assess the change in KAP of the target population / healthy home survey | GP  
DSU  
PPMU |
| 4 | State vide Sector Development | - Enhanced capacity and sustainability of village level institutions including 100% O&M cost recovery VWSCs, DSUs and PPMU. | DSU, PPMU |

GP - Gram Panchayath  
TP - Taluk Panchayath  
DSU - District Support Unit  
HD - Health Department  
M & G Dept. - Mines & Geology Department  
GOK - Government of Karnataka
Institutional Strengthening

76. The implementation of the proposed KRWS&ESP-II calls for matching institutional framework, human resource deployment and capacity building at all levels. It requires a multi-disciplinary team of professionals with sound knowledge and expertise in specialized fields such as water resources management, sanitation, health, social science, environment and ecology. Thus, there is a need to establish at the State level a separate wing with multidisciplinary expertise in areas such as planning, engineering, design, technical scrutiny of water and sanitation projects, preparation of tender documents and monitoring and evaluation with necessary supporting staff. Equally important is the need to develop an effective IEC strategy to bring about positive behavioral and attitudinal changes leading to improved health status of the target communities.

Like-wise, there is an urgent need to strengthen the ZPED by inducting environmental engineers with expertise in water resources management and social scientist-cum-hygiene education specialist who can play a key role in effective implementation of the project. Their professional skills need to be updated through periodical orientation programmes with focus on modern trends and technologies in water and sanitation sector and related environmental aspects.

As for the water quality monitoring, there is an urgent need for a State of Art laboratory at the RDED at the State level which could function as a referral laboratory for all the district laboratories. The mandatory functions of the State laboratory would include in following:

- Analysis of water and waste water for complex / difficult parameters such as pesticides and insecticides, trace metals etc.
- Analytical quality control (AQC) for the district level laboratories.
- R&D on local field problems such as high fluoride in drinking water, simple cost effective methods of disinfection, defluoridation and iron removal.
- Evaluation of new products and processes for their efficacy and large scale promotion in the field.
- Training of district-level laboratory personnel in water and waste water analysis at State Level R & D Lab.

In the light of the large number of habitations affected by high levels of fluoride in drinking water in the project districts, it is necessary to find alternative sources for new water supply schemes. If such sources can not be found within economic distance, simple household / community defluoridation systems have to be installed. The two technologies developed and accepted with fair degree of success are (i) the Nalgonda technique and (ii) the activated alumina process. In this context the field experiences gained in the implementation of DANIDA assisted project in the
State should be brought to bear upon the decision making in the choice of technology. Additionally, it is necessary to undertake R&D on commercially offered technologies, defluoridation such as electrodialysis, ion-exchange etc for their efficacy under field conditions. This objective could best be achieved only by establishing at the State level (RDED) an R&D wing backed by a ‘State of art’ laboratory and a multidisciplinary team of well qualified, experienced environmental engineers / scientists with adequate financial support. The R&D wing would also undertake evaluation of other processes / products used in water treatment and field problems that may be identified in the area of rural water supply and sanitation, and training programmes. In the light of estimated investment in the proposed project and the likely technology issues that may arise during its implementation, the establishment of an R&D wing as above will be well justified. This wing should be headed by a well qualified and competent environmental engineer at CE / SE level supported by one / two EE (Environmental Engineering) and a team of scientists comprising a chemist, a biochemist, an instrumentation scientist (M.Sc./ Ph.D in Physics) and other supporting staff ie. lab technicians.

Conclusion

77. The Environmental Analysis Study has shown that the proposed KRWS&ESP-II itself will not cause any adverse environmental impacts. The project will bring about positive health and environmental benefits to the project communities through supply of ‘safe’ drinking water and creation of necessary environmental sanitation facilities in the project villages. The recommended environmental mitigation measures appropriately integrated in the project design would have a net positive effect on the environment. The facilities created in the project villages will be operated and maintained by the beneficiary communities and the GPs through necessary capacity building measures to ensure the sustainability of the services.