HILL WATER & LIVELIHOODS

Final Report of

THE NILGIRIS WATER RESOURCES PROJECT

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EXECUTIVE SUMMARY

PRINCIPAL FINDINGS FROM THE NILGIRIS WATER RESOURCES PROJECT

The Nilgiris district can be divided into four basins:

- Moyar Basin and its 24 rivers - draining mainly into the Bhavani reservoir as water supply for irrigation and drinking water in Tamil Nadu
- Bhavani Basin and 26 rivers - draining again to the Bhavani reservoir along the district boundary and onwards again into the Tamil Nadu plains

Both the above basins finally feed into the Cauvery river basin.

- Kabini basin and its five major rivers drain into Karnataka
- Chaliyar basin and its eight rivers feed into Kerala

The Nilgiris as a region can be divided into three strata of upper, middle and lower altitudinal zones. Each has a distinct vegetation and supports a variety of life forms and activities.

Water from the upper areas flows through diverse landscapes, bringing with it a complex interaction and dependence. This is probably the only district where so many aspects of natural resources are linked in such a tight space. Spatial-temporal blocks exist, where cultures converge like the Badagas-Todas-Kotas in the upper areas, the Irulas-Kurumbas (in the lower areas), the urban and migrant population in the middle elevations. Each of these communities has a unique approach to water systems. Traditional management and indigenous knowledge have been eroded to a significant extent. Government power generation projects have also manipulated water systems. Government water supply and maintenance through different mechanisms and devices, have made forays into traditional systems of management, all not necessarily beneficial.

Inspite of 1800-2000 mm annual average rainfall, the number of rainy days has reduced drastically. Erratic and unpredictable rains have changed the water budget and utilization pattern. Water enterprises, such as private water tankers have boomed in this district.

The survey covered 61 villages in the 4 river basins of the Nilgiris District from June 01 to March 02. The break-up of villages in the basins are:

River Basin	Villages Surveyed
Chaliyar	05
Kabini	03
Moyar	28
Bhavani	25
Total	**61**

The communities who have been interviewed consist of :

1. Badagas : B
9. Beta Kurumbas : BK
2. Dalits : D
10. Gounders : G
3. Irulas : I
11. Kurumbas : K
4. Kannadigas : Ka
12. Kattu Naickans : KN
5. Malayalis : M
13. Non Badagas : NB
6. Paniyas : P
14. Sri Lankans : SL
7. Todas : T
15. Tamils : Ta
8. Thoreya Badagas : TB

- There is a crucial linkage between *Shola* patches (endemic montane forest-type which occur in this region) and water resources availability. Wherever *Shola* forests exist, existence of water source is assured.

- Large Government Water Schemes of the TWAD Board basically tap springs and infiltration systems and not ground water resources. Wells are built in swamps and marshes so that percolation from springs around the well also take place. Feeder pipelines from other springs are also brought to the well. These springs are found in various altitudes. Local land use adjacent to these water bodies is critical in maintaining year round water flow. Several spring sources have dried up or the flow has drastically reduced due to land use changes or development works (revetment walls, road enlargement, check dams, etc.). Encroachments (very common) have destroyed water bodies as they have been converted for agriculture or tea thus blocking spring routes. In marshy environments, it is important to keep the passage of flow open - this is the key to wetland management, but unfortunately decision-makers perceive these areas as vacant land for further development works.

- There is field data to show that rains are failing both as the annual average and the number of rainy days. This has severe negative consequences on this fragile hill district - the livelihood of people, the plantation & agriculture economies and the ecology.

- Swamps & Springs are the only viable sources of water in the Nilgiris. They need appropriate protection through legislation for sustaining water sources in the future.
- Shola patches however small, cannot be removed for plantation or any other purpose - they are crucial water catchment zones in the hills.
- Maintenance of water supply system is poor. Urban water systems are in a disorganized state. Self Help Groups can be handed over the maintenance of local water systems on a payment from the users.
- Rain water harvesting needs to be promoted at the village level to meet the dry period requirement.

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The Nilgiris Water Resources Project owes its gratitude to a number of people, institutions who have contributed to the making of this project and the stakeholders workshop - an important output of the project.

Firstly, if not for Ford Foundation's visit to the Nilgiris in Feb 2000, the idea of this project would have never germinated. We would like to thank Dr. Ujjwal Pradhan (presently at FF, Jakarta), Dr. Doris Capistrano, Deputy Representative, FF, New Delhi & Ms. Radhika Johari (former Fellow at FF, New Delhi) for the keen interest shown in this project. It is from that late afternoon discussion, that the project has come to this stage, today. We are grateful to the Ford Foundation, New Delhi and Winrock International, New Delhi for their financial support to this project.

We are grateful to Dr. Kinsuk Mitra, Vice President of Winrock International India, New Delhi and Mr. Sunandan Tiwari, Program Officer at WII for going through the project very rigorously and helping us to clarify our initial doubts and approaches. Their participation and feedback has helped the project take into account several facets and issues. The project was routed through the Ford Foundation - Winrock Small Grants Program, New Delhi - we are happy to know WII through this interaction.

At the District level, we are extremely grateful to the Collector, Mrs Supriya Sahu, IAS, for having recognized at an early stage the importance of this project and enabling, right from the beginning, a fruitful discussion with the decision-making authorities. The credit goes to her for organizing a meeting of all the Government departments related to water resources management in September 2001 and initiating a partnership and a process dialogue of how to address the water issues. With this meeting, several doors opened and we had access to Government reports and information on water resources. She was kind enough to inaugurate the Stakeholders Workshop.

We are grateful to Dr. Alok K Sikka, In-Charge Central Soil & Water Conservation Training Research Institute, Udhagamandalam (CSWCTRI), for providing us access to the library and sharing the rainfall data of the last several decades. He was also kind enough to validate our findings and played a leading technical role at the stakeholders workshop. We are thankful to Mr. Shanmugasundaram , Deputy Director, Horticulture for giving us rainfall data from the different stations in the district. We acknowledge the GIS map of Nilgiris drawn by Dr. Christian Fels, Germany. We are thankful to Krishna, ACCORD and Anita for requesting Dr. Fels to share his work with us. We wish to thank Devender Giri who took pains to prepare the base maps in much detail which were crucial inputs for the GIS work.

In the formulation of the project - Rev. P.K. Mulley - a renowned Nilgiris cultural anthropologist assisted us with historical perspectives and traditional water management practices which are becoming extinct. He also guided us in the field work in the remote areas of Gudalur plateau. Mr. B.J Krishnan, President, Save Nilgiris Campaign (SNC), Ootacamund helped provide information on the 4 river basins and shared his insights on water issues. He also participated actively in the workshop. We believe some of the long term and short term plans from this workshop will be pursued by interest groups such as SNC.

If not for Taru Leading Edge - especially G.K Bhat, Somnath Sen & T. Nataraja - the study would not have been able to take shape and come to a final stage so effectively. The New Delhi based consultants have significant experience on working with water resources in other parts of the country and this study was an interesting interaction and partnership with them. Hope we can continue on this mutual learning partnership.

Finally, we would like to thank all the people - the tribal, farmers, the Government Officers, NGOs and citizens for helping us to address the water resources in such a comprehensive manner. We are certain that water will become an important issue for Keystone and we would want to implement with interested parties, the findings of this study.

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Date: 30th June, 2002
*Place: **Keystone Foundation**, Kotagiri, Nilgiris, Tamil Nadu*

Chapter I
The Water Project

1.1 Background

Nilgiris, located in the north-western part of Tamil Nadu state and spread over an area of 2,549 sq km, supports a population of 0.76 million (Census of India, 2001). About 41 percent of the population resides in the 900 rural habitations of the district, whereas the four urban centres of Udhagamandalam, Kotagiri, Coonoor and Gudalur, comprise the balance. The district is home to a number of indigenous communities and they include the Todas, Badagas, Kotas, Kasavas, Irulas, Kurumbas, Jenukurumbas, Mullu Kurumbas, Bettu Kurumbas, Kattunaickens, Paniyas, Mandadan Chettis and Wynaadan Chettis. Of these a tribal population of about 30,000 have been categorised as Scheduled Tribes. These tribal communities of the Nilgiris, have inhabited specific altitudes and are dependant upon livelihoods characteristic of these regional resources, apart from their own historical and cultural traditions, including those pertaining to management of water. Natural forests (sholas) and products therefrom - tea and coffee plantations, agricultural activities, tourism, and trade and commerce constitute the economic edifice and provide livelihoods to residents of the district. The district is located over an elevation range of 1,000-2,636 m above sea level, comprising hilly peaks, plateau and lower plateau regions - most of the settlements are located in the latter two elevation ranges.

The Nilgiris Biosphere Reserve (5520 sq. km) in Southern India is an important region in the overall bio-diversity ranking in South Asia. It is home to several indigenous communities (>10 diverse ethnic groups) and the spread of flora and fauna available (several endemic species) in this mountain zone. The Nilgiris district in Tamil Nadu is a central focal point - termed as the *manipulation zone* in the overall bio-region. There are two large protected areas within the district - The Mukurti National Park, a high altitude grasslands and shola ecosystem and the Mudumalai Sanctuary in the lower reaches with dry deciduous to semi tropical forests. The rest of the district is predominantly a combination of the plantation industry, agriculture, tourism and tribal populations which occupy select niches in different altitudinal zones of this mountain system. (Refer: Nilgiris at a glance - Pg. 2)

Water resources in the hill district of the Nilgiris in Tamil Nadu, play a crucial role not only in ensuring access to water for drinking and other uses to the rural and urban communities in the district, but also serve as the upstream source to four river basins serving the states of Tamil Nadu, Karnataka and Kerala. The water resources of the district are used for power generation and account for more than a third of total hydro-power generated in Tamil Nadu. Water as a natural resource plays a vital role in the ecology and economy of the district - be it in the large scale hydro power, the tea estates or in the forest dweller's livelihood system. The Nilgiris is the source of two main river systems - the Bhavani and the Moyar, which comprise several streams emerging from high altitudes and flowing down to the Cauvery basin in Tamil Nadu.

1.2 Regional Features

Most of the macro and micro water related issues facing the district today can be categorized & stake holders identified for each. A rough listing of the issues is given in the following section.

Watershed and Land Use: The Nilgiris can be divided into three altitudinal zones

Elevation	ORIGINAL LAND USE	PRESENT LAND USE
>1800 m	Grass land and Shola ecotype	Commercial plantations Tea & Commercial vegetables
1800 to 1000 m	Sholas, Moist Deciduous forests, mixed agriculture food crops	Extensive tea cultivation Growth of urban centres Coffee and Vegetables
< 1000 m	Dry deciduous forests Cliffs and grassy slopes	Coffee, tea and millet cultivation Dry deciduous forests

Over the years these natural systems and watersheds have seen a lot of change in the Nilgiris. Building a series of hydro electric projects, tunneling the water to different areas for irrigation, building reservoirs, planting the upper areas with commercial pulpwood species and replacing natural grasslands with tea and marshes with vegetables has changed the district's water regime. Besides affecting availability, the management of the resource has shifted from local communities and indigenous groups to the state. This has resulted in several community based systems to collapse and increased the dependence on a centralized body.

A change in the land use of each of these zones has led to a steady decline in the health of the watershed. The main difference was seen with the increase in the commercial plantations of eucalyptus and wattle wood in the upper areas and the dramatic increase in tea cultivation in the middle zone. According to a study done by the Central Soil and Water Conservation, Research and Training Institute at Udhagamandalam - there is a 16% reduction in the water yield from the catchments of eucalyptus plantations vis-a-vis that of grasslands.

1.2.1 Water Issues

Besides the crop change over, regular harvest/logging increases soil erosion. Large scale destruction of forests and marshes in the middle and lower zones for tea and vegetables respectively, also seems to have reduced rainfall dramatically in the district. (Reference: Project Appraisal Report of the Kundah & Lower Bhavani River Valley Project, 96-97 by Agricultural Engineering Department, Chennai) The change in land use from rain-fed agricultural crops to plantation crops requiring irrigation has also increased demand for irrigation, placing a widespread pressure on natural water sources. This change has caused severe erosion in the region, also affecting the low lying lands of indigenous communities.

- Water Pollution: The increase in tea cultivation and commercial vegetable growing has also led to the increase in the use of chemical fertilisers, pesticides and weedicides. Some of these harmful chemicals have negatively affected the soil and water regime, percolating into the water sources. The water when used by indigenous communities for drinking purposes, has increased skin and water borne diseases.

- Water Use and Management: There are a number of users of water in the Nilgiris. The Electricity Board, Plantation sector, Tourism industry, Agriculture & Horticulture sector are the main users. With a number of dams, weirs and tunnels – water is a managed resource in the hills. However, there are few points of water access for villages and especially indigenous communities. People have to resort to dug wells and springs for water. The water from the dams, both Pykara and Bhavani feed into the Metur Reservoir and is distributed in the Cauvery River Basin for irrigation. This has raised questions for local farmers and communities – as to why they do not have access to water from the district. eg. The village of Kallampalayam is located on the banks of the River Moyar, but does not have access to water for irrigation. Local measures need to be taken, to resolve this conflict.

- Changing Culture of Water Use & Tradition: Nilgiris is a land of a myriad number of tribal groups and local ethnic communities. Some of them, like the Badagas, have a cohesive village governance and resource sharing system. Communities like the pastoral Todas, had traditional pasturages, based on the availability of water. Other hunter gatherer communities that were forest dwellers, moved their villages due to the invasion of wild animals. New sites were chosen depending on the water availability. Dug wells (*Baavi*) and protected springs (*jo: ni*), were treated with care and kept clean.

  However, now these traditions are fast disappearing. People who could earlier manage their resource now look for government schemes and doled out benefits. There is also a change in their outlook from what was considered their own resource to that which belongs to the Government. There are no institutional systems in place to look after these government schemes, which sometimes lie in disuse or create conflict within the village.

1.3 Rationale for the Study

Based on the above issues, the reason for undertaking this project/study were the following:

- ¬ Given the problem of access and rights, water resources are critical in mountain ecosystems, especially for the indigenous communities
- ¬ There is a lack of understanding of water use dynamics, with special reference to local communities
- ¬ There is no knowledge of chemical input correlation with water borne diseases in hill communities
- ¬ There is no information on run-off and its repercussions in terms of erosion, loss of top soil
- ¬ There is little knowledge of community based water management systems and cultural linkages

1.4 Methodology Adopted

Methodology undertaken was administering a detailed questionnaire after sampling villages in the four river basins. Qualitative observations, testing of water samples and informal meetings with villagers were part of the survey methodology. Refer Appendix II for questionnaire. A Geographical Information System (GIS) map was prepared for the principal parameters. The maps are attached at the end of this chapter.

Sampling

- ¬ Covered the entire district – all 4 river basins : Bhavani, Chaliyar, Kabini & Moyar
- ¬ Sampled 61 villages covering 71,566 persons from 13 distinct communities
- ¬ Identified 120 water sources
- ¬ Observed 291 water extraction structures

1.5 Readership

This report is a culmination of a one year study. The report deals with primary field findings, analysis of data from 61 villages, Geographical Information System interpretation / analysis and synthesis of secondary literature related to Nilgiri waters. The report is meant for the decision-makers - at the district and the state level - meant directly for TWAD Board, District Collectors, NGOs, Municipalities. Donor agencies associated with Water Resources issues in Tamil Nadu in particular and other parts of the country in general may find this useful. Apart from the study, the project has implemented 3 water systems in the tribal hamlets of Kotagiri taluk - the details and photographs are attached.

1.6 Limitations

One of the limitations have been - the inability to test for pesticide residue in drinking water samples due to the high cost of such tests. The sample of 61 villages - have been taken mainly from the Bhavani & Moyar basins - areas which are familiar to Keystone as well as directly relevant for Tamil Nadu. Fewer villages have been visited on the Chaliyar & Kabini basins as these flow into Kerala and Karnataka. Information on the hydro electricity aspects of the Nilgiris has been difficult to access.

Chapter II
Water, Land Use & Climate - The Physicial Environment

2.1 Natural Resources of The Nilgiris

The important features regarding water resources in the Nilgiris are presented in the following table and the Map of Nilgiris.

NILGIRIS WATER RESOURCES – FACTS			
All major streams and rivers are harnessed for Hydro-electric schemes. Eg. Kundah, Moyar, Pykara, Mukurthi.	Bhavani in the South and Moyar in the North are the two important Rivers of the Nilgiris	All villages in Nilgiris have drinking water supply	Most villages in Nilgiris depend on natural springs or wells for their drinking water needs. The catchments of these springs need protection.
There are large water storing reservoirs at Upper Bhavani, Avalanche, Parson's Valley	Tea and Coffee plantations form the major non-food crops (76% of total cropped area)	Potato and English vegetables are grown in upper areas and valleys.	It is reported that only 571 ha of land is irrigated by canals and spring channels
Source: Census of India 1991			

2.2 Climatic Information of Nilgiris

In this section, the rainfall and temperature variations will be analyzed.

2.2.1 Rainfall Variation

Long term rainfall trend was analyzed for the district. While data for Kotagiri, Coonoor and Ooty was available for a longer period - 50 years cumulative deviation, data for Gudalur was available for a shorter period only.

Kotagiri Station

Between 1946 & 1964, there was an upward trend till 1957 and then a downward trend. There was not much deviation between 1964 & 1983. Between 1983 & 1995, there was a declining trend uptil 1992 only.

Ooty Station

Between 1946 and 1994 there was a declining trend up to 1952 and then an upward trend until 1980 with a sharp decline thereafter.

Coonoor Station

Between 1946 & 1957 there was a declining trend till 1955. Between 1957 & 1969 there was a declining trend except for 1958 & 1968. Between 1970 & 1979 there was declining trend in 1970,71,74 &75 and upward trend in 1972,73 & 76-79. Between 1980 & 1995 there was a declining trend uptil 1989 and upward trend thereafter.

Conclusion

It is concluded from the comparative analysis of all the 3 stations that Ooty and Kotagiri showed upward trend in contrast to the downward trend at Coonoor during 1950s. Between 1983 and 1989, the rainfall was in a declining trend in all 3 stations. The rainfall in Ooty continues to decline from 1980 onwards while there was an upward trend at Coonoor and Kotagiri stations from 1989 and 1993 respectively. *(Data source: Project Appraisal and Evaluation report, Kundah and Lower Bhavani River Valley Project, 1996-97)*

Gudalur

Between 1950 & 1974 (24 years), an upward trend was observed during 1952-60 followed by alternate downward and upward trend between 1961 & 1964. There was a continuous downward trend from 1965 to 1974 except in 1969.

2.2.2 Average Monthly Rainfall

Average monthly rainfall (1990-2000) for Devala farm at Gudalur and CSWCRTI at Ooty were analyzed. It is observed that Gudalur receives heavy rainfall during June-August (ranges between 700 and 800mm) from southwest monsoon. Rainfall during January to March is negligible (<20mm).

Ooty receives maximum rainfall during June, July and October (around 200mm) and moderate rain during August and September (nearly 150mm). Rainfall during December to March is negligible (< 20mm).

2.2.3 Average Monthly Rainy Days

Average monthly rainy days were analyzed for CSWCRTI, Ooty (1990-2000) and Devala Farm, Gudalur (1994-2001) and Burnside Estate-Kotagiri (1994-2001). Average rainy days were very high in Devala Farm with more than 20 days in June, July and August. Average rainy days were nearly 15 days at Ooty in the months of July and October. Kotagiri has more rainy days (10days) in the months of October and November.

2.2.4 Rain fall and Run off

From the analysis of the rainfall and run off data (1978-1997) for Mynally silt monitoring station, it was observed that the average percent run off to total rainfall is 35. The percent run off trend is variable over the years. The run off is below average between 1980 and 1983 and between 1986 and 96 (except 1992 and 1995). Above average was observed during 1984, 1985, 1992 and 1995.

From the monthly rainfall and run off analysis for the same station (1996-97) it was observed that the average run off to total rainfall was 33%. The station recorded run off in the months of January, February and March and this run off was due to subsurface flow rather than rainfall since these months did not record any rainfall. The percent run off to total rainfall was higher in the months of May and August. (Data source: Project Appraisal and Evaluation report, Kundah and Lower Bhavani River Valley Project, 1996-97)

2.2.5 Periodic Fluctuation in Rainy Days at Udhagamandalam

The number of rainy days reported for this station for the five-year period (1886-1890) excluding the months June, July and August (monsoon origin) was 416 and for the period 1978-82 was 271 days (35% decline to 1986-1890). The interpretation clearly demonstrates the diminishing tendency of rainy days. Declining trend observed in all the periods except for the period 1958-1962. (Source: Meher-Homji V.M., 1991, Probable Impact of Deforestation on Hydrological Process, Climatic Change 19:163-73, Institute Francais, Pondicherry)

2.3 Section B : Temperature Data

2.3.1 Average Monthly Mean Temperature (Maximum and Minimum)

From the analysis of data from CSWCRTI for 1990-2000 it was observed that average monthly mean maximum temperature is between 20^0 and 25^0C for the months of March, April and May and for the rest of the months it remains below 20^0C. Average monthly mean temperature lies below 10^0C in December, January and February and stays between 10 and 12.5^0C in the remaining months. *(Data Source: CSWCRTI, Ooty)*

2.4 District Drinking Water Situation

2.4.1 Water Supply Level (District)

The district has a total of 1182 habitations with 4 distinct unions. Out of 619 sample habitations (TWAD Data) the latest drinking water supply level is as follows:

Supply (lpcd)	Habitations	%
15-20	3	0.5%
20-30	227	36.7 %
30-40	281	45.4 %
40-60	57	9.2 %
60-70	53	8.6 %

Totally 37% of the habitations get less than national norm level (40 LPCD - few States have even revised it to 55 LPCD), 45% gets close to national norm while only 18% get above the norm.

2.4.2 Percentage Water Supply Level in Different Unions

From the analysis of the TWAD data, it was found that all habitations having a supply level of 15-20 LPCD are in Gudalur union only. Percentage habitations having a supply level of 20-30 LPCD for Coonoor, Gudalur, Kotagiri and Ooty unions are 24, 31, 9 and 36 % respectively. Percentage habitations having a supply level of 30-40 LPCD for Coonoor, Gudalur, Kotagiri and Ooty unions are 13, 27, 46 and 14 % respectively. Percent habitations under 40-60 LPCD for Coonoor, Gudalur, and Kotagiri and Ooty unions are 16, 22, 11 and 51 % respectively. Percentage of habitations under supply level of 60-70 LPCD for Coonoor, Gudalur, Kotagiri and Ooty unions are 62, 15, 8 and 15 % respectively.

2.4.3 Type of Schemes at the District Level

CWSS	: Combined Water Supply System	PP	: Power Pump
G	: Gravity	EPL	: Electric Power Lift
OWD	: Open Well Draw	REJ	: Rejuvenation

Out of 619 sample habitations (TWAD) CWSS, CWSS & PP, CWSS & G, EPL, OWD, PP and REJ type schemes constitute 1, 0.5, 2.6, 24.4, 1.1, 69 and 0.2 %, respectively. Power Pump (PP) and Gravity (G) schemes are dominant and together constitute 93 % of the total type schemes.

2.4.4 Union Wise Type Schemes

- % CWSS schemes for Coonoor and Ooty unions are 67 and 33 respectively
- % CWSS & PP schemes for Gudalur union is 100
- % CWSS & G for Coonoor and Kotagiri is 33 and 67 respectively
- % EPL for Gudalur and Ooty is 13 and 87 respectively
- % Gravity scheme for Coonoor, Gudalur, Kotagiri and Ooty is 29, 9, 20 and 42 respectively
- % OWD for Coonoor, Gudalur and Ooty is 14, 71 and 15 respectively
- % PP for Coonoor, Gudalur, Kotagiri and Ooty is 19, 35, 29 and 18 respectively
- % REJ for Coonoor is 100 (only 1 number)

It is observed that Gudalur has highest number of PP schemes whereas Ooty union has highest Gravity schemes. Kotagiri Union has considerable percentage of both gravity and power pump schemes.

2.4.5 Water Supply Scheme Implementation

Nearly 98 % (605) of the schemes were implemented by TWAD and 2 % (12) by Local Bodies. Apart from these agencies, Panchayat and TWAD + Local Bodies have implemented a scheme each.

Water Supply - Kotagiri

The Kotagiri Town Panchayat consists of 41 hamlets. There are 55 wells with pumpsets. There is acute water shortage in the Panchayat - the water supply is available once in 2-3 days for 1 hour and is brought in 4" and 3" diameter pipes. The supply is mainly from the Elada Dam. The scheme was handed over to the Panchayat in 1972. For the 41 hamlets there are 25 sanitary workers who maintain the system. The entire water supply system is being managed and maintained by the Town Panchayat. In all the 41 hamlets - the water supply position is insufficient. According to the Sanitary Inspector, Kotagiri Town Panchayat: ***"People in the town have to migrate for search of water to the villages in the future"***. 10th October, 2001

Water Resources - Kotagiri Town Panchayat

- 41 Hamlets
- 31,975 Persons
- Drinking Water Storage Tank Capacity (Total): 1,325,000 litres
- 56 Submersible pumps
- 49 Ground Level Reservoirs (GLRs)
- 48 Open Wells (spring tapping)
- 266 Public Taps
- 786 House Connections
- 38 Commercial Connections
- 10 gravity tapped systems

Situation Analysis of Water Resources Distribution -Kotagiri

- 19 hamlets get daily water supply for 2 hours
- 9 hamlets get water on alternate days for 2 hours
- 2 hamlets get water once in 2 days for 2 hours
- 1 hamlet gets water once in 3 days for 2 hours
- 8 hamlets get water daily 1 hour
- 2 hamlets get water daily for 1 hour
- 1 hamlet gets water daily for 3 hours
- 2 hamlets get water once in 2 days for 1 hour
- 2 hamlets get water alternate days for 1 hour

Rural Water Supply : Litres per day per person

- 17 hamlets : 40 litres
- 10 hamlets : 45 litres
- 7 hamlets : 35 litres
- 4 hamlets : 50 litres
- 3 hamlets : 30 litres

Future Measures to Solve the Water Crisis at Kotagiri Town Panchayat

1. The existing Elada scheme is insufficient for the growing settlement and town panchayat at Kotagiri.

2. The proposed Halakarai scheme is not economically viable - 4 crores project budget, out of which 1 crore has to be raised by the local panchayat.

3. The Kaggula water scheme has potential for providing water year round to the entire panchayat but requires Forest Department clearances.

4. The solution could be to add another 8 inch pipeline to the existing Elada water supply scheme

2.5 Water & Land Use

2.5.1 Hydrological Implications of Converting Natural Grassland in to Bluegum Plantation in Nilgiris

CSWCRTI carried out a hydrological study between 1968 and 1992 to assess the impact of converting natural grasslands into *Eucalyptus globulus* (bluegum) on the water yield in downstream reservoirs. Comparative study was done on two small identical watersheds (32 hectares) one with natural grasslands and "Shola" forest and other with *Eucalyptus globulus* plantation. The study area was located in the catchment of Glen Morgan storage reservoir feeding the Pykara hydroelectric project in Moyar basin (24 km away from Ooty City on Mysore road).

Calibration period was during 1968-1971. Eucalyptus plantation was raised in 59 % of a watershed in 1972 and was felled (first harvest) after first rotation of 10 years in 1982 and the second harvest (second rotation or first coppiced growth) after another 10 years in 1992. The key findings of the study are as follows:

- Average annual reduction in total runoff (water yield) in the bluegum planted watershed over the natural grassland was 16 % during the first 10 years rotation and 25.4% (94 mm) during the second rotation of 10 years (coppiced growth)

- The reduction in base flow was 15 and 27 % respectively for first and second rotation

- Decreased Low Flow Index (LFI) by 2 and 3.75 times respectively for bluegum planted watershed over the natural grassland (+Shola) for the first and second rotation

- Increase of annual flow (14-17%) immediately after felling of bluegum plantation for both rotations

- Reduction in soil profile moisture in bluegum plantation watershed (during second rotation bluegum plantation extracted moisture from deeper soil zone than first rotation)

(Source: Hydrological implications of converting natural grassland into bluegum plantation in Nilgiris, 1998, CSWCRTI, Ooty)

Chapter III
Survey Findings

3.1 Water Traditions

The Nilgiris water, feeds into the reservoirs/basins of three southern states. Most of the villages have tapped a spring - based system. Out of the 35 water sources surveyed - 60% were from springs. There are differential uses for diverse water sources. Shola springs for drinking water purposes and lower down valley sources for agriculture.

In the Badaga community which is predominantly agriculture based - water sources are protected and worshiped once a year - *Halla Paruva* (Water Worship). In the *Halla Paruva* ritual - the first crop of millet is cooked with the water and served as *paruv*a(ritual meal). Today, instead of millet - rice is cooked with this particular water from the source. This ritual generally is done prior to the North Eastern monsoon to receive abundant rainfall during the season.

Case Study I : Water Customs

Bothayya - the headman from Ajjur village is also the Poojari of the temple. According to him their forefathers have come and settled in this area after locating a spring source emerging out from the ground containing "sembare kal" - a type of soil - stone sediment mix. The sighting of this stone in the ground is the signature of Huttu neeru or emerging spring. He says for the rains they have a special pooja or may pooja, which is done by looking at all the four directions and the clouds. During this period, there is also another interesting water ritual - connecting the cow (buffaloes in the olden days) and the water. This is called uppuattu habba, the cattle is given salt water in uppukal or salt stones. The salt stones made out of old granite are inlaid next to the road for the cows to drink. According to him the ritual of Halla paruva - milk pouring ceremony to the source of water - and the salt ceremony for the cows is part of whole rhythm of life cycle.

Case Study II : Dead & Alive Water

In the village of Kurumba Medu near Yellamalai - 40 families of Betta Kurumbas reside. Their tradition of drawing water is always from a spring or a swamp. They do not fetch water from the wells as they consider it "dead" water. Though there is a well close to the village, nobody uses it. They go far down the valley for fetching water in vessels from the springs. This was a common feature noticed throughout the field work. Introduction of wells in the Nilgiris is a recent phenomena mainly for agriculture purposes in the valley.

3.2 Access & Control

In most of the villages located in the plateau / upper areas - Government schemes such as a pumping facility with Ground Level Reservoir have been installed. The local people have appointed a person from the village, who is paid by village contribution, to maintain the water supply system.

In the management system of water resources there have been significant changes. From discussions with elders in the villages, it was found that in the past water resources were protected and maintained from the origin to the settlement and downstream. There was a zoning of activities - with settlements in the higher reaches and the agricultural and cattle activities in the lower areas - the chances of contamination were less. Water channels were dug through the hills and valleys up to the *Shola* source at the mountain top. It was the village system that each family would maintain the channel for a certain distance - more interactions through the management of this water resource took place until piped water came into being and common water resources became the Government's property. At present, the pipelines bring in water and there is hardly any ownership of the water by any family. If there is a breakdown in the system, then the water authorities are contacted for repair.

Case Study III : Tight Natural Resource Spaces & Changing Environment

The village of Kairbetta (actually known as Kerubetta) is located near the town of Kotagiri and is one of the oldest Badaga hamlets in the Nilgiris. We spent time in one of the *keris - line of houses,* with Mudda Gowder - an elderly Badaga. The word `Keru' means a small lake - originally situated in present day Rifle Range, Donnington, just below the village site. "Perhaps, the lake would have been one of the deciding factors for the location of this village and their buffalo herds in olden times", he muses. "The lake has dried up and has been closed some time back. The village has 68 acres of land - all planted with tea, most of the people are dependent on jobs / service in the town". According to him, long back, there were no land records, no boundaries, one could graze one's buffalo and bring water from a spring. "Since the Britishers entry, the lands have been demarcated, estates have come up and their foraging and cultural space has reduced drastically". Today, they find themselves shrunk between the road, the tea estates, the forest department land. For water, they depend on the Longwood shola source - which is their lifeline located a 100 meters away. "In Kairbetta, every house had a kitchen garden - cultivating cauliflower, peas and potato and some herbs. With the introduction of tea we lost all this and also diverse water uses". Today, he finds the new situation difficult. "The younger generation may never know the ecological history of such settlements", he thinks aloud. We have hot tea with *bella (jaggery)* and say good bye and thank him for his time and insight.

Case Study IV : Water Take-Overs

In the village of Kurumudi, in the rich agriculture belt of Kookalthorai there are 60 families who are Badaga farmers. Their livelihood is dependent on growing vegetables and selling it to the Mettupalayam mandi. Approximately 75 % of the 500 acre of vegetable farming is dependent on river water pumping. Lately, other tea planters upstream have installed higher capacity pumps and are taking the surface water away. With less water for their lands, they have to move down close to the town for search of work. Today, though being land owners they are laborers working in other peoples' lands. They say this kind of water take over should be stopped. Rich farmers from Aravenu and Jackanarai have moved into these areas for harvesting a rich crop. Small farmers are being edged out.

Case Study V : Water Carriers

In Gudalur town, the water scarcity has reached alarming levels. Mrs. Varghese, recounted the stress of living with less water and the steps sometimes people have to take. In their locality, they do not have enough water to wash clothes. Thus, every Sunday an auto rickshaw is hired to carry all their clothes and go out of town to a nearby stream for washing. Gradually, with similar problems in many localities - the Sunday water auto rickshaw for clothes and other materials is a common sight.

In the lower reaches, where tribal populations live - the scenario is different. Spring sources are limited in this zone. Inside forest areas there are streams and water holes which mostly dry out in summer due to excessive upstream usage and diversion for other purposes. Unlike their upper area counterparts, not many of the water schemes have reached these areas. The tribal is principally dependent on rain for subsistence agriculture. In the surveyed villages, it was found that for domestic

purposes - dug wells are used - pipelines made out of agave leaves, bamboos and HDPE pipes are used for bringing water from long distances. During summer, this supply is uncertain.

3.3 Valley of Spring Network

Springs management is still practiced in some of the villages visited. As most of the villages in the upper plateau depend on springs, some of the villagers have devised simple systems of conservation. After a certain time, no water is allowed to be used - there are fixed times to tap the stream - so that the next day sufficient recharge has taken place for the whole village. In agricultural operations - it is seen that villagers of higher `caste' and lineage - occupy an altitudinal niche. The Badagas have mostly better access and facilities to water than the Thoraiya Badagas (TB). For water use in agricultural purposes, it is first utilized by the Badagas then made available to the TBs. There has not been any serious conflict, as the management of water resources follows traditional hierarchical lines.

Water-Rich & Water-Poor

The Nilgiris water resources manifest themselves in different forms and thus have a diversity of issues associated with them. The Nilgiris massif presents a geography which is prominent - in terms of high lands, the plateau - or the rich agriculture belt and the lower steep areas - where the forests and tribal reside. From the water perspective - the upper areas are the harnessing zones of water which emerge from *Shola* and grasslands. The plateau is a network of springs. For most of the agricultural communities - though water sources have reduced - the chances of tapping a hill spring are not difficult. Most of the Government schemes work on tapping hill springs which are stored into large wells / tanks for upward pumping to the settlements and villages. From the initial survey in the plateau area from 20 villages, it is seen that the location dispersion is as follows:

Village Locations		**Water Source Locations**	
Valley	30%	Valley	44%
Hill Top	35%	Hill Top	4%
Slope	25%	Slope	22%
Saddle	10%	Shola	30%

It is interesting to note from the above analysis that the source of water is located maximum in the valley and it is also the location of the maximum number of villages. These are basically spring-based systems. Another finding is that the villages which have been traditionally located on hill tops (higher lineage settlements) do not have much water available any more in higher reaches. Thus, they are dependent on Government assistance through pumping systems. Most of the shola forests also occur in the fold of the mountains or the saddle zone.

The variance of water availability and water scarcity is stark in this hill district. A large population resides in water rich areas - where springs are tapped through Government schemes - for them the issue of acute water scarcity is still not an issue. The lower areas water resources are depleting at an alarming rate. Tribal villages among others such as Kolikarai, Kunjapanne, Kil Koup, Mel Koup, Thalamukh, Semmanarai, Vagapanai, Bangalapadigai, Vellerikombei (Irula & Kurumba) face an unprecedented situation. Large streams which flow through close to their settlement dry out during the summer. What happens in a small scale in the upper areas - to springs and streams - the same effect is multiplied several times leading to a complete destruction of water bodies in the lower elevations. In the survey it has been seen that large tea estates such as Burnside for the first time this year have had to bring in tankers of water to keep the labour on site.

Case Study VI : Local Water Management

In the Village of Alakare, the water is known for its delicious taste. People come from far away to taste the Halakarai water. In earlier times, the Kota - tribe used to come from Aggal village with their flutes for the advent of water celebrations. Water at Alakare emerges from an underground spring or *Baavi*, close to a shola. At the village a beautiful temple has been built around the water source. In earlier times, the families used to maintain the water channels from the origin to the settlement - removing blockages, de-silting. This community effort led to every one taking responsibility of water systems. This practice changed when the Government brought in piped water and owned the water courses. Today the management is different, with few people having to do all the work. The supply is insufficient in summer. They still have retained the *Baavi* close to the shola as a back-up if all pipe systems fail (which happens from time to time).

One interesting aspect of water conservation and management practiced by the people of Halakarai is to stop the supply of water during the nights in the pipeline. All those wanting water - have to store in by the day. Through out the night, the springs recharge and there is sufficient water for the whole village the next day.

3.4 People & Water

Sharing between villages of water is very poor. 75 % say **no** to water sharing, 25 % are willing to share in the hope of getting some water from surplus areas. Check dam is the only structure where the sharing is equal. The most unequal situation arises from the location of a spring - which is an individual clean water facility.

- 7 categories of uses have been identified : Drinking, Drinking & Washing, Washing, Bathing, Bathing & Washing, Irrigation and Not in use. Out of the 120 sources - 74 are for drinking water purposes (62 %) - the maximum emerging from Springs.

- Of the total 120 water sources - Streams account for 27 % and have multiple functions : drinking washing Bathing & washing and irrigation.

- Agriculture in the hills is not dependent on rivers. From the frequency data of the sources for irrigation of cropped area in the sample villages the following can be concluded:
    - For large land holdings of 75-100 acres, dependence is more on streams than on wells
    - 50-75 acres : check dam is used followed by the stream
    - 25-50 acres : springs & wells are tapped equally
    - 10-25 acres : only wells are used
    - less than 10 acres : farmers depend on rivers
    - less than 1 acre : only springs are used
- In the domestic uses of various sources, the most dependable source for **drinking water** is the springs followed by wells and streams respectively. The most dependable source for **washing** is the stream. The number of villages using springs & streams is higher than those villages using wells.

- Regarding the population based water usage, where there are more than 1000 people, 33% people face no shortages. The balance face water shortages in some way or the other. 20 % report to the Panchayat for alternate source, 6 % depend on springs, 6 % on tankers & 10 % on streams and other sources. Only 4% of people practice water conservation activities.

- Communities located in slopes face maximum water problems. From our survey, 15 villages face severe problems.

- The district has a total 1182 habitations with 4 distinct unions. Out of 619 sample habitations

(TWAD Data) - 37% of the habitation gets less than national norm level (40 LPCD, some States have revised to 55 LPCD), 45% get close to national norm and 18% get above the norm.

- Of the total 94 domestic water sources: 3 sources (1 stream & 2 wells) flow during the rainy period. During winter : 59 sources have water, the maximum being in springs and the least in tanks. During summers - only 32 sources have supply, maximum being in wells and least in dug holes. It can be seen - that during summer - there is a shortfall, therefore the increase in tanker water enterprises in the district. During winter - the shortfall is less. The wide gap between summer and winter domestic water situation is a cause for significant alarm - there is a drop of 44 % in domestic water supply position.

- There are 5 types of water delivery schemes : Spring with Gravity pipeline, Open well with pump, spring with pump and tanks, Bore well with pump, Open well without pump. During the survey 48 schemes were seen, out of which 28 were perennial, 16 seasonal and 4 broken down. Out of the 28 perennial schemes, 18 were spring based with gravity pipeline.

The survey has documented some interesting water resource issues in this hill district. Some of the findings are:

- There is a social stratification between communities for tapping different kinds of water sources. In most mainline Badaga villages - they have preserved an underground source - *Huttu* (emerging) *neeru* (water) for their drinking water purpose. This is a sacred zone - out of bound for outsiders, and this practice also reduces the risk for external contamination.

- Several areas during the survey we have mapped the historical names of streams flowing through these settlements - these are not found today. Upstream tapping and reduced water flows have affected both the Kurumba and Irula tribal populations, the most. Other indigenous communities such as Badagas, Kotas or the Todas live in the `spring catchment zone' - their issues are different.

- Badagas have their settlements mainly on hill tops. They depended entirely on upper spring sources close to Shola forests and grasslands - this is thought to be pure. Communities of Thoraiya Badagas and Sri Lankan repatriates are located in relatively lower elevations. Their water source is from the valley, which is also the water source used by Badagas for their agriculture purpose. With changes and non-availability of sufficient water from upper spring sources - Badagas have had to depend on lower valley sources for their drinking water.

- There is a crucial linkage between *Shola* patches (endemic montane forest-type which occurs in this region) and water resources availability.

- Large Government Water Schemes of the TWAD Board are basically tapping springs and infiltration systems not ground water resources. Wells are built in the swamps and marshes with a feeding pipeline from a spring which leads to the well. Springs around the well also percolate inside. These springs are found in various altitudes and the local land use adjacent to these water bodies are critical in maintaining year around water flow. Several spring sources have dried up or the flow drastically reduced due to land use changes or any development works (revetment walls, road enlarging, check dams). Also encroachments (which are very common) have taken over water bodies and converted into agriculture land or tea land thus blocking the spring path. In marshy environments it is important to keep the passage of flow open - this is the key to wetland management, but unfortunately decision-makers perceive these areas as vacant land for further development works.

¬ Importance of swamps is under estimated - a swamp protection committee within the Forest Department is discussed as an option to conserve and restrict the blocking and conversion of swamps. Critical wetlands in low lying areas and valleys control the movement of water regime to a large extent.

Case Study VII : Water & Gender

There are opposite traditions in different parts of the Nilgiris in relation to water. In the plateau areas, the sacred source of water where worship is done is out of bounds for women during their menstrual cycle for causes of pollution. In Melambalam - a Paniya village, it is quite the opposite. A Moopathi - a lady priestess will do the pooja to raise the water table of the well. In earlier times, her husband used to perform this pooja, due to old age now his wife does it. It is interesting to note that in the Nilgiris, each community has an approach to water related traditions which are still practiced in some way or the other. These rituals and practices seem to be relevant to their local environment.

Case Study VIII: Bamboo pipelines & Banana leaf rain water harvesting

In Pudur Kombei village, the Alu Kurumba tribals used bamboo poles to bring in water from uphill mountain springs into their settlements 20 years back. Sometimes, they would fill the bamboo hollow with water and carry it to the house. Today it is more convenient with piped water supply and plastic buckets. They worship Mariamman and believe that if there is rain in the right season - water will be there also during summer.

In Vaacikolli village of Devarshola town panchayat, the Bettakurumbas use banana leaves for collecting rain water from their roofs. Their regular water supply is from a water hole nearby.

Case Study IX: Trees as water indicators

Wild willow or *Baige* tree - is a good indicator of water according to several villages. These roots, attract water and form a source/spring in the vicinity. In Bellathi kombei village beyond Manjoor, the Kurumbas dig holes for water near these trees.

Case Study X: Liquor Groups becomes Water Users Group

In the Kookalthorai village an interesting experiment has started. This area was prone to illegal activities such as illicit liquor or ganja planters network. Youth groups were formed to keep a watch and curtail such illegal activities. In the course of time - the problem of illicit liquor was handled and ganja growers were discouraged to come this area. Today, these groups have turned their skills to water resources management. In villages such as Sigola, a group responsible for the maintenance and distribution of water systems is working effectively since 14 years. The group decides which land will be irrigated first and how the sharing will be equitable. Small earth canals are made for water distribution. Even the pumping and irrigation system of the TWAD Board has been handed over to the group.

Case Study XI: Todas - Water & Buffaloes

We met Ooneri Kuttan, an elderly Toda, at Bikkepattimund in February this year. This Toda hamlet is situated amidst a thick Shola forest at a high altitude in the upper plateau. Buffaloes and Todas always go together. They revere this animal since time immemorial. Ooneri looks back at the change in landscape and shrinking habitat for the buffalo for water and grass. “Earlier, even Badagas used to keep them, but tea, other occupations and land-use change made them opt out”. According to him, the Nanjanad area was a zone of large swamps - almost 20-30 kms wide and so long, that the crossingwould take time. “These areas had good clean water sources from springs and grass that our buffaloes fed on”. Government policy according to him, introduced pines, wattle and blue gum and dried up the swamps. “With dryness - the land developed cracks - and our buffaloes were unable to walk on these pasture lands with the risk of slipping inside the swamp muds”.

Case Study XII : Situation in Water Rich Areas of Gudalur

Ponani village in Nellakota panchayat in Gudalur is a mixed village of Paniyas, Tamil repatriates, Chettis and Malayali settlers. There is the local office of the Adivasi Munnetra Sangam (AMS) situated next to the stream. Fishing is common in this area. There are a number of springs, water holes and streams all around. Water flows throughout the year - in these lands - supporting a variety of crops - tea, coffee, pepper, ginger, paddy, bananas. This area also is prone to local landslides and mud slips - this is due to excessive gold panning activities by tribals in this area. There is a rise in water borne

diseases during the monsoon period, typhoid, diarrhea, jaundice and dysentry is common according to Manikandan, a Mullu Kurumba staff from AMS.

In this area, water being a common available resource - the people take some time planning and observing the course of water. Where does the water go, how much can be used for cultivation for paddy and other crops, at which point to divert. The people from this area understand the water flow and thereby plan their activities around them.

3.5 Water : Power & Pollution

- Mostly all the villages surveyed have a back-up system for domestic water supply from another source in case one of them is not functional. It is quite common to notice underground spring sources which are used only for drinking water purpose - these zones are out of bounds for outsiders and is a place for worship. This practice ensures the protection of the water source from external contamination.

- The Nilgiris as a region from the early 1920s was seen as a natural resource base for exploitation for the cities and towns in the plains (Coimbatore, Erode, Madurai, etc.). Today, due to significant environmental changes - the Nilgiris is trying hard to cope with the limited water resources in terms of management, distribution, maintenance and accessibility.

- In water scare areas there is a local migration of farmers who have land in upper reaches but do not have the capital to pump water from lower areas. Due to erratic rainfall and change in land use springs have dried up in the slopes, forcing several families to come down in the valleys and work as agriculture wage labor (villages such as Kookalthurai area). In water - abundant areas such as Nedugula - the situation is very different. For drinking water purposes they depend on the *Shola* patches from where pipe lines (12 kms) are brought into the settlement. For agriculture purposes each has their own open well in the valley. Water table is less than 5 feet - these are springs being tapped which ooze out in to the well. In a 10 acre valley belt - we encountered more than 100 diesel pump sets drawing water for irrigating potatoes, cabbage, cauliflower, etc.

- Use of chemicals and pesticides in agriculture is very high. According to the farmers the quantity of chemicals used have gone up every year and during the rains application of these inputs is doubled. From water samples tested it is found that there is a high incidence of iron content (more than permissible limits) in drinking water sources. Almost all water bodies used for drinking water purposes have coliform presence. (Refer Annexure 4)

- The mapping and ground verification shows the importance of Nilgiris water to four large basins for Kerala, Karnataka and Tamil Nadu. Water in the Nilgiris during the 1930s was thought to be the source for power generation. Deficit of power in the state was planned to be met through hydro electricity projects in the hills. The Electricity Board played a historical role in controlling water resources of this district so much so that a 1950 GO promulgated that “not a drop of water from the Nilgiris district will be used for any other purpose other than power generation.” Nilgiris was then the highest contributor of electric power to the state grid through hydro electricity. Only lately, the TNEB has tied up with irrigation department to provide `free’ electricity to farmers. This has had a negative effect on tapping of water resources at high altitudes and denying the water resources for lower downstream villages.

- The Nilgiris water resources in the upper areas have been tapped through a network of tunnels and penstock for power generation. Power stations in lower reaches have high turbine capacities to generate power from a huge head of water from the hills. All this power generated feeds in to the main grid.

- There has been no local encouragement of utilizing small hydels for power generation at a village level - though there are several locations where these are possible.

Case Study XIII : Water tanker business in Ooty

Suresh is an owner of a well in Koddapamund in Ooty and does a brisk business of water mainly in the months of April, May & June. He has a diesel pump set to pump the water from his well into the tanker. He has invested in 2 water lorries. Each tanker has a capacity of 7000 litres and is sold at Rs. 275 per tanker. In the season, this goes up to Rs. 500 per tanker. For every tanker of water, he uses ½ litre of diesel (approx. Rs. 8). In the season, he supples 20 tankers per day or 1,40,000 liters per in Ooty to hotels mainly. This water is mainly for domestic purposes. Suresh knows of 3 other competitors in the water business. In one day, during the season he can make Rs. 10,000. He employs 6 persons to manage the operation - pumping, delivery, transport, etc.

Chapter IV
Field Implementation to Protect Drinking Water Sources in Tribal Settlements

4.1 Village Semmanarai

It is a fairly large tribal village in Kotagiri taluk. There are 107 Irula and 8 Kurumba families living scattered in the valley. The village is located on a slope through which no perennial steam flows. There are few folds/ gullys and a thin marsh on the slopes where few dug wells are made by the villagers to collect drinking water. These water holes' have supplies during rainy seasons but many will dry out during summer. Because of either no proper protection or construction, the waters get polluted by falling materials from the ground surface.

Source No 1 : Konja bavi

It is a spring located in Raju's land, which serves as domestic water supply for seven families. The field study result indicates presence of coli form in the water. To prevent it, source protection was necessary. Hence this sources was cleaned first and built with cut stone as a circular well. A protection wall was raised with cement mortar, two feet from the ground level. A HDPE hose line was fixed to drain water from the well so that pollution through the vessel or even by drawing is also avoided.

Status	Participation	Implementation
Open dug well without construction and protection above the ground-level	Three families provided 50% of the manual labour	This source was deepened for 1.5 meters and cleaned first and then built with cut stone. A protection wall was made to prevent runoff into it. A HDP hose line is fixed to drain water from the well.

Source No 2 : Nellimodakku

This is a tank for which the water is tapped from a stream located on revenue parambokku about 600 meters away from the village. A 300-meter HDP hose was provided as project assistance while for the remaining distance, old pipes from the village itself, were used. This tank was unused till date. A tap and three distributing lines have been provided. Also drains have been put around the tank to avoid unnecessary collection of water.

Status	Implementation
It is an incomplete ground level tank built by panchayat.	i. A 300-meter HDP hose line was provided ii. The ground around the tank was cleared, so the pollution around the area was prevented. iii. A tap and distribution fittings were provided for nearby users and settlements at lower level.

Source No 3 : Nadur

It is located in a swamp. Labour support was provided to deepen it and the construction with stones.

Status	Participation
It was a flow of a swamp, it blocks often, and displaced by animals	Five men of five families provided two days manual labour

Source No 4 : Nadur tank

Repairing and provided with fittings to the water system. So the distribution was good and the

wastage was reduced.

4.2 Village Vagapanai

There are 43 Irula families and 3 Kurumba families in this settlement. The houses are located in two clusters. Both the clusters have separate water sources. There is another spring which flows through during the rainy season and is mainly used for cattle and washing. Project assistance was provided for the two main drinking sources only.

Source no:1

It is a dug well about 15 feet deep and 8 feet in diameter, built with stones and a protection wall around it. Few years back, during summer, when the water table was low, a herd of elephants came into the village knocked down the protection wall and damaged the well heavily. Since then the water become non potable. The well was cleaned and repaired.

Status	**Participation**
It is a dug well, damaged badly by elephants some years ago and polluted	The villagers provided 50% labour

Source no:2

It is a spring, located in the middle of coffee plants. It serves the lower settlement. With no protection around, it used to silt during rainy season and got polluted with grazing cattle and their droppings.

Status	**Participation**	**Implementation**
It is dug well in a gully in a coffee land without construction and protection	20% labour was provided by the villages for the complete construction 80% labour was support to shift construction materials from Kotada estate	i. The source was deepened for three meters and widened ii. A protection wall was raised by 15 feet long * 15 feet wide and 3 feet high around the source. iii. A retaining wall was built to protect the lower side iv. An out let pipe was fixed

4.3 Vellaricombai

It is a Kurumba settlement located on the Kallar slopes. There are 14 families who live here and are mainly dependent on two water sources. The first and traditional source is a protected spring which was damaged by elephants some years ago. The second is a tapping of a stream on top of the mountain ridge about 1800 meters away from the village.

Project assistance: The project assisted to clean up the damaged source.

4.4 Village Bangalapadugai

It is an Irula tribal village located in a valley. There is a panchayat water system installed in a spring which used to dry up during summer. The village has a traditional drinking water source next to a temple from where it is carried in vessels. A perennial stream flow adjacent to the village was selected to tap water for domestic and excess flow could be used for agriculture purposes. Since the stream is at a higher elevation, water was brought down through gravity flow and a storage system made.

Status	**Participation**	**Implementation**
Present tapping of water dries during summer. The temple well is at a lower elevation which needed mechanical energy to pump up to the ground level reservoir.	i.50% labour provided by the villagers for digging an earthen tank ii. 40 man days labour was provided by villagers to lay the hose line.	i. A 900meters HDPE hose line and fittings ii. a 7ft long X 6 ft wide X 6 ft deep earth tank was dug iii. The tank was lined with an agrifilm-polythene sheet iv. A thatched roof was provided v. A chain link fence was provided to protect the tank. vi. A 300 meter hose line was provided for village supply. vii A 400 meter 1inch hose line was provided for irrigation with excess water

Chapter V
Stakeholders' Water Workshop: The Process & Issues

5.1 Planning For The Workshop - April 24th, 2002

5.1.1 Objectives

- To identify key hill water issues, problems and explore the way forward for a sustainable management strategy.
- To disseminate information and awareness on water resources to stake holders from the project findings.
- To facilitate a dialogue amongst diverse stake-holders for a practical policy statement on the Conservation, Management & Development of Nilgiris Water Resources for the future.

5.1.2 The Focus

The above objectives would be realized through this workshop to discuss the hill water issues and the findings from the Nilgiris Water Project in particular. There were approximately 50 participants from the Government, Civil Society (Citizens & NGOs), Plantation, Farmer and Tribal communities and water experts from the district, Bangalore, Hyderabad and New Delhi. The participants were selected to represent the 4 basins - Bhavani, Chaliyar, Moyar & Kabini - each one bringing an important insight and experience from their perspective.

The Programme

0900 - 0930 hrs : Inauguration of the Water Workshop

0930 - 1030 hrs : Presentation of the Project Findings

1030 - 1300 hrs : 5 Groups of approx. 10 persons each; list of 5 major themes discussed within the groups, which emerged from the project findings; each group had a facilitator

1300 - 1400 hrs : Lunch Break

1400 - 1600 hrs : Presentation by each group of their findings

1600 - 1700 hrs : Preparation for the Nilgiris Declaration on Hill Water Resources - Management & Perspectives for the Future.

1730 hrs : Vote of Thanks

The discussions were held both in English & Tamil.

5.2 List of Participants

District Administration

1. Mrs. Supriya Sahu, IAS, Collector of the Nilgiris
2. Dr. Alok K Sikka, Incharge, Central Soil & Water Conservation Research Training Institute, Fernhill, Udhagamandalam.
3. Mr. S. Sundaramahalingam, SE - TNEB, Aavin's Complex, Coonoor
4. Mr. R. Durai, Executive Engineer - TWAD, Udhagamandalam
5. Mr. R Rajendran, Assistant Executive Engineer - TWAD, Udhagamandalam
6. Mr. Thangaraj, ADE, Town - TNEB, Udhagamandalam
7. Mr. M. Palaniswamy, Public Relations Officer, Collectorate, Udhagamandalam
8. Mr. C.G Dharanipathy, Ranger, Singara Range, Masinagudi
9. Mr. A. Sivanu, Commissioner, Udhagamandalam Municipality
10. G. Rajanayagam, Commissioner, Coonoor Municipality
11. The Executive Officer, Kotagiri Town Panchayat
12. Mr. Senthil Velan, Water Resources Organization, PWD, Bhavanisagar
13. Mr. N. Subramani, Assistant Executive Engineer, TWAD, Udhagamandalam
14. Mr. Chandran, Panchayat Office, Kotagiri

Citizens/NGOs

15. Mr. B.J Krishnan, Save Nilgiris Campaign, Hospital Road, Udhagamandalam
16. Rev. P.K Mulley, Save Nilgiris Campaign, St. John's Church, Coonoor
17. Dr. Tarun Chabbra, Dental Clinic, Hospital Road, Udhagamandalam
18. Mr. Rajkumar, Project Officer, MYRADA, Mount Pleasant, Coonoor
19. Mr. Sankaran, UPASI - KVK Coonoor
20. Mr. C. R Krishnan, Tamil Nadu Fisheries (Retd.), Padanthurai, Gudalur
21. Mr. Soundarajan, Nilgiris Environment & Wildlife Association, Udhagamandalam
22. Mr. Alphonse, Managing Trustee, Island Trust, Kotagiri
23. Mr. Krishna, ACCORD, Gudalur
24. Ms. Anu, ACCORD, Gudalur
25. Ms. Mari, ACCORD, Gudalur
26. Mr. L. Bheeman, Chief Engineer, TNEB (Retd.)
27. Mr. Michel Danino, LongWood Shola, Kotagiri
28. Mr. Alwas, NAWA, Kotagiri
29. Dr. Mani, Ooty Hospital

Tea Plantation Companies

30. Mr. Hegde, UNITEA, Chamraj
31. Mr. Jebakumar, M B & Co. Coonoor

Farmers & Tribals

32. Mr. Sashikumar, Farmer at Kookalthorai
33. Mr. B. T Mahalingam, Farmer, Nanjanad
34. Mr. Sivaraj, Bangalapadugai, Irula, Moyar Basin
35. Mr. Raman, Barliyar, Kurumba, Moyar Basin
36. Mr. Nanjappan, Nedugalkombei
37. Mr. Suresh, Adivasi Munnettra Sangam
    (Adivasi Representative from Chaliyar basin)

Experts & Consultants

38. Dr. K. Jagdish, Ashoka Trust for Res. Env & Ecology, Bangalore

39. Mr. Somnath Sen Taru Leading Edge, New Delhi
40. Mr. G.K Bhat, Taru Leading Edge, Hyderabad

Reporters
41. Mr. D. Radhakrishnan, The Hindu, Udhagamandalam
42. Mr. Haldorai. Indian Expresss, Udhagamandalam
43. Dinamalar Reporter
44. Dinakaran
45. Mr. D. Thiagarajan, Times of India, Udhagamandalam
46. R.A Dass, Sun TV

Donor Agency
47. Mr. Sunandan Tiwari, Program Officer, Winrock International India, New Delhi

Keystone Foundation
48. Mathew John, Keystone
49. Snehlata Nath, Keystone
50. Robert Leo, Keystone
51. Senthil Prasad, Keystone
52. Pratim Roy, Keystone
53. Anita Varghese, Keystone

5.3 Thematic Groups

GROUP 1
Theme : WATER CONSERVATION - MEASURES & STRATEGIES
- ¬ Importance of source of water - Shola, swamps, springs, stream, etc.,

Group Members:
1. Dr. Alok Sikka, In-charge - Central Soil & Water Conservation Training Research Institute
2. Mr. B.J Krishnan, Save Nilgiris Campaign
3. Dr. Tarun Chabbra
4. Ms. Mari, ACCORD
5. Mr. Michel Danino, Long Wood Shola, Kotagiri
6. Mr. Jebakumar, Coonoor
7. Mr. Suresh, Adivasi Munnettra Sangam (Representing Chaliyar basin)
8. Mr. Dharanipathy, Range Officer, Nilgiris North Division

Facilitator : Dr. K. Jagdish, Ashoka Trust for Research in Ecology & Environment
Anita Verghese & Senthil Prasad (Keystone)

GROUP 2
Theme : WATER DISTRIBUTION & MANAGEMENT
- ¬ Access
- ¬ Control
- ¬ Equity
- ¬ Service & Supply

Group Members
1. Mr. S. Sundaramahalingam, SE, TNEB
2. Mr. R Rajendran, Assistant Executive Officer, TWAD

3. Thiru Senthil Velan, AE, PWD, WRO
4. Mr. Sivan, Commissioner, UMC
5. Mr. Alphonse. Managing Trustee, Island Trust
6. L. Bheeman, Chief Engineer, TNEB (retd.), Coonoor
7. Mr. Raman, Barliyar, Coonoor (Kurumba from Moyar Basin)
8. Mr. Subramani, Assistant Executive Engineer, Water Resources Organization, PWD
9. Irula, Bhavani Basin
10. Krishna, ACCORD (Translation)
11. Mr. Mani, Ooty Hospital

Facilitator : Snehlata Nath, Keystone Foundation
Somnath Sen, Taru Leading Edge

GROUP 3

Theme : COMMUNITY BASED WATER MANAGEMENT SYSTEMS

- ¬ Need
- ¬ Issues
- ¬ Possibility of Revival
- ¬ Innovative Mechanisms & new arrangements

Group Members

1. Mr. R. Durai, TWAD
2. Mr. Alwas, NAWA
3. Ms. Anu, ACCORD
4. Executive Officer, Kotagiri Town Panchayat + 1
5. Rev. P.K Mulley, Save Nilgiris Campaign (Translation)
6. Mr. Sankaran, UPASI-KVK
7. Mr. C. R Krishnan, Padanthorai
8. Farmer from Nanjanad

Facilitator : Sunandan Tiwari, Program Officer, Winrock International India, New Delhi
Mathew John, Keystone

GROUP 4

Theme : WATER QUALITY & SUSTAINABILITY IN THE NILGIRIS

- ¬ Pollution
- ¬ Carrying Capacity
- ¬ Future Scenario

Group Members

1. Mr. Thangaraj, ADE, EE, TNEB
2. Mr. Rajanayagam, Commissioner, CMC
3. Mr. Rajkumar, Project Officer, MYRADA
4. Mr. Soundarajan, Nilgiris Environment & Wildlife Association
5. Farmer from Kookalthorai
6. Irula from Bhavani Basin
7. Irula from Moyar Basin

Facilitator : G.K Bhat, Taru Leading Edge, New Delhi
Pratim Roy and Robert Leo, Keystone

Chief Facilitator : Somnath Sen, Taru Leading Edge, New Delhi

Meeting Documentation & Logistics : SN, MJ & SP

5.4 Outputs From the Group Discussions

5.4.1 Group 1

Upstream catchment location of Nilgiris

- Seen as an energy and water source for other regions/downstream/plains
- Upper catchments with fewer settlements
- Regulatory / advisory body for Nilgiris
- Articulate Nilgiris role in State's energy & water supply for the rest of the state - create awareness
- Sensitization of MPs & MLAs regarding Nilgiris
- Comprehensive land-use policy (as a water catchment conservation of the entire Nilgiris region)
- Shola regeneration areas to be protected - firewood depots
- Plantations vs. Sholas - harvest plantations to reduce pressure on Sholas
- Water management in rainy season
- No cultivation in dry seasons
- Other sources for dry season
- Consider Shola-grassland ecosystem together
- Land-use zoning authority to be functional

Multiple Sources with unique features

- Swamps, springs, wells & streams
- Exotic plantations on upland grasslands - no planting
- Old working plans need to be shelved on new knowledge
- Encourage shola regeneration in old eucalyptus plantations
- Extension of Mukurti National Park to plantation areas
- Best swamps gone under reservoir - protection of swamp urgent
- Springs - no study done so far, need to know recharge mechanism

Conservation measures for other water sources
(streams, swamps, wells)

- Encroachments in riparian zones
- Simple presentations to younger generation of communities & tribals
- Vernacular press for dissemination & awareness
- Grass fire regime - need to spread information on their importance
- Existing rules are adequate - implementation is poor

Policy & operational incentives for sustainable management

- Local institutions
- Water catchment areas need extra protection
- Water conservation during water scarce years
- Land-cover/land-use manipulation to increase water yield (eg tree plantations)

- ¬ Pricing, incentives, regulations and policies to: promote prudent water management and sharing
- ¬ Incorporation of watershed concerns in forest working plans
- ¬ Issues of urban water use & sanitation
- ¬ Water " hot spots"
- ¬ Harvesting systems for house holds - subsidized
- ¬ Impact of mono culture - tea plantations - water quality & quantity
- ¬ Restriction on new water consumption points
- ¬ Tourism conflict with water conservation
- ¬ Encourage less water-consumptive appropriate land-use in different hydrological systems/rainfall regimes
- ¬ Licences for resorts to be seen in the context of water use and location

5.4.2 Group II

Commercial vs. Domestic

- ¬ First preference to domestic
- ¬ If conflict, during lean periods some regulatory order is necessary for commercial use
- ¬ Rights of Nilgiris farmers over the water for irrigation
- ¬ Need for improved storage measures for domestic & irrigation
- ¬ Conservation of water supplied for domestic
  - better management & distribution
  - Proper maintenance (no leakages / wastage)

Series of check dams in micro catchments subject to geological conditions

Equity

- ¬ People associations "water users" required to ensure equity
- ¬ Panchayats are to be effective for equitable distribution and in case of conflict the District Administration should intervene

Traditional vs Conventional

- ¬ The construction & maintenance of conventional systems to be handed over to local water users for better results
- ¬ Local bodies have capacity to deal with water systems

5.4.3 Group III

Demand - Supply Gap

- ¬ Construct maximum number of check dams / maintenance of existing check dams
- ¬ Preservation of swamp areas
- ¬ Minimizing waste
- ¬ Prevention of contamination of sources
- ¬ Waste water recycling
- ¬ Awareness generation
- ¬ Rain water harvesting : minimizing pressure on existing water supply systems

- Potential source for a number of uses : drinking and other domestic uses
- Cheap storage devices : ferro cement / poly lined tanks
- Equitable water usage : guideline s required
- Involving communities in planning specifically for identification of sources
- Coordination between implementing agencies. E.g : Forest Dept. TWAD, EB (amendments in legislation required)
- Sensitizing politicians
- Planning for expansion of settlements as well as for resettlement

Relevance of Traditional Systems

Why traditional systems are not applicable in today's context

- Physical systems have deteriorated
- Change in land use has made the traditional system defunct
- Growth in population - cannot cater to the numbers

Aspects of traditional systems which can be relevant

- Planting & protection of area around with native species
- Revival of traditional village communities for managing the water systems
- Redefining the boundaries of responsibility
- Management between people, elected bodies and Government - the interface of a trial basis
- Documentation & study of traditional water management systems

Planning Regulation & Division of Roles & Responsibilities

- Water planning at local levels
- Participation in decision making
- Contribution from stakeholders
- Water institutions - at the town & village level
- People designing the project and implementation by Government institutions
- Identify and protect water sources even under Private holdings
- Compensate and negotiate with private bodies for water source conservation
- Legislation for conversion of parts of large land holdings with water source into community water reserves

Drinking water shortage : How de we overcome?

- Improve water storage : possibility of de-silting of tanks
- Traditional systems to be revived
- Revival of defunct systems
- Protection of water sources/ prevention of encroachments
- Awareness on rain water harvesting
- Commercial activities causing pollution to drinking water should be stopped
- Improvement of distribution system should be made periodically
- Prevention of diversion of drinking water for other purposes

Appropriateness of Supplementary Measures - Rainwater Harvesting

- In hilly areas rain water harvesting is to be attempted with caution - keeping in mind the topography / situation of the land
- For agriculture purposes water harvesting structures should be encouraged

Do we need specialized management & regulatory institutions for Nilgiri waters?

- TWAD, TNPCB, FD, TNEB, PWD, Municipalities / Local Area PRIs, AED, Health Officer are Government Departments dealing with water resources and issues.
- There is a specialized coordination required amongst them
- Advisory & Awareness building institutions required
- Reduce dependence on external agencies
- Promote community-managed institutions for water management

5.4.4 Sustainability

Pollution Issues

- Controlling / eliminating encroachments in catchment areas
- In-situ treatment at village level and urban zones for water pollution
- Promotion of organic farming
- Proper disposal of solid wastes & segregation
- Identification of pollution zones from Industries
- Village level / user group water quality monitoring mechanism & periodic check
- Lesser usage of chemicals in to water bodies
- District administration should ensure the mechanism of water quality management to be implemented.

5.5 THE NILGIRIS DECLARATION ON HILL WATER RESOURCES MANAGEMENT

Recommendations of the Consultative Stakeholder Group Udhagamandalam, The Nilgiris, April 24, 2002

5.5.1 Background

1. Water resources in the hill district of the Nilgiris in Tamil Nadu, play a crucial role not only in ensuring access to water for drinking and other uses to the rural and urban communities in the district, but also serves as the upstream source to four river basins serving the states of Tamil Nadu, Karnataka and Kerala. The water resources of the district are used for power generation and account for more than a third of total hydro-power generated in Tamil Nadu. Natural forests (sholas) and products there from, tea and coffee plantations, agricultural activities, tourism, and trade and commerce constitute the economic edifice and provide livelihoods to residents of the district. The district is located over an elevation range of 1,000-2,636 m above sea level, comprising hilly peaks, plateau and lower plateau regions - most of the settlements are located in the latter two elevation ranges.

2. Nilgiris located in the north-western part of Tamil Nadu state and spread over an area of 2,549 sq

km, supports a population of 0.76 million (Census of India, 2001). About 41 percent of the population resides in the 900 rural habitations of the district, whereas the four urban centres of Udhagamandalam, Kotagiri, Coonoor and Gudalur, comprise the balance. The district is home to a number of indigenous and tribal communities including the Todas, Kotas, Irulas, Kurumbas, Mullu Kurumbas, Betta Kurumbas, Kasavas, Kattunaickens, Paniyas, Chettis and other tribes (a tribal population of about 30,000 persons). These tribal communities, apart from other communities who are residents of the Nilgiris, have settled in specific altitudes and are dependant upon livelihoods characteristic of these regional resources, apart from their own historical and cultural traditions, including those pertaining to management of water.

3. Recognizing the criticality of water to the district in a situation increasingly characterised by recurrent shortages and competition between uses, a Study of Nilgiris water resources was undertaken in the district over 2001-2002. The salient findings from this study was discussed by a consultative stakeholder group comprising administrators, researchers, practitioners, non-governmental organizations, representatives of district's regions, communities and occupations, and other stakeholders, on April 24, 2002, in Udhagamandalam.

5.5.2 Issues in Nilgiris Water Resources Management

This Consultative Group has taken special note of the following Study findings:

4. The Nilgiris is an upstream catchment district and the bulk of its water resources are dedicated to power generation for the state. The interests of the Nilgiris district vis a vis those of other districts and the state, will come in focus with increasing demands. Further, water policy and programs in the state are not fully suitable to this hilly terrain and alternate approaches are needed that are based on local experience and best practice in other hilly regions.

5. The district experiences six months of dry period, is witnessing changes in the days and pattern of rainfall, has aquifers with limited ability to hold water for long periods, and signs of water stress in particular rural and urban locations are incipient.

6. Access to water resources seems to be determined by the location of settlements. With growth of settlements, a mismatch has emerged between locations of settlements (both rural and urban), and ready availability of reliable water sources nearby.

7. The district depends on a variety of sources including springs (feeding about 30 percent of settlements), wells (28 percent), streams (24 percent), checkdams (6 percent), and others (rivers, tanks, borewells, etc.). Amongst user communities, there is a high dependence on and preference for water from springs, streams and wells. These water sources need to be studied and conserved in a systematic manner. Further, there are a number of inter-linkages between the former two categories and other resource regimes (grasslands, sholas, plantations, etc.) that need further understanding for improved water management.

8. Overall, water resources are said to be abundant in the district but about a third of the sources are seasonal, more than 80 percent rural settlements have less than 40 lpcd (litres per capita per day) of water available, and shortages are common in urban locations. These point to the urgency of studies and concerted action in the areas of water resources development, and judicious use and management of water resources and related resource regimes.

9. Traditional practices in water management have thrived in the district and provide an opportunity

to learn from, for design of management mechanisms for the present and the future. There is a need for revival of traditional water management systems that are fast becoming out of use.

10. Management of water resources and related resource regimes, is the business of many stakeholders in the district and therefore, consultative processes of planning, decision-making and implementation, are crucial for successful outcomes for the district.

5.5.3 Recommendations

The Consultative group has discussed the above and related issues in detail and now recommends:

Water Resources

The special role of Nilgiris in water & power generation must be highlighted in Tamil Nadu.
Sholas and grasslands must be protected as it has the greatest impact on water yields.
Swamps and grasslands planted with exotics over the last few decades, can still be recovered if these are supplemented with measures of managing land-cover to increase recharge and retention.
Further planting of exotics must not take place in the Nilgiris.
Supply of firewood to villagers on reasonable terms and with subsidies if required, must be vastly increased so as to relieve the pressure on Sholas. The proposal to allow people to use firewood for domestic use from existing exotic plantations, may also be considered.
An advisory body to coordinate the work of NGOs, Government departments , research institutions, and elected people's representatives, should be formed to formulate a comprehensive Land and Water Use and Management Policy. This group would act also as a pressure group for improved management of Nilgiris water resources.
Springs, streams, other water sources and related resource regimes need to be studied further to inform policy and operational management strategies for different stakeholders.

Water Distribution and Management

In keeping with the spirit of the National Water Policy, domestic water supply needs must have the first charge on water resources. Due recognition needs to be accorded to water for agriculture, plantations and other commercial purposes. However, wherever there is a situation of conflict between uses, domestic use needs to be given priority and other uses regulated appropriately.
At present, water resources of the Nilgiris are applied to production of power and thereafter made available for farmers in plains regions. Water requirement of the agriculturists of Nilgiris needs to be accorded importance and appropriate policy measures taken to ensure equitable rights over water resources across plains and hilly regions.
The development of water resources has come under increasing strain lately owing to demands for more water. This situation needs to be corrected by careful planning of storage for dedicated uses with due regard to environmental and social considerations.
Operations and maintenance of water conveyance and distribution systems, both in urban and rural areas, need to be undertaken efficiently. This should lead to loss reduction and benefits to domestic and other users.
Proper planning for wastewater treatment and disposal are also necessary to reduce pollution in water bodies as also to make best possible use of available water.
Formation of Water Users Groups (WUGs) and people's associations is necessary to ensure

equity in the distribution of water resources.

Panchayats and municipal bodies are the legitimate bodies to ensure equitable distribution of water resources and in case of conflict, the District Administration should intervene especially to protect the rights and interests of the poor and vulnerable groups in Nilgiris.

Concerted efforts need to be made to provide a larger role to local water users' groups and PRIs, in the design, construction and maintenance of water supply and sanitation systems. Appropriate capacities and resources will need to be devolved for the local bodies to undertake these functions efficiently. Many if not most of the water systems are simple and perhaps well within the capacity of local bodies and user groups to construct and manage. A beginning needs to be made with these simple systems.

Communities and Water Management Systems

There exists a gap between demand and supply of water in many locations. The measures and innovations that need further investigation and application, include:

- Preservation of swamp areas
- Minimizing of wastage and prevention of contamination of sources
- Recycling
- Awareness generation
- Potential of rain water harvesting to minimize pressure on existing water supply systems where appropriate
- Equitable water usage – guidelines required in the long term
- Involving communities in planning specifically for identification of sources
- Improving coordination between implementing bodies (e.g. FD, TWAD, EB, PRIs)
- Sensitising politicians
- Planning for expansion of settlements as well as for resettlement

The roles and responsibilities between state institutions and community institutions are an area for continuous review and improvements based on experience and learning from best practice elsewhere in hill systems. While further studies and consultations are required to experiment with changes in institutional mandates and division of roles, the following measures need to be considered in the short run:

- Water planning at local levels with
  - participation in decision making,
  - contributions from users
- Promoting institutions for water management in rural and urban areas
- Users having a major role in designing projects
- Identifying and protecting water sources even under private ownership
- Documentation and study of traditional water management systems to learn for the future

Sustainability Issues

In the Nilgiris, rainwater harvesting needs to be attempted but with due consideration to local conditions (rainfall, topography, social and environmental parameters). For agricultural purposes, water-harvesting structures could be encouraged.

There are several existing departments who are involved in water management (TWAD, TNFD, PWD, TNEB, TNPCB, PRIs, Health Dept.). There is a need for improved coordination amongst these agencies, in preference to creating another specialised institution, to ensure desirable outcomes in integrated water resources management in the Nilgiris.

There is a need for increased awareness amongst stakeholders within the district as well as at the level of the state.

In the long term, responsibilities to plan, design, operate and manage water systems must become the business of local communities and their representatives.

Continued dependence on external agencies will not be a sustainable solution and hand over of systems must be started gradually.

Pollution of water resources needs to be urgently controlled and reduced by:

Controlling and eliminating encroachments in catchment areas
Treating rural and urban effluents in a cost-effective manner and ensuring their recycling and safe disposal
Promoting organic farming
Identification of pollution zones from establishments and industries
Village level / user level water quality monitoring mechanism and awareness generation on a regular basis
Establishing a systematic water surveillance and quality monitoring system across the district

Immediate and recurrent drinking water shortages need to be tackled by:

Rejuvenating and improving water storage systems
Reviving traditional systems
Reviving defunct systems
Protection of water sources – preventing of encroachment

Other Issues

While the Consultative Group has not been able to discuss all issues pertaining to water management in the Nilgiris, it notes that further studies and consultations are required with regard to the following issues:

Financing and Tariff issues in water and environmental sanitation

Promotion of leadership in the area of water management

Capacity Building and Training for community and other institutions involved in and proposed for management of water

Other issues that this consultation may not have not able to discuss

Chapter VI
Emerging Scenario : The Way Forward

The one year study and implementation on the Nilgiris Water Resources projec39t has opened a window on this complex field of hill water systems, sharing, equity, upstream-downstream stakeholder perspectives . The way forward is two folds:

- **Action**: The study findings need to be implemented - conservation of spring water, developing water management groups, setting up low-cost water testing facilities in villages, purification of drinking water at source, availability and access of water for villagers. This action needs to be done by Keystone Foundation in select sampled villages - where the situation is critical.

- **Action-Research**: The study has pointed out grey areas which need urgent investigation to understand hill water systems. For example :
  - a study on spring ecology - where do they occur, what are the associated factors which are intrinsic to a spring habitat. If springs are the key to water availability - how can we manage them better.
  - Urban water situation has not been studied as yet, the conflict between urban - rural water availability.
  - The issue of sanitation, solid waste disposal has not been addressed - this is an area of focus for the enw project. How fresh water gets transformed into dirty water - what are the locational, engineering and social problems.
  - Innovative methods to revive old, defunct water systems - which were based on traditional management methods and have been neglected.

The Approach

From the enthusiasm generated at the Stakeholders Meeting in the Water Workshop - Keystone would want to involve as many stakeholders as possible in the new project for implementation, campaigns, awareness generation, advocacy work, policy on hill waters and information dissemination through their local area networks.

Keystone would be facilitating the project by involving appropriate agency, citizens's group for the implementation of the project. Institutes such as the Central Soil & Water Conservation Training Research Institute will be co-opted as partners in the new project for field studies and technical back-stopping.

Dream : The Vision of the future

Water in the Nilgiris is more than an economic good. It contributes to a rich ecology & wildlife, has significant cultural and social linkages. Today Nilgiris water are dwindling and are being polluted at an alarming rate. Safe drinking water should be made available to all - especially downstream villages - who are now dependent on upstream sources. Water harvesting to be developed in more innovative lines. Enterprise approach to water products & value addition - high altitude stream fishing, mineral water units, labs for testing water, small hydros / hydrams for tapping energy. A whole gamut of activities need to be started with water - so as to bring it back on the main stage. Today - the reaction of less water is knee-jerk - people are dependent on the Government to provide water, shortages are

common in summer, pollution is rampant. The challenge would be to ensure year round quality water and initiate sustainable land use and water uses which do not adversely change the quality of water. If this has to be achieved through peoples' groups, movements and practice - a whole new effort and coordination needs to be done. The Nilgiri Waters should be revived for the sustenance of living beings for a better quality of life.

Conclusions

Conservation of Springs

It can be concluded from this one year study that in the Nilgiris Water Resources context - the role of springs is very crucial. Springs and Sholas do not necessarily have a symbiotic relationship. In other words, the occurrence of a spring does not mean it flows out of a Shola, or otherwise - the shola always does not support a spring. Sholas are good protectors of the entire biota, with swamps, grasslands - the springs remain protected. Even in tea areas - the project has identified several springs which are being tapped by a large population. There is an urgent need to understand Spring Habitat & Ecology and introduce practices to rejuvenate them.

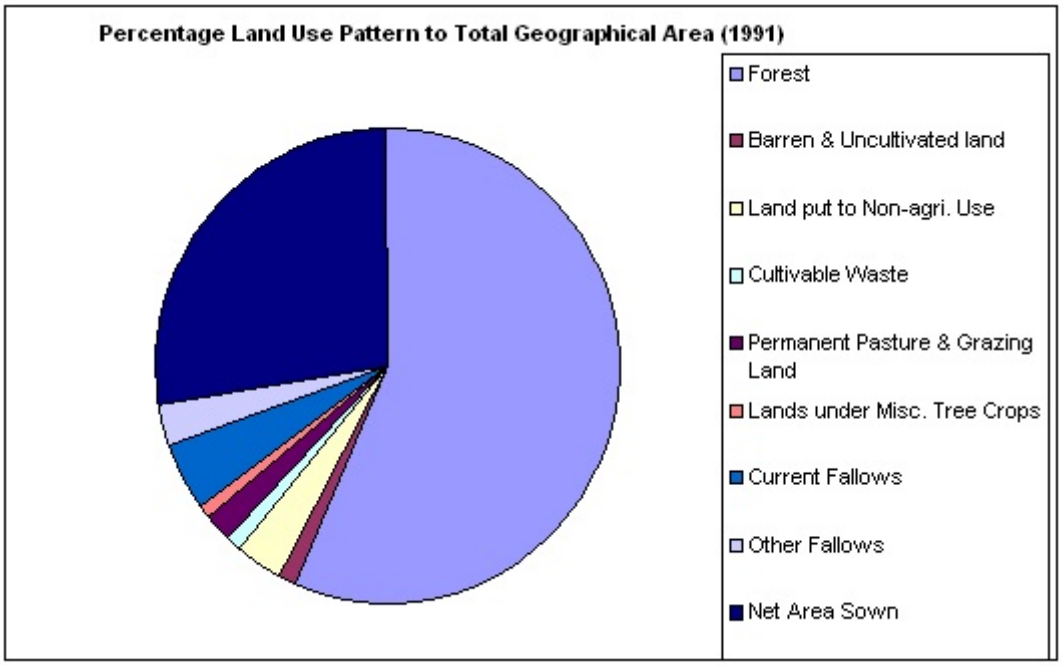
Community Based Water Management Systems

There is a break down of sharing systems within and between communities to a large extent. Water finding, water sharing is an individual activity. As the total domestic water sources are dwindling - there is an urgent need for developing community based water management systems. In earlier times, this has existed and worked very effectively, but now with most of the system being piped and the dependence high on TWAD - the community participation has reduced significantly.

Pollution

Drinking water quality is a serious issue. Coliform contamination due to human wastes is a common problem. This has resulted in water borne diseases. 80 drinking water samples were collected and tested for different parameters. 51 cases have reported coliform pollution. Most of the pesticide sprayed (for example - in the Ooty valley - for a single garlic crop - 19 sprays are applied) goes into water bodies and flows downstream - where they serve as drinking water sources for villages. *(Refer appendix for potability data)*

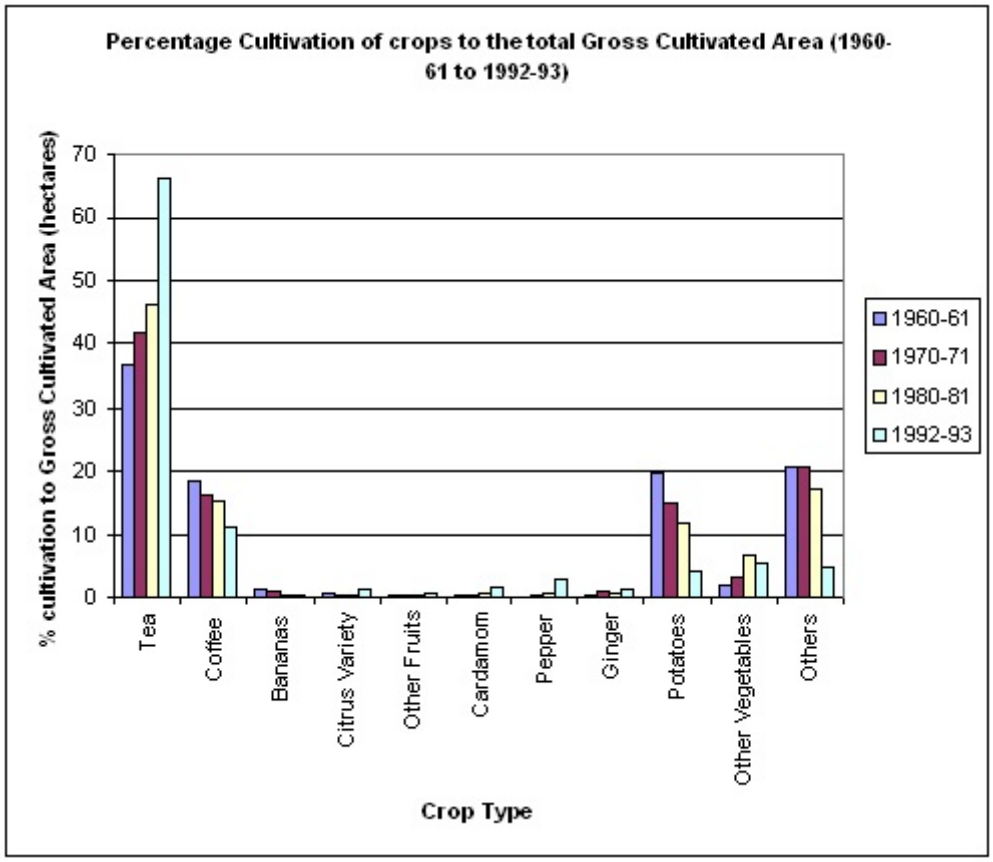
Annexure I: Land Use Pattern in the District (1991)



From the analysis of the land use pattern of the district (respect to geographical area) for the year 1991 (source HADP), the percentage to total area is as follows;

- Forest 56.4 %
- Barren & Uncultivated land 1.1 %
- Land put to Non-Agri. Use 3.4 %
- Cultivable Waste 1.1 %
- Permanent Pasture & Grazing Land 1.8 %
- Lands under Misc. Tree Crops 0.9 %
- Current Fallows 4.6 %
- Other Fallows 3.0 %
- Net Area Sown 27.7 %

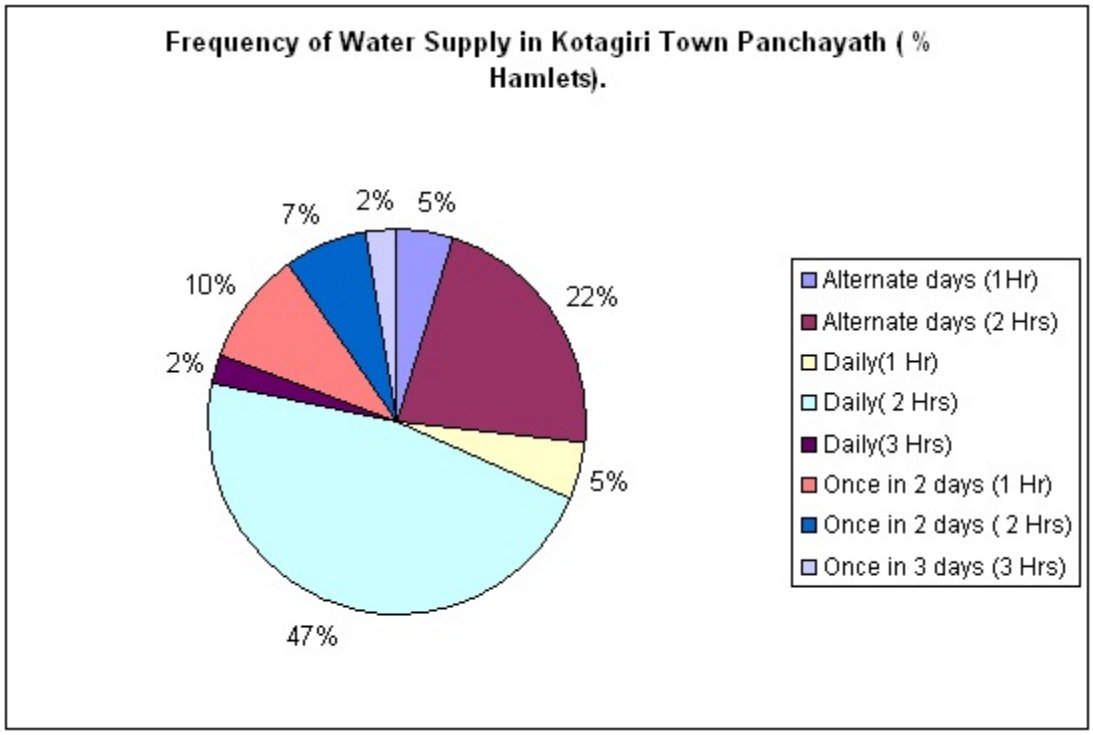
Annexure II : Percentage Cultivation of the Crop Types to Total Cultivated Area (1960-61 to 1992-93)



From the analysis of the percentage of cultivated area of different crop types to the total cultivated area it is observed that:

- Tea cultivation has increased from 37 % (1961-62) to 66 % (1992-93)
- Coffee cultivation has decreased from 18.4 % (1961-62) to 11.24 % (1992-93)
- Bananas decreased from 1.26 % (1961-62) to 0.4 % (1992-93)
- Citrus variety has increased from 0.7 % (1961-62) to 1.44 % (1992-93)
- Other fruits increased from 0.2 % to 0.6 %
- Cardamom increased from 0.2 % to 1.56 %
- Ginger increased from 0.14 % to 3 %
- Potatoes decreased from 19.5 % (1961-62) to 4 % (1992-93)
- Other vegetables increased from 1.9 % to 5.5 %
- Others decreased from 20 % (1961-62) to 4.66 % (1992-93)

Annexure III : Kotagiri Town Panchayat Water Supply Situation



Out of 41 hamlets coming under Kotagiri Town Panchayath, 47, 5 and 2 % hamlets gets daily 2, 1 and 3 hours supply respectively. 22 and 5 % hamlets gets 2 and 1 hours supply in alternate days. 10 and 7 % hamlets gets 1 and 2 hour supply once in 2 days. 2 % of the hamlets get water once in 3 days with 3 hours supply.