

INFLUENCE OF SOCIO-CULTURAL NORMS AND COMMUNITY PERCEPTIONS
ON THE SUSTAINABILITY OF RURAL WATER SUPPLY AND SANITATION:
A CASE STUDY IN TAMIL NADU, INDIA

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ABSTRACT

THE INFLUENCE OF SOCIO-CULTURAL NORMS AND COMMUNITY PERCEPTIONS ON THE SUSTAINABILITY OF RURAL WATER SUPPLY AND SANITATION: A CASE STUDY IN TAMIL NADU, INDIA

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The purpose was to examine the efficiency and sustainability of village water supply and environmental sanitation facilities and how they are influenced by socio-cultural norms and community perceptions. The methods were mainly qualitative with a participatory, community-based and gender-sensitive approach.

The research found that: government water supply and sanitation initiatives are supply-driven; socio-cultural norms and gendered perceptions influence community and household management of water supply and sanitation; and the village water supply and sanitation facilities are unsustainable.

The conclusions were that: there is a gap between policy and practice; limited resources have been invested in sanitation; consultation between governments and the community is limited; social inequalities increase the complexity of establishing sustainable water supply and sanitation; perceptions affect water supply and sanitation management; villagers rely on government to provide and maintain public facilities; and mismanagement of resources has led to water scarcity. Finally, recommendations for research, policy and action are offered.

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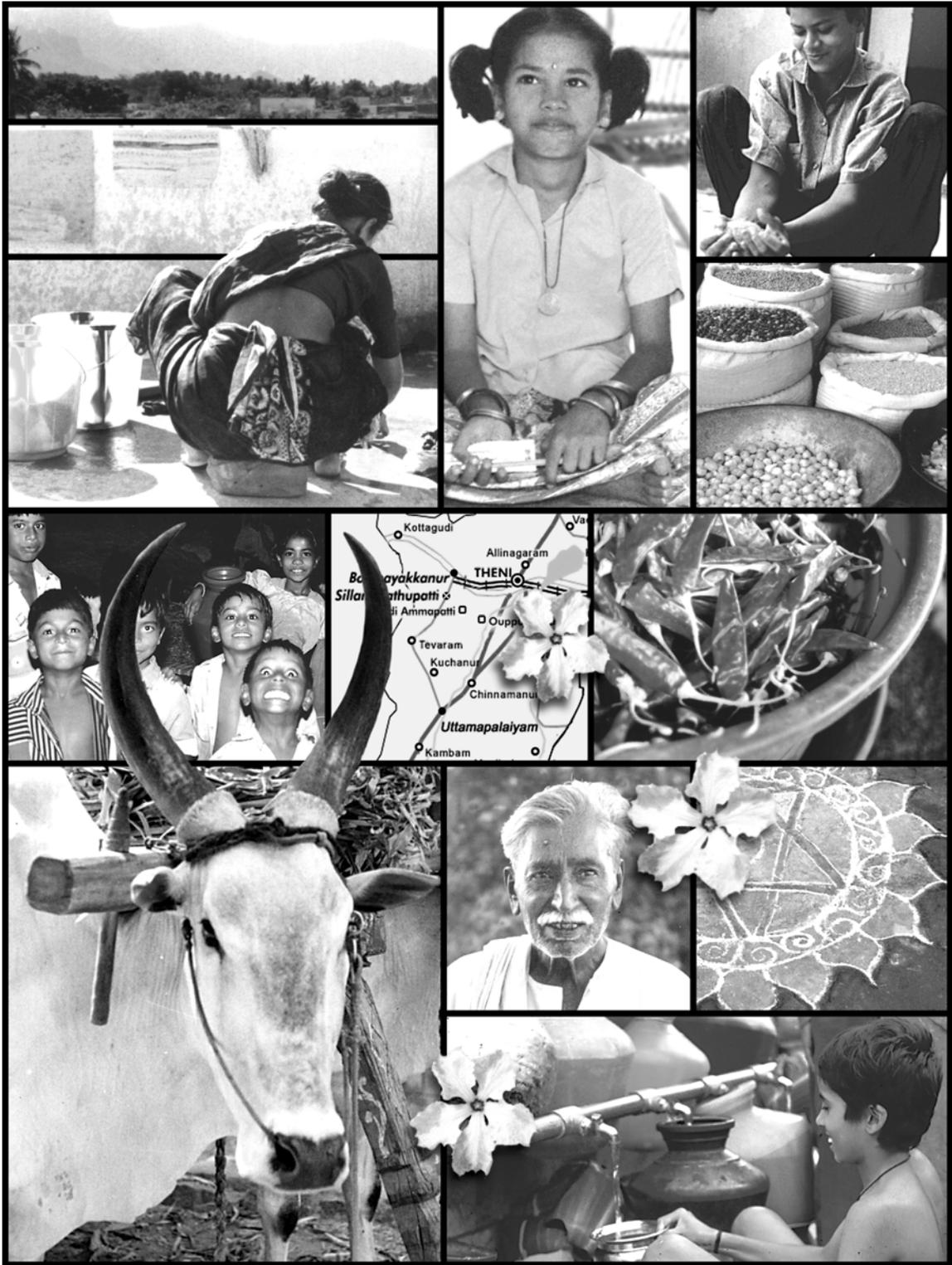
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DEDICATION



DEFINITIONS OF KEY RESEARCH TERMS

Sustainability:	The capacity to maintain efficient water supply and environmental sanitation services at the community level without detrimental effects on the community and the environment (adapted from Narayan, 1993).
Efficiency:	<p>The optimal, hygienic and consistent use and maintenance of water supply and environmental sanitation facilities to maximise benefits and minimise negative consequences over an extended period of time (adapted from DDWS, 2001b; GOTN, 2001b; Narayan, 1993; van Wijk-Sijbesma, 2001):</p> <p><u>Optimal use</u></p> <ul style="list-style-type: none">• Number and characteristic of users of water facilities: 1 handpump or stand post for every 250 persons• Quantity of water available: 40 litres per capita per day (lpcd) of safe public drinking water; and 55 lpcd for household access. <u>rural habitation coverage status:</u> not covered: no water supply; no safe source: water quality problems; partially covered: water supply < 40 lpcd; and fully covered: ≥ 40 lpcd.• Time taken to use the water facilities: source should exist within 1.6 km• Management of water resources: conservation and protection; and equitable distribution. <p><u>Hygienic use</u></p> <ul style="list-style-type: none">• Treatment practices and water quality, household and village• Water transport and storage practices• Environmental cleanliness: presence and state of waste disposal provisions (water, household solid waste, faeces). <p><u>Consistent Use and Maintenance</u></p> <ul style="list-style-type: none">• Patterns of daily and seasonal use• Reliability of water supply environmental sanitation facilities
Socio-cultural norms:	Relating to, or involving a combination of social and cultural factors (Merriam-Webster, 2002), which for the purpose of the research include gender, class and caste.
Participatory approach:	An approach that encourages people to share, assess and evaluate issues in terms of their knowledge and experience (adapted from Chambers, 1997 and Mukherjee, 1997b).
Gender-sensitive approach:	An approach sensitive to the roles, responsibilities, relations and perspectives of women and men (van Wijk-Sijbesma, 1995, 1998).
Community-based approach:	An approach tailored to the ability of the local community, the local socio-economic, environmental and cultural conditions; the needs of men, women and children; and to the availability of resources (Visscher <i>et al.</i> , 1999).

GLOSSARY OF COMMON TERMS

Administrative Divisions in India

- District:** The primary division of a state (28 in Tamil Nadu).
- Taluk:** The secondary division of a district, usually 1, 000 km² in area (206 in Tamil Nadu).
- Block:** A development division that is normally smaller than a taluk with two or three blocks comprising a taluk and an approximate population of 30, 000 people. A block of villages is the smallest administrative unit in a district. Block is synonymous to a Panchayat Union (385 in Tamil Nadu).
- Panchayat:** The smallest level of elected self-governance for an agglomeration of villages, usually 5, 000 hectares in area and with a population of 5, 000 (12, 619 village panchayats in Tamil Nadu).
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Source: Adapted from GOTN, 2001c and Dr. T. Vasantha Kumaran, personal communication, November 2002.

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Chapter One

Introduction to Water Supply and Sanitation Development Efforts

Chapter One provides an introduction to the efforts of the international community and the Government of India to improve water supply and sanitation coverage, outlines the current coverage status for India, Tamil Nadu and Theni District, specifically for rural areas, and introduces the research. The chapter begins with an introduction to the international efforts to improve water supply and sanitation through addressing: the International Drinking Water Supply and Sanitation Decade (IDWSSD); the international agenda, post-decade; and VISION 21, 'water for people'. The second section provides an overview of rural water supply and sanitation in India discussing the national agenda through ten Five-year Plans, 1951 to 2007, national water supply and sanitation coverage and water supply and sanitation coverage in Tamil Nadu and Theni District. The third section of the chapter includes: problem statement, purpose, objectives, significance of the research, limitations of the research process and the thesis structure.

International Water Supply and Sanitation Agenda

Water supply and sanitation have featured prominently on the international development agenda since the mid 1970s (for a summary see Appendix I; 99). In 1976 at the United Nations (UN) Conference on Human Settlement, Vancouver the UN called on its member states "...to adopt programmes with realistic standards for quality and quantity to provide water for urban and rural areas by 1990 if possible" and "...to adopt and accelerate programmes for the sanitary disposal of excreta and wastewater in urban and rural areas" (United Nations, 1976; 50). Further concern was expressed in the Action Plan resulting from the UN Water Conference held in Mar del Plata, Argentina, in 1977. The Plan called for the designation of the period of 1981 to 1990 as the IDWSSD. The premise of the IDWSSD was that all peoples, whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs (UNDSO, 2001; UNICEF, 1995a). In 1980, the UN General Assembly officially proclaimed the IDWSSD as a period to promote substantial improvement in the standards and levels of services in drinking water supply and sanitation, particularly in developing countries (United Nations General Assembly, 1980).

The Post-decade (1990 to 1999) Agenda

Post Decade was marked by the production of a wealth of knowledge on the lessons learned, changes required, the strategies to be adopted and the actions to be undertaken, mainly through the forum of international conferences (Ghosh, 1999; Neto & Tropp, 2000; van Damme, 1999). The New Delhi Global Consultation on Safe Water and Sanitation, held in New Delhi in 1990, led to the New Delhi Declaration, which stated "some for all rather than more for some" as the overarching goal of improved water supply and sanitation. The Declaration called for renewed political commitment combined with new communication and mobilisation efforts (WSSCC, n.d.). The Declaration recognises the roles of women as managers of domestic water collection and waste disposal and as educators of children. Women are also seen as pivotal for improving the efficiency and sustainability of projects (Cleaver & Jobes, 1996; van Wijk-Sijbesma, 1998). The International Conference on Water and the Environment held in Dublin in 1992 built on the recommendations from the New Delhi Declaration establishing the participatory approach and water as an economic good as the guiding principles for development. Empowerment and equality were the cornerstones of the approaches, demanding that democratic institutions respond as the initial points of contact between communities and governments. The new approaches required investments, awareness, legislative and institutional changes, technology development and capacity building, with specific focus on the pivotal role of women as providers and users of water (van Damme, 1999).

The UN Conference on Environment and Development, Agenda 21, held in Rio de Janeiro in 1992, established water and sanitation as critical elements in human and economic development (van Damme, 1999). The rationale for sustainable development and management of freshwater resources is articulated in Agenda 21, Chapter 18, with an emphasis on implementation through financing and cost evaluation, scientific and technological means, human resource development at all levels, including special programmes for women and capacity building (UNSD, 2001). However, Guijt (1993) indicates that Agenda 21 demonstrates a lack of understanding about gender as an analytical concept because gender-differentiated needs, uses and options regarding water management are neglected. Agenda 21 proposed national targets for reducing waterborne diseases and for

meeting urban and rural water and sanitation needs while protecting the freshwater needs of future generations as a guiding principle (van Damme, 1999).

A Ministerial Conference was held in Noordwijk, the Netherlands in 1994 to ensure follow-up of the freshwater recommendations set forth in Chapter 18. The Ministers reiterated their support for the guiding principles of the New Delhi Declaration by stressing that "governments do not solve problems, people do" and emphasising five actions (van Damme, 1999):

- involving stakeholders more strongly in partnerships for decision-making;
- integrating water resource management into planning for other key sectors;
- strengthening the institutions responsible for service provision;
- mobilising financial resources for the future; and
- improving the quality of international support for the sector.

These actions were reinforced at the International Conference on Water and Sustainable Development, held in Paris in 1998 (van Damme, 1999).

Agenda for the Twenty-first Century: VISION 21, 'Water for People'

VISION 21 is one of three components of the World Water Vision compiled by the World Water Council at the Second World Water Forum held at The Hague, March 2000. The Vision is for the management of the world's water resources in the 21st century, encompassing water, life and the environment by addressing issues of 'water for food', 'water for nature' and 'water for people' (WWC, 2000; WSSCC, 2000). The purpose of the World Water Vision is to generate global awareness of the water crisis that people face and of the possible solutions for addressing the crisis (WWC, 2000). The main vision of 'water for people' is, "A clean and healthy world: A world in which every person has safe and adequate water and sanitation and lives in a hygienic environment" by the year 2025 (WSSCC, 2000; 1). The conceptual framework of VISION 21 is based on the premise that people have the aspirations and energies to fulfil the human right of a clean and healthy world with access to hygienic conditions, sanitation and water for everyone. The household is recognised as the prime catalyst for changing the existing water supply and sanitation conditions, whereby change demanded and achieved at the household leads to extended cooperation and action

involving communities, local authorities, NGOs (non-governmental organisations), government and the international community (WSSCC, 2000).

Water Supply and Sanitation Agenda, Rural India

The National Agenda: Ten Five-year Plans, 1951 to 2007

State and Union Territory governments have the responsibility to provide safe drinking water and sanitation in rural India and the Government of India (GOI) supports these efforts financially. The first Government body to focus on the importance of providing a safe drinking water supply on a national scale was the Bhore Committee, established in 1944. The Madras State Government followed by appointing a committee in 1947 to examine and report on water supply and drainage for urban and rural areas. The Environmental Hygiene Committee (EHC), established in 1948, was the first group to undertake a national assessment of environmental hygiene. The EHC recommended a comprehensive plan to provide water supply and sanitation facilities to 90 percent of the population within forty years. However, the National Water Supply and Sanitation Committee, established in 1960, reported in 1961 that measures were not taken to implement the recommendations of the EHC. As part of the post-war reconstruction activities, some State Governments initiated Five-year Plans inclusive of provisions for urban and rural water supply and sanitation schemes. However, the State Governments were unable to pursue these initiatives because of limited funding and limited support from the GOI (Ghosh *et al.*, 1995).

In 1951 the GOI established their First Five-year Plan (1951 to 1956) including funding for safe drinking water and sanitation schemes to the State Governments (for a summary see Appendix II; 100). The First Plan placed emphasis on technological inputs for water supply and sanitation, whereby sanitation was equated with drainage facilities. The Plans began to follow the international development efforts in water supply and sanitation. For example, during the Fourth Five-year Plan the GOI initiated the Accelerated Rural Water Supply Programme (ARWSP). The ARWSP was established in 1972/73 to assist State and Union Territory governments in accelerating drinking water supply coverage and to cover all rural habitations in the country (DDWS, 2001b; Ghosh *et al.*, 1995). The objectives of the ARWSP are:

1. to ensure coverage of all rural habitations especially to reach the un-reached with access to safe drinking water;
2. to ensure sustainability of the systems and sources; and
3. to tackle the problem of water quality in affected habitations and to preserve quality of water by institutionalising water quality monitoring and surveillance through a Catchment Area Approach (DDWS, 2001a)

The Sixth Five-year Plan (1980 to 1985) was launched with an increased focus on the importance of safe drinking water supplies in sustaining the process of economic and human resource development and improving the quality of the environment. In full support of the IDWSSD the Indian Ministry of Works and Housing developed the 'National Master Plan of India' in July 1983. The Plan highlighted the position of the water supply sector and decade coverage programme policies in terms of physical and financial targets, emphasising the need for reforms in the process of planning, implementation, monitoring, operation and maintenance of water supply and sanitation projects (Ghosh *et al.*, 1995). In 1986, as part of the Seventh Five-year Plan, the GOI launched the Central Rural Sanitation Programme (CRSP) to complement the efforts of the State Governments (DDWS, 2001b). The objectives of the CRSP were to improve the quality of life of the rural people and to provide privacy and dignity to women (DDWS, 2002). The concept of sanitation was limited to technology-based interventions such as disposal of human excreta by cesspools, open ditches, pit latrines and the bucket system. The National Drinking Water Mission, renamed the Rajiv Gandhi National Drinking Water Mission in 1991, was launched with focus on technology for improved drinking water and related water management (DDWS, 2001b). Previous rural water supply and sanitation schemes were undertaken as components of community development programmes.

To conform to the strategy outlined in the Ninth Five-year Plan (1997 to 2001), the CRSP was restructured into a demand-driven and people-centred approach (Total Sanitation Campaign or TSC), with emphasis on information, education and communication activities to increase awareness, specifically for women (Ghosh *et al.*, 1995, Planning Commission, n.d.). The TSC views sanitation as a comprehensive concept, which includes liquid and solid waste disposal and food, personal, domestic and environmental hygiene. The CRSP is based on six objectives (DDWS, 2002):

- bringing about an improvement in the general quality of life in the rural areas;

- accelerating sanitation coverage in rural areas;
- generating a sense of need through awareness creation and health education;
- covering schools in rural areas with sanitation facilities;
- encouraging suitable cost effective and appropriate technologies; and
- bringing about a reduction in the incidence of water and sanitation related diseases

In 1999, the Department of Drinking Water Supply was created under the auspices of the Ministry of Rural Development to further the 'National Agenda for Governance' goal of providing safe drinking water to all habitations by March 2004. To achieve these goals, the Tenth Five-year Plan (2002 to 2007) places further emphasis on human development through capacity building of local communities and operation and maintenance training, specifically for women (DDWS, 2001b).

Water Supply and Sanitation Coverage

Regional Coverage

An assessment of the water supply and sanitation coverage indicates that there is a large gap between policy and practice, although water supply and sanitation have been featured prominently on the international and Indian agenda. UNICEF (2002b) and WHO and UNICEF (2000) report a three percent increase in universal access to safe drinking water and a five percent increase in universal access to sanitary means of excreta disposal between 1990 and 2000. Seventy-one percent of the global rural population has improved water supply and 38 percent has improved sanitation (Table 1). Asia accounts for the vast majority of the global population without access to improved water supply and sanitation services (WHO & UNICEF, 2000) whereby the combined population of India and China account for approximately 40 percent of the total world population (UNDP, 2002). Data compiled by WHO and UNICEF (2000) indicate that rural Asia has the lowest sanitation coverage (31 percent) and the third highest water supply coverage (75 percent) compared to other regions of the world. Additionally, there is a large discrepancy between Asian rural and urban areas in terms of sanitation coverage (31 percent and 78 percent) and water supply coverage (75 percent and 93 percent).

Table 1: Water Supply and Sanitation Coverage by Region, 2000

Region	% Population Served					
	Water Supply			Sanitation		
	Rural	Urban	Total	Rural	Urban	Total
Global	71	94	82	38	86	60
Africa	47	85	62	45	84	60
Asia	75	93	81	31	78	48
Latin America & Caribbean	62	93	85	49	87	78
Oceania	63	98	88	81	99	93
Europe	87	100	96	74	99	92
North America	100	100	100	100	100	100

Source: WHO & UNICEF, 2000; 8.

Data may not sum to 100 because of rounding; only a proportion of the population is represented for each region: Global, 89%; Africa, 96%, Asia, 94%; Latin America and the Caribbean, 99%;Oceania, 85%; Europe, 44%; North America, 99.9%.

Coverage in Rural India

Efficiency and sustainability of drinking water supplies are strained despite efforts of the National, State and Union Territory Governments toward improving rural water supply through investments and improved technology (DDWS, 2001b; Planning Commission, 2001a). DDWS (2001b) states that access to safe drinking water in some rural areas has become increasingly more difficult because of increased water pollution from industrial activities, population growth and increasing agricultural requirements. Reddy (1999) argues that failure of government policy and institutions have led to severe water shortages rather than the commonly cited constraints of financial access and available supply. Nigam *et al.* (1998) conclude that the five main causes of the water crisis in India are:

- the system of 'water rights' under Common Law in India, which sees groundwater not as a common resource but as belonging to the landowner;
- uncontrolled use of bore well technology which has allowed groundwater to be extracted at a rate exceeding groundwater recharge;
- pollution of freshwater resources;
- inadequate efforts directed at water conservation, efficient water use, groundwater recharge and ecosystem sustainability; and
- the denial of community control of water resources.

Additionally, Mehta (2000) indicates that Indian water crises usually emerge because access to and control over water is unequal and differentiated in micro, meso and macro settings.

The total sanitation and water supply coverage in rural and urban India is 31 percent and 88 percent respectively. The greatest discrepancy between Indian rural and urban areas lies in sanitation coverage with 14 percent rural and 73 percent urban, whereas the water supply coverage in rural and urban areas is 86 percent and 92 percent respectively (WHO & UNICEF, 2000). In November 2001, an estimated 87 percent of Indian rural habitations were fully covered (40 litres per capita per day (lpcd)), 12 percent partially covered (< 40 lpcd). The remaining one percent, approximately 20,000 habitations, are not covered (DDWS, 2001b).

To compare usage, municipal households in Canada were recorded to use 343 lpcd in 1999 (Burke *et al.*, 2001). OECD (1999) data shows that Canadians use approximately twice the water per capita per day as other OECD countries. In 1996, Canadian households used 326 lpcd compared to 128, 130 and 149 lpcd in Germany, the Netherlands and the United Kingdom, respectively (OECD, 1999). The Planning Commission (2001b) of India cite independent reports that show drinking water scarcity in approximately half of Indian villages. Additionally, the DDWS (2001b) estimates that 15 percent of the rural habitations in India are affected with water quality problems from excess iron, fluoride, salinity, nitrate or arsenic (Table 2).

Table 2: Percent of Rural Habitations Affected with Drinking Water Quality Problems in India, 1999

Water Quality Problem	Habitations Affected
Excess Iron	64
Excess Fluoride	17
Excess Salinity	15
Excess Nitrate	2
Excess Arsenic	2
Other	1

Source: DDWS, 2001b.
Data do not sum to 100 because of rounding.

The access of rural Indian inhabitants to a minimum level of sanitation is very low and there has been little change in the sanitary conditions since the inception of the CRSP. Some of the issues that have prevented effective implementation of the Programme include:

- very low priority given by the State governments and the people to sanitation;

- low emphasis on information, education and communication;
- promotion of a single model of latrine;
- heavy reliance on subsidy and lack of motivation efforts;
- poor disposal of waste water from water points creating un-hygienic conditions;
- people's habits;
- unwillingness to pay for the cost of sewerage, scarcity of water; and
- lack of community participation and NGO/Private Sector involvement (DDWS, 2001b; Planning Commission, 2001b).

There are difficulties and limitations in making a realistic assessment of sanitation facilities available in rural areas. However, sanitation coverage, in terms of individual household latrines, at the beginning of the Ninth Five-year Plan (1997) was estimated to be 16 to 20 percent of total rural households. An estimated 20 percent of rural households will have sanitary facilities through the CRSP by the end of 2002. The National Sample Survey (July 1999) indicates that 17 percent of the rural population were using a latrine (DDWS, 2001b).

Water Supply and Sanitation in Tamil Nadu

The average annual rainfall for Tamil Nadu is 1005 mm. Groundwater is the major source of water for most of the government drinking water supply schemes in Tamil Nadu. Approximately 90 percent of the rural population and 70 percent of the urban population rely on groundwater for their drinking water supply. The water table has been rapidly declining in Tamil Nadu because of the continuous monsoon failure, overexploitation and deforestation. Additionally, rainfall is the only source of recharge for groundwater. Direct rainfall accounts for 10 to 25 percent of the total recharge. The balance is augmented through a network of traditional rainwater catchments (*e.g.*, tanks, *ooranis*, *eris* and *kanmais*). The declining water table indicates that many traditional catchments have been degraded and their holding capacities reduced through siltation, encroachment and conversion of structures for other uses (GOTN, 2001b). Agarwal and Narain (1999) indicate that two major changes are responsible for the decline of the traditional systems in India:

1. the State has become the major provider of water replacing communities and households as the primary units for provision and management of water; and
2. there has been growing reliance on the use of surface and groundwater, while earlier reliance on rainwater and floodwater has declined, even though rainwater and floodwater are available in much greater abundance than river water or groundwater.

Additionally, Niemczynowicz *et al.* (1998) suggest that the use of inappropriate technology, which neglects socio-economic conditions, and inadequate maintenance of technology resulted in an economic burden, overexploitation and pollution of limited groundwater.

Forty-six percent of the community development blocks have been identified to have significant groundwater depletion: 13 percent of the blocks are classified as overexploited (groundwater extraction has exceeded the recharge), 9 percent of the blocks are classified as dark areas (groundwater extraction is more than 85 percent of the estimated recharge) and 22 percent of the blocks are classified as grey areas (exploitation is 65 to 85 percent of the estimated recharge) (GOTN, 2001b; Office of the Registrar General, 1991).

Data compiled for the 1991 census for India and Tamil Nadu (Table 3) indicate that rural households also have less access to electricity, safe drinking water and toilet facilities than urban households. Safe drinking water is available for 64 percent of rural households in Tamil Nadu and for 55 percent for India. In Tamil Nadu, 7 percent of rural households have toilet facilities and 5 percent have both safe drinking water and toilet facilities. For India 9 percent of rural households have toilet facilities and 7 percent have both safe drinking water and toilet facilities (Office of the Registrar General, 1991).

Table 3: Availability of Electricity, Safe Drinking Water and Toilet Facilities in Households of Rural and Urban Areas in India and Tamil Nadu, 1991

Facility	Households (%)					
	Total	India		Total	Tamil Nadu	
		Rural	Urban		Rural	Urban
Electricity	42	31	76	55	45	77
Safe Drinking Water	62	55	81	67	64	74
Toilet	24	9	64	23	7	57
Electricity and Safe Drinking Water	30	19	64	38	29	57
Safe Drinking Water and Toilet	18	6	54	17	5	42
Electricity and Toilet	20	7	59	22	6	55
All Three Facilities	16	4	51	16	4	41
None of the Three Facilities	25	31	5	15	20	5

Source: Office of the Registrar General, 1991.

Data for India exclude figures for Jammu and Kashmir where the 1991 census could not be conducted because of instability.

Water Supply and Sanitation in Theni District

Theni District has the ninth highest average rainfall (1068 mm) district wise with a water table depth in between five and 12 m (TWAD, 2002). The eight blocks in Theni District are categorised as follows (TWAD, 2001a):

- overexploited and dark blocks: Theni and Chinnamanur;
- grey blocks: Bodinayakanur, Uthumapalayam, Andipatty and Cumbum; and
- white blocks (exploitation is less than 65 percent of the estimated recharge): Periyakulam and Kadamalaikundu.

Water supply coverage for Theni District is lower than the coverage for both India and Tamil Nadu (Table 4). Theni ranks tenth lowest in the state and is below state average for rural water supply coverage with 60 percent of the habitations fully covered and 40 percent partially covered (10 percent with 1 to 10 lpcd and 90 percent with 11 to 39 lpcd) (TWAD, 2001a). Appendix III, p. 99 contains the average rainfall and water supply coverage for the districts of Tamil Nadu.

Table 4: Water Supply Coverage for Rural Habitations in India, Tamil Nadu and Theni District, 2001

Type of Coverage	Rural Habitations Covered (%)		
	India	Tamil Nadu	Theni District
Fully covered	87	93	60
Partially covered	12	6	40
No safe source	n/a	1	n/a
Not covered	1	0.0	0.0

Source: Compiled from DDWS, 2001b; TWAD, 2001a, 2001b.

Foundations of this Research

Research Statement

A collaborative project on Community Action Plans (CAPs) for restoring the environment in the Thevaram Basin, Theni District, March 1999 to February 2000, ('Making Deserts Bloom') (Kumaran *et al.* 1999; Kumaran & Hyma, 2001) identified socio-cultural, economic and environmental constraints to community-based development and stressed the need for improved water supply and sanitation. One of the major constraints to building the CAPs is the lack of unity among the people of the villages because of fragmentations of caste, class, gender and land ownership. However, women and men in the villages did reach

consensus regarding the need for immediate attention on health and sanitation, including the provision of latrines with water facilities specifically for women, drainage for household waste waters, disposal sites for domestic and village wastes and cleanliness of the village.

Natural resource- and socio-economic-based problems were assessed through Participatory Rural Appraisals (PRAs) with women and men identifying water quality and scarcity as one of the key natural resource-based problems and latrine and drainage facilities as key socio-economic problems (Kumaran *et al.*, 1999; Kumaran & Hyma, 2001). Tummon (2001) concluded that a gender-based approach to water supply and sanitation management is necessary to implement effective socio-economic and environmental initiatives. Human capacity building was also identified as a pivotal step toward effective and sustainable environmental and socio-economic community planning and action (Kumaran & Hyma, 2001). Prior to initiating community-based development related to improved water supply and sanitation there was a necessity to conduct further research on the efficiency and sustainability of the existing water supply and sanitation systems and how these factors are influenced by socio-cultural norms and community perceptions.

Research Purpose

The purpose of the research was to examine the efficiency and sustainability of the existing community water supply and environmental sanitation facilities and how they are influenced by socio-cultural norms and community perceptions in the village of Sillamarathupatti, Theni District, Tamil Nadu, India.

Research Objectives

The specific research objectives were:

1. To examine past and current village water supply- and environmental sanitation-based initiatives (schemes, projects or programmes).
2. To identify how socio-cultural norms influence village water supply and environmental sanitation activities.
3. To identify women's and men's perceptions about water supply and environmental sanitation and the relationship to community health.
4. To examine the efficiency and sustainability of existing village water supply and environmental sanitation.

Significance of the Research

The research provides continuity to the project 'Making Deserts Bloom' (Kumaran and Hyma, 2001) and follows-up on recommendations made by Tummon (2001). Evidence suggests that water supply and sanitation facilities need to be examined based on their efficiency and sustainability including how they are influenced by socio-cultural norms and the environment rather than numerical achievements such as the number of new facilities installed or the number of women involved in a project (Carter *et al.*, 1999; WHO & UNICEF, 2000; WSSCC, 2000). Hoque (2000) states that research should determine how community involvement, social, cultural, demographic, geographic and health factors interact with and/or complement water and sanitation facilities. Yacoob (1994) suggests that imposed 'solutions' are rarely effective, particularly in sanitation development. Thus it is necessary to acquire knowledge about existing community practices. Mehta (1997) argues that both macro- and micro-level water interventions overlook questions concerning social differences and thus schemes build on or reinforce already skewed social and power relations. Determining the efficiency and sustainability of the water supply and environmental sanitation systems and how they are influenced by socio-cultural factors in Sillamarathupatti should provide a framework for future research, including the work of at least one PhD student in the Department of Geography, University of Madras and projects/programmes in the village. The findings may also be transferable to villages with similar characteristics within the Thevaram Basin.

Limitations of the Research Process

The research was an evolving process in which flexibility was necessary. Re-evaluation of the research was a necessary part of the process. As stated by Chambers (2002; xiv): "Participatory processes cannot be 'properly planned', where 'properly' refers to fixed content and strict timetables...time management matters. But you cannot fit exploring, experiencing and learning to tight, preset timetables." Bridging the gap between theoretical knowledge and practical experience added to the re-evaluation process, thus increasing the duration needed for each research activity. The main research challenge was to engage in effective interpersonal and intercultural communication.

Language and communication dynamics, which are affected by culture, personality, context, level of knowledge and understanding, created barriers to the research. Working

with people in a different cultural context demanded energy, time, diplomacy and patience. Additionally, the relationship between an 'outsider' and an 'insider' ('uppers' and 'lowers' as defined by Chambers (1997)) created a relationship of unequal status based on preconceived notions, suspicion and interest. The socio-cultural context, the dynamics of caste, class and gender and the dynamics between the researcher (outsider/upper) and the villagers (insiders/lowers) added to the complexity of implementing a truly participatory gender-sensitive community-based approach to the research. Time and financial resource constraints further restricted the ability to implement a community-based approach.

Structure of the Thesis

The thesis is structured into five chapters: Chapter One has introduced both the context of the problem and the research approach; Chapter Two reviews the water supply and sanitation literature; Chapter Three describes the approaches and methods used in the research; Chapter Four presents an analyses and discussion of the research findings; and Chapter Five summarises the research, provides conclusions, offers recommendations and includes research reflections.

Chapter Two

Review of the Water Supply and Sanitation Literature

International Progress toward Improved Water Supply and Sanitation

McGarry (1991) and WHO & UNICEF (2000) indicate that there was significant expansion in the provision of drinking water supply and sanitation during the IDWSSD (1981 to 1990). Kalbermatten *et al.* (1999) state that significant progress was made in infrastructure development and in the methods used to plan and implement improvements in service delivery. However, Warner and Laugeri (1991) recognise three major deficiencies of the IDWSSD:

- the goal of universal coverage by 1990 was not attained;
- unsustainable water and sanitation projects were continually implemented; and
- the development community did not mobilise sufficient resources to meet all needs.

Several economic and social obstacles restricted the progress toward the goal of universal coverage—external debt problems; macroeconomic adjustment requirements; constraints on public expenditure; widespread poverty; and rapid population growth (Briscoe & de Ferranti, 1988; Neto & Tropp, 2000; Nicol, 1999). Kalbermatten (1991) suggests that two principal factors affect the water supply and sanitation sector: population growth, which determines future demand; and economic development, which determines financial resource availability. Coverage during the IDWSSD was unevenly distributed between urban and rural areas and between water supply and sanitation (Christmas & de Rooy, 1991). The IDWSSD served as both a rallying point for action and a constant reminder of the inadequacies of the development community at meeting the water and sanitation needs of all people (Warner & Laugeri, 1991).

There were wide variations within and between countries and it is debatable whether the water supply and sanitation coverage levels are inclusive of the poorest people within communities (Bell & Franceys, 1995; Nicol, 1999). A hardware approach, whereby emphasis is placed on technology, was relied on as the means to improve coverage. The expansion of coverage became a numbers game with agencies proudly reporting the number of new people being served with water and sanitation services (Warner & Laugeri, 1991). Chauhan and Gopalakrishnan (1983) argue that global plans and national programmes draw neat lines

around village problems, dealing with a part rather than the whole (*e.g.*, a Decade for women, a Year for children, and the IDWSSD).

Water supply and sanitation coverage goals dominated project thinking and failed to include existing behaviours and practices as the basis for either selecting technological interventions or target behavioural changes (Yacoob & Whiteford, 1994). More difficult to quantify were the numerous facilities unused, inoperable or poorly maintained and the subsequent effects on people's health (Bell & Franceys, 1995). Warner & Laugeri (1991) state that little attention was paid to whether the systems functioned as designed or whether people actually used them. Carter *et al.* (1999) indicate that few studies have actually quantified consumers' responses to 'improved' water supply technology with few projects measuring actual consumption and time spent on water carrying, pre- and post-construction. Evidence from the IDWSSD suggests that continuing with "business as usual" would not bring improvements quickly enough to provide access to growing populations (Kalbermatten, 1991; WHO & UNICEF, 2000).

Progress was made in the development of affordable technologies and participatory approaches to help serve those without access to improved water and sanitation services (Christmas & de Rooy, 1991; Kalbermatten, 1991; UNICEF, 1995a; WHO, & UNICEF, 2000). McGarry (1991) states that one of the more significant achievements of the IDWSSD was the development and application of a range of appropriate technologies. Bell and Franceys (1995) suggest that the IDWSSD sought to challenge the powerful and enduring 'high tech' image of progress on which western environmental and social transformation have been based. Furthermore, Bell & Franceys (1995) argue that underdeveloped communities were slow to accept, become involved in, or to benefit from many of the implemented strategies. Experience has shown that increased coverage targets are not sufficient unless attention is paid to sustainability of water supply and sanitation systems (McGarry, 1991). Warner and Laugeri (1991) indicate that the minimal financial and human resources available for water supply and sanitation coverage expansion forced governments and external support agencies to adopt radical new approaches to IDWSSD promotion.

Cairncross (1992) states that the realm of ideas generated was the most significant contribution of the IDWSSD. The knowledge gained from experience in implementing water and sanitation programmes changed practitioners' perceptions of the roles of

technology (Bell & Franceys, 1995; Kalbermatten, 1991; McGarry, 1991). Growing emphasis was placed on the need for a software approach, whereby social and institutional elements of programmes became the focus (Warner & Lauger, 1991). Warner and Lauger (1991) indicate that a strategy of community-based development resulted in an unprecedented move toward closer coordination of governments and external support agencies, in turn facilitating improved practices for planning, monitoring and evaluation. Community management of services emerged as the most viable solution to serve poor settlements where incentives do not exist for the public or private sector to provide affordable and sustained services (McGarry, 1991). In the latter part of the IDWSSD two trends were apparent: a drive for economic efficiency and the need for alternative methods of welfare financing and provision (Bell & Franceys, 1995).

The experience gained during the IDWSSD produced a store of knowledge including several lessons for future development. According to Cairncross (1992) the principal lesson is that progress and continuing success depend on response to consumer demand. Katz and Sara's (1998) study found that employing a demand-responsive approach at the community level significantly increases the likelihood of water system sustainability. According to van Damme (1999), the need to put people at the centre of action in water and sanitation is the main lesson and reflects the imperative for development to be a process driven by those with most to gain from and affected by the development. Kalbermatten (1991) summarises the lessons of the IDWSSD into two points:

1. population growth and economic development are not under the water supply and sanitation sector's control, and thus, the sector has to emphasise financial self-sufficiency; and
2. 'state of the art' technology provides a high level of convenience but is rarely essential to achieve the desired impact on health, productivity and environmental improvements.

In addition, UNICEF (1995a) provides a summary of the key lessons learned under four major programme concerns (Table 5): achieving universal coverage; promoting sustainability; maximising social and health benefits; and effectiveness of resource mobilisation and use.

Table 5: Summary of Major Lessons Learned during the IDWSSD, 1981 to 1990

Achieving universal coverage
<ul style="list-style-type: none">• Governments need to focus more specifically on the goal of universal access to water and sanitation and to establish the process for developing, implementing and monitoring action towards these goals.• Governments need to focus more on promotion, facilitation and coordination of services rather than merely on their provision.• Appropriate technologies continue to have a vital role.• Greater equity in access to services will accelerate progress towards universal coverage.• NGOs can play a catalytic role as champions of the poor and agents of change.
Promoting sustainability
<ul style="list-style-type: none">• Community involvement is an essential element of sustainability.• The active involvement and empowerment of women promotes sustainability of services.• Water and environmental sanitation efforts must be linked to social services and other development activities.• Sector programmes must address environmental degradation and pollution.• Sector monitoring and evaluation deserve emphasis.
Maximizing social and health benefits
<ul style="list-style-type: none">• Greater emphasis on sanitation, hygiene education and social mobilization in support of priorities and goals of the water supply and sanitation sector are essential.• The interplay of technical, economic, political, environmental and social dimensions in water supply and sanitation programmes must be recognized to design effective programmes.
Effectiveness of resource mobilization and use
<ul style="list-style-type: none">• Determined actions can reduce costs and improve cost-effectiveness.• Prudent cost-sharing and cost-recovery, with due consideration to the ability of the poor to pay, is an instrument for resource mobilization, for promoting sustainability and for improving access by the poor.• Private entrepreneurship should be promoted where potential and opportunity exist.

Source: UNICEF, 1995a; 12

Post-Decade: 'some for all rather than all for some'

Post-Decade (1990 to 1999) was marked by a period of policy creation and reform through the venues of numerous conferences (Ghosh, 1999; Nicol, 1999). The New Delhi Declaration that 'some for all rather than all for some' was the theme of water supply and sanitation development efforts (Nicol, 1999; WSSCC, n.d.). Safe water supplies and environmental sanitation were seen as vital for protecting the environment, improving health and alleviating poverty (WSSCC, n.d.). However, Nicol (1999) challenges these links indicating that while 'some for all' might be necessary to endure human survival, it is not necessarily sufficient to assist the poor, particularly in rural areas, in lifting themselves out of poverty. Ghosh (1999) indicates that the new paradigm for the 1990s did not offer anything more than a package of cost recovery, demand supply management and privatisation. The efforts failed to address issues related to institutional problems, specifically: the virtual absence of institutions and private sectors in rural areas; the lack of access to finance by the

poor; the problems of natural watersheds versus the political boundaries; and the virtual absence of people's basic right to water (Ghosh, 1999).

There was near consensus at all forums that universal access for water supply and sanitation can never be achieved through governments, institutions (NGOs and private) and with external supports (Ghosh, 1999). International consensus driven by the World Bank and the UNDP (United Nations Development Programme) viewed state provision of services as both expensive and unsustainable, particularly given the prevailing economic state of many developing countries. Calaguas (1999) indicates that water policies and strategies have not been consistent with the international declarations of the basic right to water. Ghosh (1999) suggests that the development solutions offered were not direct and did not address the widening gap in the access to finance and human resources. Calaguas (1999) argues that demand-responsive approaches presuppose a level of organisation and voice within communities and a willingness from the professionals and technicians to share information conducive to community participation. Additionally, Mehta (2000) argues that despite the various global discourses concerning demand management, for all practical purposes in most developing countries, water resources management is still supply driven.

At the end of the IDWSSD, potential development constraints were identified, including logistics, funding limitations, inadequate cost-recovery and inadequate operation and maintenance (WHO & UNICEF, 2000). Sustainability and increasing concerns about the use of scarce financial resources had enormous subsequent implications for a poverty focus in the water and sanitation sector (Nicol, 1999). The water supply and sanitation sector does not exist in isolation and is increasingly seen as a conduit for affecting a number of important issues such as poverty alleviation and gender (Moriarty *et al.*, 2002). Carter *et al.* (1999) state that sustainability, in the sense of continued delivery and uptake of services, is threatened by numerous attitudinal, institutional and economic factors and community participation approaches alone are no guarantee of success. The lack of involvement of communities in technology selection has also been frequently cited as a major constraint (WHO & UNICEF, 2000). To promote user ownership of services, consultation and decisions with the people most directly affected should be taken at a level as close as possible to the source of the problem (Kalbermatten *et al.*, 1999). Moriarty *et al.* (2002) state that the one overriding lesson is that the key to effective management of both resources and

systems is dependant on the capacity (technical, institutional and financial) of local level organisations (government, community and private sector). Furthermore, Mehta (2000) argues that if the concern is really 'water for all', interventions and investigations must inquire about people's entitlements to water. An understanding is required of the diverse institutional settings, knowledge claims and organisational forms that shape water use and water management in a variety of contexts amongst diverse water users.

Community Management of Water Supply and Sanitation

Carter *et al.* (1999) state that the inability of governments to maintain water and sanitation infrastructure has been the major factor leading to community-based approaches although communities rarely have the capacity to sustainably manage their own infrastructure independent of government or NGOs. IRC (1997) suggests several problems in achieving effective and sustainable community management:

- insufficient capacity building;
- partial coverage of communities;
- lack of effective and equitable financing systems;
- absence of suitable management tools;
- environmental degradation of watersheds; and
- an improper gender balance.

Sustainable access to a safe, reliable and affordable water supply and to adequate sanitation is only achieved if people are able to participate in the planning and management of the services (Calaguas, 1999; WSSCC, 2000). Manikutty (1998) indicates that few sector-specific guidelines are available to guide planning and integration of participation into construction of facilities and to help devise methods to elicit and sustain participation by the community. Nicol (1999) places emphasis on the need for current approaches in community participatory decision-making to determine the social and cultural barriers currently determining access levels. Mehta *et al.* (1999) indicate that emerging research argues for the need to see institutions as embodiments of social practice that are moulded by social and power relations. Failure to understand these aspects might lead to the proliferation of simplistic interventions for 'community' management that both obscure local realities and undermine

the flexible and dynamic character of local institutional arrangements and the socio-cultural, economic and political contexts within which they are embedded (Mehta, 2000).

Programmes need to be tailored to the ability of the community and to the local socio-economic, environmental and cultural conditions, according to Visscher *et al.*, (1999). Bell and Franceys (1995) suggest that greater realism in interpreting the dynamics of communities needs to be matched by a close look at household structures and gender roles and relations within different societies. Few studies link the dynamics of household decision-making to collective action and community level resource management (Cleaver, 1998). Yacoob (1994) states that without a behavioural component, the constructed facilities are unlikely to be properly used and maintained and thus the programme is unlikely to be self-sustaining. Briscoe and de Ferranti (1988) state that all parties involved in efforts to improve community water supply and sanitation need to adhere to the principle that the local people, not those trying to help them, have the most important role. Bolt and Fonseca (2001) conclude that a number of conditions must be established for community management:

- communities need sufficient information to make good decisions;
- communities need to know how to deal with different interests and conflicts among themselves;
- communities need to know how certain management tasks can be delegated;
- issues about source ownership and delegation of responsibilities need to be backed by legal arrangements; and
- communities need easy access to technical and managerial support and to spare parts for maintenance and repair.

VISION 21 recognises that people's roles must change if the goal of water, sanitation and hygiene for all is to be achieved. People's initiative and capacity for self-reliance needs to be put at the centre of planning and action based on the recognition that water and sanitation are basic human rights (van Damme, 1999; WSSCC, 2000). However, Mehta (2000) suggests that the current discourse on water as a human right is still very abstract because there is a lack of empirical research and the practicalities have not been deciphered. Moriarty *et al.* (2002) suggest that effective community management relies on several external factors:

- communities (or their representative organisations) should have the legal right to assume ownership and responsibility for their water supply;

- there should be an appropriate policy framework;
- there should be adequate support for the community, in particular with assistance in organisation and training and mediation with others; and
- affordable and appropriate technologies should be available.

Carter *et al.* (1999) suggest that the sustainability of community water supply and sanitation systems involves a chain of four essential links: motivation, maintenance, cost recovery and continuing support. The IRC coordinated study (1997) concluded the following with regard to community management:

- communities are willing to undertake management of water supply systems if they perceive the improvements as desirable and belonging to them;
- communication, information and routine involvement of communities in decision-making are crucial for effective management; and
- successful and sustainable management of water supply schemes depends on the magnitude, value and distribution of the social and economic benefits that the users gain from the scheme.

The study also argued that while progress has been made, there is considerable scope and need for further development.

Integration of Gender into Water Supply and Sanitation

During the IDWSSD, the involvement of women was recognised as a critical element in reaching the goal of universal coverage (Melchior-Tellier, 1991; van Wijk-Sijbesma, 1998). In 1983 PROWESS (Promotion for the Role of Women in Water and Environmental Sanitation Services) began as an interregional project at the UNDP with the objective to promote ways to include women more fully in water supply and sanitation projects. The PROWESS approach evolved toward an emphasis on gender analysis, community involvement, participatory techniques and capacity building through field projects in 20 countries and training workshops at global and local levels (Wakeman, 1994). However, evidence indicates that water and sanitation management is highly gender-specific (van Wijk *et al.*, 1996; WHO & UNICEF, 2000). Cleaver and Elson (1995) and van Wijk *et al.* (1996) state that although the importance of strengthening the role of women in water resource management has been mentioned at various international conferences, the instruments through which water resources are being managed and the issues that are emphasised tend to weaken the position of women in water resource management. Devasia

(2002) argues that the existing development paradigm is gender-biased and devoid of sensitivity to women's issues. WSSCC (2000) indicates that biases, such as maintaining/increasing gender inequalities and inhibiting the achievement of sector goals, persist and operate despite the rhetoric on the importance of women.

Cleaver and Jobes (1996) state that there is a significant gap between policy definition and implementation. Evidence suggests that gender analysis is still not a systematic and integral part of the majority of water supply and sanitation projects. Prior to the research cited by van Wijk-Sijbesma (2001) a gender perspective had not been systematically integrated into existing methodologies of evaluating community water services. Meinzen-Dick and Zwarteveen (1998) and van Wijk-Sijbesma (1998) show that although women are separately mentioned in the policies that have emerged, the principles have not been made gender-specific. Cleaver (1998) criticises the prevailing policies and practices of many governments and development agencies on three grounds:

1. Gender approaches retain a narrow sectoral bias—international policy statements that declare integrated water resource management are not adequately supported by analyses of water use or the mechanisms for promoting a multi-disciplinary approach.
2. Approaches to the planning of water projects and the participation of stakeholders remain highly technical and is often based on infrastructural planning.
3. Most policy approaches fail to make a credible link between the individual participant and their social context.

van Wijk-Sijbesma (1998) proposes an emerging common water policy comprising five principles: demand-responsive projects; water as an economic good; a holistic approach to water management; a shift of government roles from provider to enabler; and the participation of stakeholders. However, the principles are still couched in general terms and gender is not mentioned specifically.

van Wijk-Sijbesma (1998) further states that the principles of a coherent and demand-based approach can be made gender-specific by taking into account that:

- men and women in different socio-economic classes and societies have different demands for different water uses;
- the importance of these demands is properly valued;
- tools used to regulate demand will affect men and women in different income groups differently; and

- men and women in different socio-economic classes can express their demands and see them honoured.

Cleaver (1998) suggests that there is a need for gender analysis of water resource management that encompasses issues of social relationships and infrastructure provision. Further, gender analysis should account for both collective and individual actions and recognise complexity, diversity and change at a number of levels (*e.g.*, household, community and institutional). Green and Baden (1995) stress that communities are heterogeneous, and thus analysis of inequity requires a holistic analysis. van Wijk-Sijbesma (2001) argues that it is both unrealistic and cumbersome to analyse gender apart from other inequity aspects such as poverty. van Wijk *et al.* (1996) and WHO and UNICEF (2000) conclude that effective water management requires a participatory approach that avoids presenting the illusion of homogeneity and gender neutrality. The approach should emphasise the different activities of household members to ensure that different uses and impacts of water are recognised and accounted for in the management of water resources.

van Wijk-Sijbesma (2001) indicates that a gender analysis framework can help achieve a process of mainstreaming gender equality. However, a gender analysis framework that is adjusted to domestic water projects and that can be readily and rapidly applied has not been developed. Additionally gender aspects have not been systematically integrated into participatory assessment materials and methods. Furthermore, van Wijk-Sijbesma (2001) shows how gender perspectives can be incorporated into a participatory assessment at three levels:

1. Community (micro) level: division of labour between women and men; reproductive and productive work; access to and control over resources and benefits; community management work and decisions; and practical needs and strategic benefits.
2. Agency (meso) level: gender policies and strategies; and institutional arrangements for implementation.
3. Policy (macro) level: gender and gender approach in sector policy.

Neto and Tropp (2000) state that without the mobilisation and participation of people at all levels of society, including women, local communities and the poor, the goal of full coverage is unlikely to be attained. van Wijk-Sijbesma (2001) argues that large programmes have been blind to gender aspects in participation and management and to the effect which the presence or lack of a gender approach has for the continuity of services. Furthermore,

UNICEF (2002a) and van Wijk-Sijbesma (2001) indicate that the degree to which women, men and the poor have equitable access to and benefit from the services and the participation process needs increased attention.

Progress Toward Improved Water Supply and Sanitation in Rural India

Biscoe and de Ferranti (1988) indicate that India made remarkable progress during the IDWSSD. UNICEF (2002a) states that India's water and sanitation programme has provided services, long-term training and technical support, especially in the case of water supply, and encouraged technological innovation and international expertise while strengthening input from the community and local private sector. However, Chauhan and Gopalakrishnan (1983) raised the question of whether the IDWSSD is helping to perpetuate myths that have little basis in the actual experience of a village in the developing world (Table 6). The study also questioned whether a million villages can truly benefit from one international decade or whether a million decades are needed. Evidence shows that one decade is not enough and water and sanitation problems persist in rural areas (DDWS, 2001b; Gunyon, 1998; Nigam *et al.*, 1998; TWAD, 2001a; WHO & UNICEF, 2000).

Table 6: Two Contrasting Views of the IDWSSD and Two Rural Villages in Tamil Nadu, India

IDWSSD View	Village View
Clean water and adequate sanitation are basic needs for life, and these needs are overwhelming for humanitarian purposes.	In an acutely water-scarce situation, a convenient water supply is an important priority—not just for drinking and domestic purposes, but also for irrigation.
The technologies required are relatively simple and readily available and the cost-effectiveness is very high.	Villagers' perceptions of need determines whether and how they will adopt new technologies—some of the "simple technologies" (<i>e.g.</i> chlorinating the water) appear complicated in the village; some sophisticated technologies like electrically-powered irrigation are easily handled. Cost effectiveness is dependant on how villagers use the technology.
The results of improved water supply and sanitation are quickly and clearly visible. For example, more taps will indicate better health and the achievement of Decade goals will revolutionise the lives of rural women.	The number of water taps may indicate the degree of health in a town with a piped and treated water supply, but not in a village. The quality of drinking water is only one of many factors affecting health. More convenient water supplies help rural women in situation of extreme scarcity. Achieving Decade goals alone will not revolutionise the lives of rural women.
Implementation of programmes should be broad-based and people-oriented, enabling communities to use their own labour and enterprise.	For historical and economic reasons, the sense of being one village community does not exist—neither in the large, old village nor in the small, young village.

Source: Chauhan and Gopalakrishnan, 1983.

The participants of a workshop held at the National Institute of Hydrology in Roorkee, Uttaranchal State, India (August 1997) identified and ranked important water-related problems in rural areas: drinking water supply and quality; surface drainage and solid waste disposal; sanitation; agricultural pollution; and industrial pollution. Additional water-related problems identified include: inadequate solid waste disposal; pollution from unprotected and unauthorised garbage piles; over-exploitation of shallow aquifers; lack of public awareness, involvement, motivation and participation toward improvement; and lack of vision for long-term planning and appreciation of field realities (Niemczynowicz *et al.*, 1998). Niemczynowicz *et al.* (1998) suggest that improvements in water supply and environmental sanitation are unachievable in India without measures limiting population increase, raising public awareness on sanitation issues, promoting local participation in projects and encouraging the active participation of research institutions in the planning processes and in development of new technologies. Through a review of water sector policy, Mohile (1996) identifies three priority areas that need to be addressed: increasing costs of future provision because of spreading resources too thin, inefficient water use and growing conflicts (*e.g.*, between states sharing a common river, between urban and rural areas and between landholders and landless).

Gunyon (1998) concludes that there is potential for improvement in water supply and sanitation services if the GOI shifts resources from infrastructure subsidies toward community-based support. Furthermore, Devasia (2002) argues that there is a need for a radical shift from the vertical or bureaucratic planning of water management to a community-based women-centred approach. In a comparison between two rural drinking water supply projects in the State of Kerala, Manikutty (1997) concludes that community participation leads to more sustainable development of water supply and sanitation. Furthermore, in a comparative study of water and sanitation projects in five States (Gujarat, Maharashtra, Rajasthan, Kerala and Karnataka) Manikutty (1998) concludes that participation must be planned and managed to be meaningful and that there are limits to the effectiveness of a typical engineering-oriented government agency in generating and sustaining participation by the community. For example, DANIDA (2002) reports four gender-based results that have been reached through a co-operative project based on demand and a participatory approach with the GOI and GOTN in Cuddalore and Villupuram Districts:

1. Gender participation in the project cycle is visible and in particular, women's participation in all activities has increased to 36 percent since 1997.
2. The percentage of women's participation in the activities of planning, hygiene education meetings, village panchayat training (25 to 38 percent) and for the user group orientation training (70 to 73 percent) has increased between 1997 and 1991.
3. A significant improvement is seen in women's increased willingness to participate in technical training (*e.g.*, hand pump mechanics, masons and power pump operators).
4. The participation of women and men has improved the water supply maintenance system in the villages.

However, Nigam *et al.* (1998) conclude that social equity in terms of access to water supply by different socio-economic and caste groups and its implications for water management has been neglected and thus, needs to be incorporated in community- and government-based initiatives.

Box 1: Summary of the Water Supply and Sanitation Literature

International Progress toward Improved Water Supply and Sanitation

IDWSSD (1981 to 1990)

- expansion of drinking water supply and sanitation facilities
- coverage goals dominated project thinking
- wide variations in coverage within and between countries
- focus on affordable technologies and participatory approaches
- questionable whether the coverage levels were inclusive of the poor
- failure to include existing socio-cultural behaviours and practices into projects
- recognition of the need for people-centred action, including recognition of socio-cultural factors
- the most significant contribution was the realm of ideas

Post-Decade (1990 to 1999)

- period of policy creation and reform
- vital for environmental protection, health improvement and poverty alleviation
- recognition that demand-responsive approaches presuppose existing organisation conducive to community participation
- efficient management depends on the capacity (technical, institutional and financial) of local level organisations (government, community and private sector).

Community Management of Water Supply and Sanitation

- inability of governments to maintain infrastructure has led to community-based approaches
- community participation in planning and management is necessary for sustainability
- programmes must consider community ability and socio-economic, environmental and cultural conditions
- studies need to link household decision-making to collective action and community resource management
- people's roles must change to achieve universal coverage

Integration of Gender into Water Supply and Sanitation

- involvement of women is critical for universal coverage
- water and sanitation management is highly gender-specific
- there is a significant gap between policy definition and implementation
- gender analysis is not a systematic and integral part of the majority of projects
- gender analysis must include issues of social relationships and infrastructure provision
- effective management requires a participatory approach that avoids the illusion of homogeneity and gender neutrality

Progress Toward Improved Water Supply and Sanitation in Rural India

- India made remarkable progress during the IDWSSD
- the use of improved facilities and operation and maintenance are areas that need further attention for sustainable water supply and sanitation facilities
- improvements in water supply and environmental sanitation are unachievable without significant changes to government and private structure and support for community-based management

Chapter Three

Research Approaches and Methods for Examining Water Supply and Environmental Sanitation

Selection and Description of the Study Village

The research was conducted in the village of Sillamarathupatti, Theni District, Tamil Nadu (Figures 1 to 3). The village was chosen because of its proximity to the villages of the 'Making Deserts Bloom' Project in Theni District, Tamil Nadu (Kumaran & Hyma, 2001). The researcher discerned that there had been no previous research carried out in the village on water supply and sanitation. Kumaran (University of Madras, personal communication, August 2001) recommended this case study in order to gain greater understanding about the Thevaram Basin by expanding research and communication to a village outside of the Project area.

Theni District is located between 9°32' and 10°13' N and 77°13' and 78°4' E, comprised of five Taluks and eight Blocks, and covers an area of 3067.2 km². The terrain is comprised of undulating topography and two rivers (Suruliyaru River and Vaigai River) (Office of the Registrar General, 2001; TWAD, 2001a). Theni is the fifth smallest district in Tamil Nadu by population (1, 094, 724) with a density of 357 people per km², a sex ratio of 979 women per 1000 men and the second lowest population growth rate in Tamil Nadu from 1991 to 2001 (4.3 percent). The total literacy rate is in line with the rates for Tamil Nadu with a total of 72 percent, 83 percent for men and 61 percent for women. In rural Theni District there are a total of 272, 209 main and marginal workers. Sixty-four percent of the workers are agricultural labourers, 20 percent are other workers, 14 percent are cultivators and 2 percent are household industry workers (Office of the Registrar General, 2001).

Sillamarathupatti is located in the rainshadow of the Western Ghats mountain range. The village is divided into five wards and ten blocks with a total of 1, 614 households (Village Administration Office, personal communication, September 2001). The total population is 6, 320 of whom 15 percent (921) are Scheduled Caste (SC) and 4, 620 are eligible to vote. The village facilities include: two schools (a Government Higher Secondary School and a Panchayat Primary School); three Food Scheme Centres; one Government

Public Health Centre (GPHC); two Public Distribution Shops (PDS or ration shop); one Milk Co-operative Society; one post office; two movie theatres; two libraries; and one co-operative bank (Sillamarathupatti Panchayat Office, 2001).

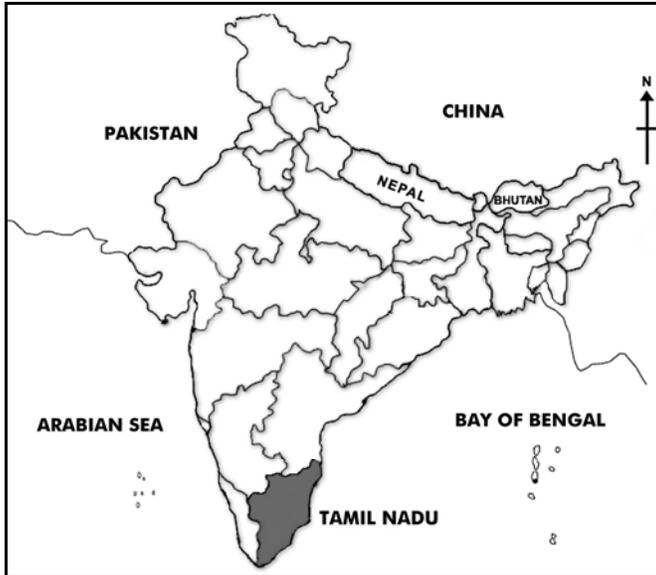


Figure 1: Map of India: Location of Tamil Nadu in Relation to all other States

Source: Adapted from Maps of India, n.d.

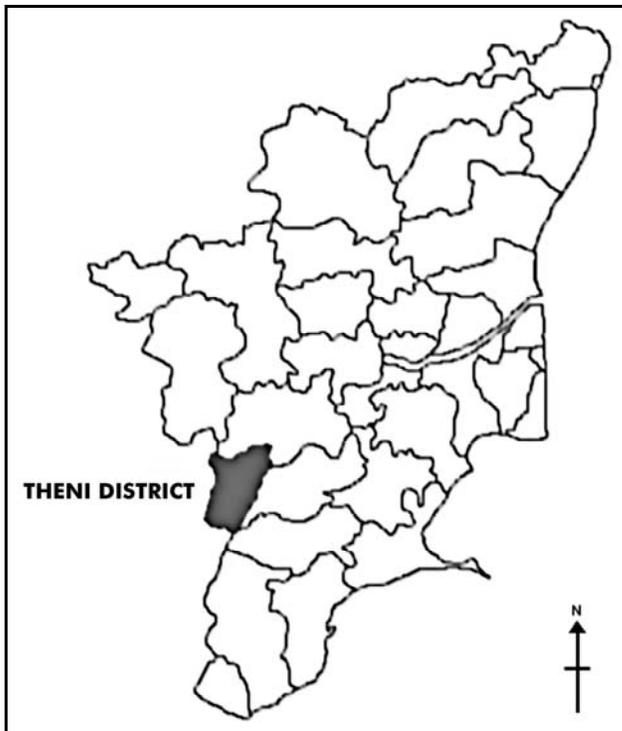


Figure 2: Map of Tamil Nadu, India: Location of Theni District in Relation to all other Districts

Source: Adapted from GOTN, 2001a.

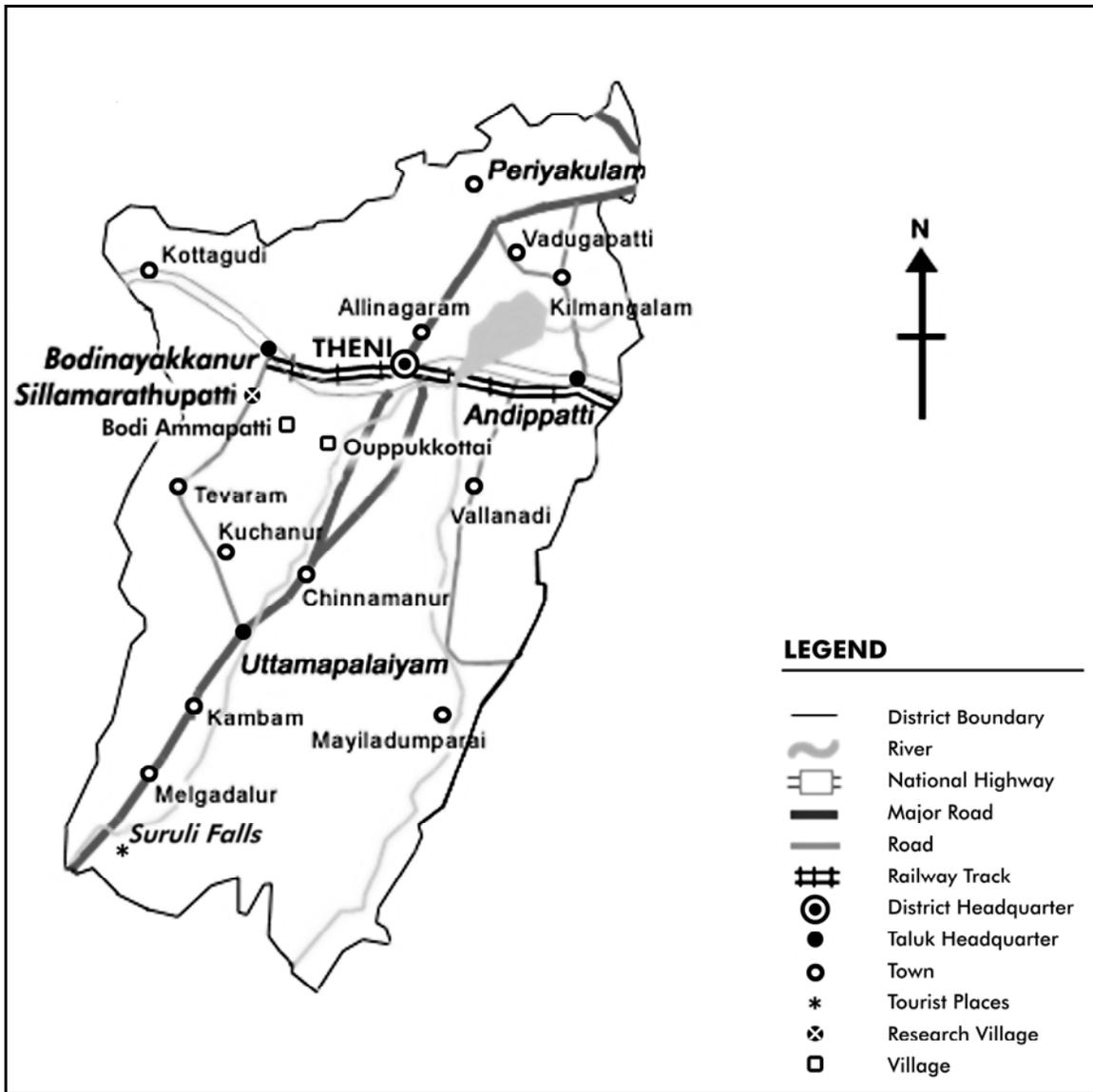


Figure 3: Map of Theni District, Tamil Nadu: Location of Sillamarathupatti, Bodinayakkanur, Bodi Ammapatti and Ouppukkottai

Source: Adapted from Maps of India, n.d.

Research Approaches and Methods

The research in Sillamarathupatti was conducted during five months (September 2001 to January 2002). Most of the research methods were carried out from 10:00 to 13:30 and from 16:00 to 20:00—hours that were more amenable to research because of the schedules of villagers. The data collection and recording methods for the research were mainly qualitative with a participatory community-based gender-sensitive approach. Mukherjee (1997a) describes Participatory Rural Appraisal (PRA) methods as providing rural people with an opportunity to express themselves in a way that is instrumental in exposing various dimensions of their lives that normally remain unperceived or under-perceived. van Wijk-Sijbesma (2001) indicates that a gender approach that distinguishes between and within groups of women and men is needed to understand behavioural patterns. Therefore, the majority of the research methods and tools were drawn from the tenants and practices of (PRA). Participant observation was used to complement and support the PRA activities. The following PRA methods and tools were employed: community mapping; transect walk; informal, individual and group interviews; and story with a gap. Semi-structured interviews were also conducted and a semi-structured questionnaire was used to obtain quantitative data relating to all four research objectives.

Participation was encouraged from diverse people including those of different gender, caste, class and age in order to obtain comprehensive information. Two research assistants, a woman, and a man aided in data collection and recording through Tamil to English translations, establishing connections through communication with villagers and providing guidance on the appropriateness of methods, cultural sensitivity and understanding. The woman is a PhD student from the Department of Geography, University of Madras and the man is a local resident from Bodinayakanur and was a field assistant for the project 'Making Deserts Bloom'. The research assistants employed the research methods with individuals of the same gender as much as possible. This was more important when working with women because many felt uncomfortable, especially when being interviewed by a man. Notes were taken during discussions with people and a tape recorder was used to aid in transcriptions of the discussions during community mapping, story with a gap and informal interviews.

Participant Observation

Babbie (1998; 282) defines participant observation as "a specific form of field research in which the researcher participates as an actor in the events under study." Unstructured observations provide qualitative data, and thus are helpful to understand behaviours in their physical and social context and to understand relations between behaviours (Boot and Cairncross, 1993). Hoque (2000) indicates that social norms are significant by confounding or interacting with water and sanitation factors, thereby introducing further complexity in observations. Participant observations were used to understand the socio-cultural context within which the people of the village live. Observation was not limited to water supply and environmental sanitation. The researcher openly shared in the life and activities of the people for the duration of the research. Experiences and daily reflections were recorded in a journal. The journal helped the researcher to enhance self-awareness and reflect upon issues in the current context and stage of research. According to Chambers (1997) direct observation can be most effective if combined with self-critical awareness of what we tend to see and not see, resulting from our own specialised education and interests and consciously trying to correct for these. Participant observation also helped in developing research questions and clarifying research methods.

Community Mapping

Thomas-Slayter et al. (1995) indicate that community mapping is a good place to begin participatory research because the exercise initiates dialogue among participants and researchers/project staff. The maps also serve as a visualisation of the conditions in the community. Mukherjee (1997a) argues that participatory mapping is crucial to PRA. Srinivasan (1990) suggests that during a mapping exercise and afterwards, discussions can reveal important information about the lives and living conditions of the villagers. Bolt and Fonseca (2001) and Dayal *et al.* (2000) indicate that mapping can be used to learn about the community's situation regarding all water supply and sanitation facilities (traditional as well as those provided by specific projects) and access to these facilities by the poor, rich, and middle-income households.

Community mapping based on village streets and colonies was used to obtain information on all four of the research objectives. Community mapping provided an

opportunity to engage in dialogue with a variety of people, gain an introductory understanding of the local water supply and sanitation situation and encouraged discussion among villagers. Between six and thirty people, including men, women and children, participated in each of the mapping exercises conducted for thirteen streets, two SC Colonies and the Backward Caste (BC) Colony. The participants determined the boundaries and map contents in discussion with the researcher and assistants, including infrastructure (roads, houses, buildings, drainage canals, latrines, waste disposal areas and water sources), health and education facilities and *Kovils* (Temples) (Appendix IV; 102). The maps were drawn freehand with pencils on chart paper. The maps served as the basis for conducting transects and aided in the direction of informal interviews and the development of questions for the semi-structured questionnaire.

Transect Walks

Transect walks help to learn about selected areas from local people. Transects can help identify aspects of an area that require greater attention and detailed discussion with villagers (Mukherjee, 1997b). Dayal *et al.* suggest that transect walks can be used to determine to what extent a well-sustained water and sanitation service is present in the community and to cross-check some of the information on the community map(s). Additionally, Bolt and Fonseca (2001) suggest that transects can provide information about the differences in the levels of service and sanitation among different areas in the community. Simpson-Hébert (1983) indicates that a large amount of information can be collected if the observers are sensitive, experienced, keenly observant and do not anticipate the answers to questions.

Transects were based on the same streets and colonies as the community mapping exercises. Transects involved systematically walking down streets and through colonies with select community members and engaging in discussion. The walks helped to learn more about the features drawn on the maps, to generate further discussion and to determine additional information, including the condition of water supply and sanitation facilities, water collection methods, household waste disposal, childcare, animal care (cows and goats) and the sanitary state of the environment (faecal contamination, solid waste, stagnant drains and water). Transects increased familiarity with the physical and social organisation of the village and the existing water supply and environmental sanitation situation.

Informal Interviews

Boot and Cairncross (1993) define informal interviews as conversations that are spontaneous discussions with individuals and groups of people based on the research focus. Rubin and Rubin (1995) state that qualitative interviewing design is flexible, iterative and continuous. Therefore, questioning is redesigned throughout the research process. Informal conversations are particularly useful in combination with unstructured observations because they allow for immediate discussion, thus increasing the researcher's understanding of the lives of people and their behaviours (Boot & Cairncross, 1993).

Informal interviews were conducted with men, women and children from different castes and classes throughout the research process; however, not all of the conversations were recorded. A total of fifteen individual (four with women and ten with men) and three group informal interviews (both men and women) were recorded. The interviews were an opportunity to discuss water supply and environmental sanitation activities (*e.g.*, water collection, household water use, solid and liquid waste disposal). They initiated and enhanced communication with women, men and members of different community groups and elicited information related to all four research objectives. The interviews helped to develop and clarify the discussion topics for the other PRA methods and the questions for the semi-structured interviews and questionnaire.

Story With a Gap

Story with a gap uses before and after images of a problem situation to allow all individuals an opportunity to participate in a dialogue (Thomas-Slayter, 1995). Boot and Cairncross (1993) state that pictures or drawings are easy tools to encourage expression, to generate discussion, exchange views and experience and to provide interpretations to subjects of interest. Story with a gap was used to learn about women and men's perceptions and understanding about the relationship between health, water supply and environmental sanitation. The method involved two images, one of an unsanitary village environment and one of a sanitary village environment (Appendix V; 106). The story was conducted with 11 men and 11 women household heads of various ages, castes and classes. The original plan was to tell the story prepared for the first image and then show the second image asking for the participants' opinions of how the village environment changed over two years. The participants were also asked to describe both image one and image two. However, all of the

men were eager to tell their own story for both image one and two. Women were told the prepared story because they were reluctant to tell their own story for image one.

Semi-structured Interviews

Boot and Cairncross (1993) define semi-structured interviews as interviews guided by a list of questions posed in the exact wording and order as they have been written. Semi-structured interviews were used to ask specific questions about the village water supply and sanitation of a limited number of people. The questions were based on the information obtained from participant observation, informal interviews, community mapping and transects. Four semi-structured interviews were conducted: one with the former Panchayat president, one with the current Panchayat president, one with the electrician of the Bodi Ammapatti water pumping station and one with the electrician of the Oupukkottai water pumping station (see Figure 3 for village locations). The interviews were used to gather information on the objectives and to clarify some of the conflicting and uncertain information obtained from villagers through other research methods.

Semi-structured Questionnaire

Babbie (1998) states that questionnaires can be used for descriptive, explanatory and exploratory purposes and for measuring attitudes and perceptions in a large population. However, Gill (1993) and Almedom *et al.* (1997) argue that there are a number of limitations when questionnaires are used as the sole instrument for research, specifically research relating to socio-cultural factors, whereby qualitative information can improve the effectiveness of questionnaires. Therefore, questions for the semi-structured questionnaire were developed through participant observations, community mapping, transect walks, story with a gap and informal interviews. This helped to reduce the bias in the questions, provide a focus on issues of concern and act to confirm, complement and expand data collected from other methods.

The questionnaire was based on a systematic sample, whereby every k th element (*i.e.*, household) in the total list (*i.e.*, total households) is chosen for inclusion in the sample (Babbie, 1998). An approximate sampling interval of every tenth house on seventeen streets in the main village, in one SC Colony and in the BC Colony was conducted. The sample comprised 3.5 percent of the households (57/1614) in the village. The man and woman

heads of each household were interviewed separately. Household heads were defined as the married family members who are chiefly responsible for the welfare of the household. A systematic sample was used to ensure that data were collected from diverse from different areas in the village. The questionnaire was used to obtain qualitative and quantitative information on all four objectives. The questionnaire was tested with ten individuals and changes were made to the types of questions asked on the final questionnaire. An English-language copy and a Tamil-language copy of the semi-structured questionnaire are provided in the Appendix (Appendix VI; 107 and Appendix VII; 115).

Box 2: Summary of the Research Approaches and Methods

Participant Observation

- understanding of socio-cultural context; acceptance into the village; sharing in people's lives and activities; basic conversational Tamil; enriched the data collected.

Community Mapping

- initiated communication with a diversity of people; introduced the research; encouraged discussion within community groups; community interpretation of village water supply and sanitation; foundation for transects; understanding of gender relations.

Transect Walks

- expanded on community mapping information; strengthened communication and relations with villagers; introduced the research; helped establish questions for the semi-structured interviews and semi-structured questionnaire.

Informal Interviews

- initiated communication with villagers; encouraged discussion between villagers; development, expansion and clarification of research methods and questions.

Semi-structured Interviews

- expanded and confirmed the data collected from villagers.

Story with a Gap

- information on women's and men's perceptions on unsanitary vs. sanitary environment and the relationship to health; understanding of gender relations.

Semi-structured Questionnaire

- qualitative and quantitative data complemented and expanded on the data collected from other methods.

Chapter Four

Analysis and Discussion of the Research

Village Water Supply- and Environmental Sanitation-based Initiatives

There are two water supply sources in the village of Sillamarathupatti: Mullai/Ouppukkottai River water, which the community refers to as *nalla thanni* (good water), and brackish groundwater, which the community refers to as *uppu thanni* (salt water). For the purpose of this thesis *nalla thanni* will be referred to as 'drinking water' and *uppu thanni* will be referred to as 'salt water'. The Sillamarathupatti Panchayat Office (2001) reports the following water supply facilities: 14 handpumps; two power pumps; 63 public taps (40 'drinking water', 23 'salt water'); 650 household taps; two overhead 'drinking water' tanks (OHT); six 'salt water' tanks (one small Syntex tank, four ground level re-storage (GLR) tanks and one OHT); one rainwater storage tank: (*Mundbai Kulam*); two ponds (*Gowndan Kulam* and *Muthalamman Kulam*); and agricultural (garden) wells. The village environmental sanitation facilities consist of three non-functional public latrines, household latrines; drainage canals (open and closed constructed, stone and sand) and open space.

The Panchayat Office is responsible for maintaining the public water supply and drainage facilities. Nobody is officially responsible for maintaining solid waste facilities or sweeping defecation areas, but the Panchayat does carry out minimal maintenance. Higher government authorities (Bodi Panchayat Union Office, Theni Collector Office) must approve the construction of new facilities. The funds for new projects are handled through levels of Government in the following order: GOI; GOTN; Theni Collector Office; Bodi Panchayat Union Office; Bodi Taluk Office; and the Sillamarathupatti Panchayat (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002).

The Panchayat has not entered into any partnerships with other organisations (NGOs, private organisations or governmental). Rather, they initiate projects based on village needs, complaints from the community, suggestions from the various levels of government and government schemes (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). The majority of respondents indicated that there have been no schemes or programmes implemented by NGOs or private organisations. They also indicated that the Panchayat provides information via *dbandoram* (a

messenger using a drum) and the GPHC provides limited information on health and sanitation when villagers seek treatment. The Panchayat schemes or programmes that villagers recalled were mainly one-time informational sessions such as health camps, AIDS awareness, 'drinking water' management and sanitation information organised by the GPHC, GOTN and local NGOs. The Panchayat plans to construct more water and sanitation facilities in the coming year. However, construction of new facilities requires funding and approval from the Bodi Panchayat Union Office and the Theni Collector Office (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002).

Village Water Supply Facilities

'Drinking Water' Supply

The Tamil Nadu Water Supply and Drainage Board (TWAD) developed the Sillamarathupatti 'drinking water' supply under the auspices of the *Kuttu Kudineer Thittam* (Joint Drinking Water Scheme) 'Sillamarathupatti and 14 village settlements' scheme in 1991. TWAD maintains the Joint Drinking Water Scheme and sells the water at a rate of Rs. 2/25 per 1,000 litres (electrician, Bodi Ammapatti pumping station, personal communication, February 2002). Water is pumped from the Mullai River through two tanks that house two four horsepower motors. The water is pumped to the Ouppukkottai pumping station at 3,744 litres per minute and stored in a sump with a capacity of 80,000 litres. Water is divided among the fifteen villages in two separate intervals (06:00 to 18:00 and 18:00 to 06:00) (electrician, Ouppukkottai pumping station, personal communication, February 2002).

The Sillamarathupatti water supply is pumped from the Ouppukkottai pumping station to the Bodi Ammapatti pumping station and from Bodi Ammapatti to Sillamarathupatti every second night. One OHT is used for village 'drinking water' storage (Figure 4). The tank holds 150,000 litres and requires 5.5 hours to fill. However, the time when the water is released from Bodi Ammapatti depends on the volume of water pumped from Ouppukkottai (electrician, Bodi Ammapatti pumping station, personal communication, February 2002; Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). The water is released from the 'drinking water' OHT on a street-by-street basis for approximately 30 minutes to streets with 'drinking water' facilities. Approximately 20 manual 'gate valves' (when functional) are used to redirect the water through the pipeline on different streets.



Figure 4: 'Drinking Water' Overhead Tank, Sillamarathupatti

'Drinking water' collection facilities include household taps, street taps and aeration tanks (two open and one closed, see Figure 5 and Figure 6). Aeration tanks were constructed to collect water released from aeration valves (Figure 7); the aeration valves release air from the pipeline and thereby increase water flow. Open tanks are uncovered because the pipeline is buried deeply in these areas (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). Based on the average of questionnaire responses from men and women, the majority of households collect 'drinking water' from multiple sources: 25 percent from an inside household tap; 36 percent from an outdoor household tap; 41 percent from a public street tap; and 39 percent from an open aeration tank (Table 7).

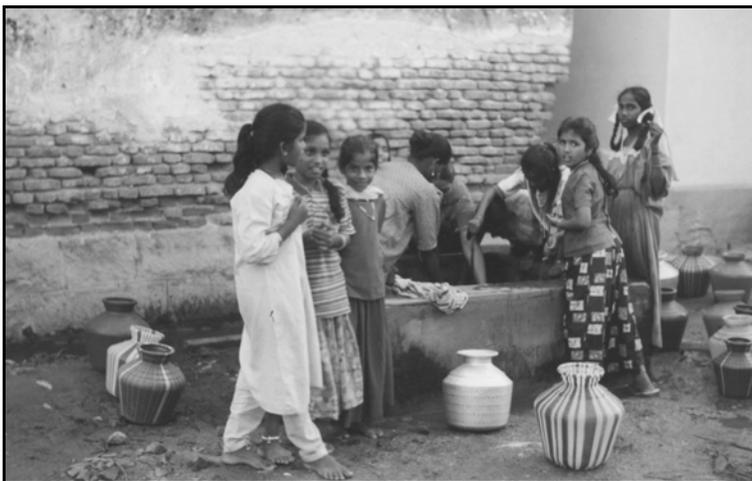


Figure 5: Girls Collecting 'Drinking Water' from an Open Aeration Tank, Sillamarathupatti



Figure 6: Closed Aeration Tank, Sillamarathupatti



Figure 7: Girls Collecting 'Drinking Water' from an Open Aeration Tank: Inside View of the Tank Showing the Aeration Valve, Sillamarathupatti

Table 7: Household Availability of 'Drinking Water' Facilities as Indicated by Women and Men

	Household Tap (%)		Public Facilities (%)	
	Inside	Outside	Street Tap	Open Aeration Tank
Women	28	32	40	49
Men	21	40	42	28
Average	25	36	41	39

Data do not sum to 100 because the majority of households have access to more than one facility.

'Salt Water' Supply

The Sillamarathupatti Panchayat supplies 'salt water' to the village from two wells—one located in the *Ranimangammal Salai* (a forested area west of the village) and one (*nalla kenaru*, 'good water well') located east of the village. Water from *Ranimangammal Salai* is pumped to the 'salt water' OHT. The tank holds 25,000 litres and supplies water to the village 'salt water' taps daily. Two of the four GLR tanks are functioning (P.T. Rajan Street and the BC Colony) (Figure 8). The BC Colony GLR tank is supplied by the *Ranimangammal Salai* well and the P.T. Rajan Street GLR tank is supplied by *nalla kenaru* (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). Based on the average of questionnaire responses from men and women, the majority of households collect 'salt water' from multiple sources: five percent from an inside household bore well; 48 percent from a public street tap; 14 percent from a GLR tank; 22 percent from a handpump; and 22 percent from a garden. Twelve percent of the women and 25 percent of the men indicated that 'salt water' is only collected for their household when there is an inadequate 'drinking water' supply. Eleven percent of both women and men indicated that they do not collect 'salt water' (Table 8).



Figure 8: Women and Children Collecting 'Salt Water' from a Ground Level Re-storage Tank, Sillamarathupatti

Table 8: Household Availability of 'Salt Water' Facilities as Indicated by Women and Men

	Facility (%)					
	Household Bore Well	Street Tap	GLR Tank	Handpump	Garden	None
Women	4	54	16	23	23	11
Men	7	42	12	21	21	11
Average	5	48	14	22	22	11

Data do not sum to 100 because the majority of households have access to more than one facility.

Village Environmental Sanitation Facilities

The DDWS (2002) defines sanitation as a comprehensive concept that includes liquid and solid waste disposal, excreta disposal, food hygiene and personal, domestic and environmental hygiene. Boot and Cairncross (1993) define sanitation in terms of hygiene behaviours, including environmental hygiene, which includes street cleanliness, wastewater disposal and drainage, solid waste disposal, and hygiene at public places. For the purpose of the research the following aspects of environmental sanitation were studied: human excreta management; cattle and household solid waste management; and liquid household and cattle waste management.

Human Excreta Management

Three non-functional public latrines were constructed for women in 1998 and 1999 by the GOTN through the Bodi Panchayat Union Office (Figure 9). The latrines do not have electrical or water connections. Water was provided through a direct connection to the 'drinking water' OHT when the latrines were initially constructed. The Sillamarathupatti Panchayat Office complained about the use of 'drinking water' and the Bodi Panchayat Union Office disconnected the supply. The previous Panchayat did not have enough funds to establish a new water connection so the current Panchayat has submitted a complaint to the Theni Collector Office (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). Some households have personal latrines (28 percent) while most respondents practice open defecation (72 percent)—a common practice in rural areas (Chauhan & Gopalakrishnan, 1983; Mukherjee, 1990; Kurup *et al.*, 1996). The fraction of respondents who have a latrine is similar to the CRSP National estimates (DDWS, 2001b) and is above the census value for Tamil Nadu (Office of the Registrar General, 1991).



Figure 9: Non-functioning Women's Latrine, Northeast Scheduled Caste Colony, Sillamarathupatti

Household latrines, which are currently not used, were constructed as part of two different housing schemes: 1990 GOTN SC housing scheme, under which 26 houses were constructed in the Southwest SC Colony (members of the Southwest SC Colony, personal communication, October 2001); and the 1999 Indira Gandhi Housing Scheme, under which 19 households with latrines were constructed for people below the poverty line in the BC Colony (Mr. T. Muthukrishnan, Panchayat President from October 1996 to 2001, personal communication, December 2001)—the Planning Commission (2002) defines the separate rural and urban State specific poverty lines based on a minimum consumption expenditure with an average energy adequacy norm of 2400 and 2100 kilocalories per capita per day. Some people from the SW SC Colony indicated (personal communication, October 2001) that the latrine facilities are not used because the septic tank was only constructed to a depth of five feet and thus, the waste did not decompose properly creating a bad smell. Therefore, the people filled the septic tank with sand and they now use the cement slab that covered the septic tank for washing clothing. One woman from the BC Colony was observed to keep her chickens in her household latrine indicating that she does not use the latrine because there is no water connection.

Research by Karup *et al.* (1996) in Kerala found that most of the facilities provided through programmes implemented by government and NGOs have not been maintained and used in a satisfactory manner. Similarly, Manikutty's evaluation (1998) of a water supply and sanitation project in the State of Gujarat, India found that when planning the location of

household latrines the convenience of the beneficiary families and the prevalent social-cultural norms were not considered; approximately fifty percent of the families used their latrines. Additionally, water and sanitation were not linked in the planning processes. Since the use of latrines depended on the availability of water, the lack of water affected the use of latrines in several villages (Manikutty, 1998). van Wijk-Sijbesma (1998) also cites studies that have found that increased work required to collect water for flushing and cleaning has reduced demands for pour-flush latrines unless water is readily available.

Solid Household and Cattle Waste Management

There have been no schemes implemented for solid waste management. However, the previous Panchayat president (October 1996 to October 2001) did organise a one-day plastic waste disposal effort whereby plastics were burned in a pit near the *Mundbai Kulam* and villagers were told to continue disposing of plastics in this way (Mr. T. Muthukrishnan, former Panchayat President, personal communication, December 2001). Villagers dispose of household waste in abandoned wells and open areas inside and outside of the village, including the *Mundbai Kulam*. Cattle waste is stored in open areas within the village or on agricultural land and used as fertiliser for village lands and/or sold for fertiliser to farmers in the State of Kerala (Figure 10).



Figure 10: Open Space used for Household Solid Waste and Cattle Waste Disposal, Sillamarathupatti

Liquid Household and Cattle Waste Management

Liquid household and cattle waste is disposed of through a network of drainage canals. The Panchayat is responsible for drainage maintenance and construction (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). Most of the main village has open-constructed drainage (Figure 11) but the Colonies (BC and one SC) and the area across the main road do not. People have dug drainage canals in the sand (Figure 12) where there is no constructed drainage. Based on the average of questionnaire responses from men and women the households have the following drainage facilities: 58 percent open constructed; nine percent closed constructed; six percent stone; and five percent sand. Twenty-two percent of the households indicated that they have no drainage facilities (Table 9).



Figure 11: Open Constructed Drainage, Sillamarathupatti



Figure 12: A Woman cleaning the Sand Drainage, Northeast SC Colony, Sillamarathupatti

Table 9: Household Availability of Drainage Facilities as Indicated by Women and Men

	Facility (%)				
	Open-constructed	Closed-constructed	Stone	Sand	None
Women	58	11	3	5	23
Men	58	7	9	5	21
Average	58	9	6	5	22

Government Responsibility for Village Water Supply and Environmental Sanitation Development and Management

In Sillamarathupatti, villagers of all communities strongly rely on local and state government—there is a belief that the government is responsible for solving the village water supply and environmental sanitation problems. The majority of people lack motivation to mobilise because they believe that the GOTN or Panchayat are responsible for the provision of village facilities—a mindset of inaction, which can be attributed to cultural tradition and the top down approach taken by the Colonial, National and State governments. A sense of apathy can be attributed to the Hindu belief that it is one's destiny or duty to live the life that is set before them. Most of the people who engaged in participatory methods, informal and formal discussions and responded to the semi-structured questionnaire complained about some aspect of the current water supply or sanitation situation while indicating that the Panchayat has not taken responsibility. For example, one woman from the Northeast SC Colony stated: "There are no drainage facilities and no toilet facilities. Nobody has taken any action. There is already one toilet constructed, but it has no water facility and

no handpump facility. We have asked the Panchayat for water facilities but they have not taken responsibility." One man stated:

The Panchayat has only told us that they will keep the roads and streets clean, however, they do not do anything. I want somebody [Panchayat] to take care of the street. There are no road facilities and no burial road. There is no garbage bin or vehicle to carry the waste. If these things were given to us it would be fine.

The Indian Planning Commission (2001b) indicates that water is being perceived by the rural public as a social right to be provided free by the Government rather than as a scarce resource, which must be managed locally as an economic asset to ensure effective use—a perception that development efforts have augmented and continue to augment although both the national and state governments promote community participation and management (DDWS, 2001a, 2001b, 2002; Planning Commission, 2001a, 2001b; TWAD, 2001b). The water supply systems are currently designed and executed by Engineering Departments and imposed on end-users, although these are formally transferred to the local panchayats (Planning Commission, 2001b). Furthermore, the Planning Commission (2001a, 2001b) suggests that panchayats have relied too heavily on central and state funding rather than committing to community control over funds, programmes and effective monitoring—sector reforms which are unpopular political and administrative decisions.

Box 3: Summary of the Village Water Supply- and Environmental Sanitation-based Initiatives

- water supply facilities: 'drinking water' (household and public taps, aeration tanks) and 'salt water' (household wells, public street taps, GLR tanks, handpumps, gardens)
- majority of households collect water from multiple sources to meet their daily needs
- the village has traditional rainwater harvesting structures that are no longer maintained: one rainwater storage tank and two ponds
- environmental sanitation facilities: three non-functional public latrines built for women; household latrines; drainage canals; and open space
- majority of villagers practice open defecation
- the Panchayat is responsible for management of water supply and drainage facilities; nobody is officially responsible for maintaining solid waste or open defecation areas
- the Panchayat conducts minimal maintenance of solid waste on public land
- the Panchayat has not entered into any partnerships with other organisations (NGOs, private, governmental)
- NGOs, private organisations or foreign governments have not implemented any large-scale schemes
- projects are initiated on the basis of village needs, community complaints, government suggestions and government schemes
- the existing water supply and environmental sanitation initiatives were supply driven through top-down GOTN initiatives
- people lack motivation to mobilise because they believe that the government is responsible for the provision of facilities—a mindset of inaction attributed to cultural tradition and government action

Influence of Socio-cultural Norms on Village Water Supply and Environmental Sanitation

Communities are heterogeneous entities within which socio-cultural factors influence differences in responsibilities, access to resources and influence within the community (Mehta, 1997, 2000; van Wijk *et al.*, 1996). Mehta (1997) argues that notions of 'community' in India need to be de-homogenised to accommodate differences that are a result of class, caste and gender. Kapadia (1995) argues that it is impossible to study the dynamics of class and caste without a gendered analysis. She contends that in South India, both caste and class construct gender and gender constructs both class and caste. Ghosh *et al.* (1995) state that heterogeneous habitations have been largely attributed to geographical location, however customs and social institutions also contribute to heterogeneous habitation and social stratification within habitations. Mosse (1997) indicates that existing systems of water use are supported by structures of authority rather than democratic decision-making. The systems often symbolically reproduce this authority and the accompanying gender and caste exclusions.

Influence of Gender Roles, Responsibilities and Relations

Household Water Supply

The research in Sillamarathupatti complements numerous studies on water supply in rural India that indicate that women are mainly responsible for household water collection and management (Chauhan & Gopalakrishnan, 1983; Kurup *et al.*, 1996; Mehta, 1997; Mukherjee, 1990; Nigam *et al.*, 1998; Reddy, 1999; Tummon, 2001; UNICEF, 1995b). The average response from women and men showed that 92 percent of the women household heads are responsible for the management of water collection, storage and household use (Table 10). Households whose members share the responsibility of water management are a minority. Women household heads also collect the bulk of the household water supply (86 percent)—their husbands, children or relations collect water occasionally. Several reasons for water collection by men were cited: when their wives are sick; when their wives are busy with household work or work away from the house; when water must be collected at night; and when water must be collected from a handpump or from outside of the village if other sources are unavailable. Some daughters collect water only when they have holidays from school and both daughters and sons collect water when their mother is sick or unavailable.

Women, men, children and labourers take varying responsibility for water collection and management for cattle.

Table 10: The Division of Water Collection among Household Members as Indicated by Women and Men

	Household Member(s) (%)				
	Wife	Husband	Daughter(s)	Son(s)	Relation(s)
Women	86	18	23	11	12
Men	86	42	19	7	25
Average	86	30	21	9	19

Data do not sum to 100 because more than one household member may collect water for the household.

van Wijk *et al.* (1996) and van Damme (1999) indicate that the ways in which water is used and managed often have distinct implications for women and men. The assumption that water supply and sanitation are managed domestically by women and managed publicly by men is widespread (Cleaver, 1998; Cleaver & Jobes, 1996; DFID, 2001; Melchior-Tellier, 1991). However, research has shown that the situation is complex and that women, men and children are involved in, and have specific knowledge of tasks and requirements for water supply and environmental sanitation in the house, the community and the surrounding area (van Damme, 1999; van Wijk *et al.*, 1996; van Wijk-Sijbesma, 1998). Cleaver (1998) suggests that it is necessary to recognise that the differing priorities of women and men be equally considered in an attempt to ensure that the primary household water needs are met.

Household and Village Environmental Sanitation

Gender roles, responsibilities and relations influence the management of environmental sanitation, including solid and cattle waste disposal and latrine use. Household solid waste disposal is primarily the responsibility of women household heads in Sillamarathupatti (85 percent) (Table 11). Female relations (including, mother-in-law, mother, daughter-in-law and sister) (19 percent) and daughters (13 percent) were also cited as having more responsibility than other household members. Alternatively, the responsibility for cattle waste disposal also varies within and between households. There is a marked gender division in the relationship that women and men have with latrine use; 44 percent of the men with a household latrine indicated that they practice open defecation while the women indicated that they use the latrine. Samanta and van Wijk (1998) and van Wijk-Sijbesma (1998) confirm that latrine use is greatest and most consistent among women.

Mukherjee (1990) argues that women are more motivated than men to adopt latrines. van Wijk-Sijbesma (1998) reports that mobility and socio-cultural acceptability are the main reasons for men and children practicing open defecation, while mature women face problems of distance, lack of privacy and personal safety (Kurup *et al.*, 1996; Mukherjee, 1990; van Wijk-Sijbesma, 1998).

Table 11: The Division of Household Solid Waste Disposal among Household Members as Indicated by Women and Men

	Household Member(s) (%)					
	Wife	Husband	Daughter(s)	Son(s)	Relation(s)	Labourer(s)
Women	90	0	12	0	9	5
Men	81	4	14	9	28	5
Average	86	2	13	5	19	5

Data do not sum to 100 because more than one household member may dispose of household solid waste.

The majority of both women and men who practice open defecation indicated that it is comfortable for them to use the open areas anytime of day. More men than women commented that using open areas was difficult for women. For example, one man stated: "the men use south, west, north and east and any open area. It is more difficult for women. A toilet has already been constructed in the village, but there are no water or electricity facilities." Some women did state that although they go anytime, they must stand up whenever a man walks by. van Wijk-Sijbesma (1998) indicates that to avoid being seen, women in some cultures have to visit defecation grounds in the dark at risk to their safety.

Whether people use open space during the day seems to be determined by the location and seclusion of the area. Some women and men did indicate that they only use the areas in the early morning or at night—a practice that was observed to be more common than practicing open defecation during the day. However, some men indicated that morning time was difficult because of the people walking past on their way to agricultural fields. Relying on open space can also be difficult for women and men when they have diarrhoea. Alternatively, young children and some elderly women and men were observed to have no social inhibitions toward using the open defecation areas during the day.

Influence of Caste and Class on Village Water Supply and Environmental Sanitation

In Sillamarathupatti caste and class are inseparable social divisions deeply embedded in the community. These social divisions affect community and household management of water supply and environmental sanitation, including access to water and sanitation facilities, water collection patterns and the household division of responsibility. Water supply and environmental sanitation facilities are constructed on a street-by-street basis with the upper castes and relations of the prominent upper caste Panchayat members receiving better access to limited resources. The most prominent division is between the facilities available in the SC Colonies and the facilities available in much of the main village. Most of the people of all other castes in the main village of Sillamarathupatti have better water supply and sanitation coverage than SCs.

Divisions of caste and class add to the complexity of social roles and responsibilities in and relationships to water supply and environmental sanitation. Singh (1992) and Ghosh *et al.* (1995) state that in rural India the relationship between the dominant and the dominated as determined by caste divisions influences every aspect of people's lives. Mehta's (1997) work in Gujarat shows that caste relations are a key aspect of social difference. There are different degrees of segregation between castes. However, the gap separating SCs from the rest of the population is more significant than the differences between other castes. SCs form a separate class of society that is segregated by the numerous discriminations and disabilities imposed on them (Deliège, 1999). Mehta (2000) suggests Indian low caste villagers remain victims of local conflicts over water since access is highly differentiated through power and politics. Mehta (1997) also indicates that traditional and modern drinking water institutions function adjacently, with traditional rules of purity—a state of ritual cleanliness (Boot & Cairncross, 1993)—and pollution on one hand and monitoring of modern water supplies by village leaders on the other.

Village Water Supply Facilities

In Sillamarathupatti there is a distinct division between the level of access to water supply facilities for the SCs and the higher castes/classes. For example, the Northeast SC Colony does not have their own 'drinking water' facilities and only received a reliable 'salt water' supply (Syntex tank) one week prior to the October 2001 Panchayat election. The people from the Northeast SC Colony currently rely on one open aeration tank for 'drinking

water' collection and the 'salt water' tank for all other purposes. When water is unavailable from the open aeration tank some members of the SC Colony augment their water supply by collecting water from agricultural areas (gardens) or households of other castes. The SCs are dependent on the generosity of other villagers in order to meet their daily water needs. Similarly, Mehta (1997) indicates access to irrigation water is inextricably linked to land ownership, which remains with the higher castes. The Planning Commission (2002) states that at the national level, SC households have almost the same access to safe drinking water supplies as other households in rural areas. However, there are considerable differences at the State level. For example, in Karnataka rural SC households have better coverage than other households (Planning Commission, 2002). Additionally, WaterAid's (2001) work in four villages in Tiruchirapalli District, Tamil Nadu, has shown that the drinking water supply is defined by the existing caste system.

Poor households of other castes that do not have their own facilities also rely on the generosity of others to some extent, including relations. One BC woman stated:

We ask the people who own their own tap if we can collect one or two pots of water; if we are able to collect the water we only use it for drinking. If the water is not available, we collect water from the nearest garden. The garden owner only gives permission sometimes, so we collect the water whether we have permission or not. Otherwise we collect water from the Bodi Ammapatti drinking water tank. We walk one kilometre to Bodi Ammapatti and carry the water on our heads.

Through conversations with villagers it was revealed that those who must rely on a garden supply often collect water even if the landowner has indicated that they are not allowed; people will wait for the landowner to leave the garden to collect the water. People will risk conflict in order to secure the welfare of their household. In most cases obtaining water from alternative sources is easier for higher castes than it is for the SCs. If necessary, water is also collected from the open aeration tank in Bodi Ammapatti, approximately one and a half kilometres from Sillamarathupatti. Social organisation dictates that women of lower caste, including SCs and Dhobis, can more easily collect water from a farther distance. van Wijk-Sijbesma (1998) indicates that in religions which propagate seclusion for women, wealthier women are generally more restricted in their freedom of movement than poorer women, as the latter have to work for a living.

In Sillamarathupatti, households who can afford household 'drinking water' connections (inside or outside) and a household bore well were found to use more water. Household taps must be approved by the Bodi Panchayat Union Office and are subject to proof provided by the Sillamarathupatti Panchayat that there is extra water available. The Panchayat constructs the household tap once they obtain approval. Households with personal taps are required to pay Rs. 1, 000 for installation and a water tax of Rs. 30 per month to the Panchayat. Some households were observed to use a motor to pump the 'drinking water' from the pipeline into a household water tank whenever the water was available. Pumping the 'drinking water' causes increased inequity by decreasing the amount of water available for other households along the same pipeline.

van Wijk-Sijbesma (1998) indicates that in rural areas, the majority of illegal connections belong to wealthier households. The Commissioners in Pudukottai and Tirunelveli, Tamil Nadu have recorded similar practices indicating that residents of their respective areas have been using motors to draw additional water from the pipelines (Ganesan, 2001; Staff Reporter, 2001). The quantity of water acquired by households of different social status has created water deficiency for some households and conflict within the community. Reddy (1999) found that the economic status of the household has some bearing on the quantity of water used. van Wijk-Sijbesma (1998) indicates that high socio-economic status is positively related to the amount of water collected by households. Additionally, Chauhan and Gopalakrishnan (1983) found that in Guruvarajapalayam, Vellore District, Tamil Nadu, only the wealthiest households had a personal tap, while the majority of households shared community taps. Mehta (1997) argues that small-scale water schemes lack widespread acceptability and that targets based on technology and environmental regeneration seem more important than addressing issues of equity and social justice—there is a tendency to view communities as homogeneous or to focus on just one user group or caste, which is invariably the most powerful.

Water collection patterns in Sillamarathupatti are also affected by the necessity to share water facilities between communities. However, the necessity to share the village-managed water facilities between community groups may have contributed to the decline of traditional caste-based restrictions. The open aeration tank is shared between Northeast SC Colony households and nearby households of other castes. The different communities have

"adjusted" to sharing the water source out of necessity. Some people belonging to the BC community have indicated that they collect water in the early morning "because there is no crowd and the water is clean [free of pollution by SCs]." One BC woman stated, "people of all castes collect water at the open 'drinking water' tank, so we adjust and collect the water." Similarly, members of the SC community seem to also avoid collecting water when people from other communities are using the tank.

Mehta (1997) found that some SCs prefer to go to their own well to avoid conflict. Additionally, van Wijk-Sijbesma (1998) suggests that water shortages and subsequent demand management increase tensions and competition. Deliége (1999) and Mehta (1997) indicate that traditional societal beliefs of purity and pollution manifest in the ban of SCs from collecting water from the village well. The other castes perceive that SCs would contaminate the water and thus, all the communities in the village (Deliége, 1999). Mehta's (1997) research suggests that some of the earlier water restrictions on lower castes have dissolved, while Deliége (1999) states that the prohibition on lower castes using village wells is still common in many Indian villages. Additionally, Deliége's research revealed that although SCs have their own well in many villages, it is often not as deep as the main village well. However, WaterAid (2001) reports that in Tirichirapalli District, Tamil Nadu, the provision of a handpump to several SC colonies is a symbol of their empowerment, whereby they no longer are forced to rely on the upper castes in their community.

Village Environmental Sanitation Facilities

In Sillamarathupatti, conflict over environmental sanitation facilities is not as common as conflict resulting from the division of water supply. However, there is a marked difference in the availability of household and community environmental sanitation facilities between community groups. The Colonies and households located outside of the main village have access to fewer facilities than the majority of the main village. Priority is given to areas of the main village and specifically to higher castes/classes and relations of the Panchayat because the Panchayat has limited resources available for the construction of facilities. Half of the Northeast SC Colony has constructed drainage canals while the Southwest SC Colony and the BC Colony do not. The Northeast SC Colony may be better-off without constructed roads and drainage because of the current condition of the facilities. Located on the eastern edge of the Colony, a pond of drainage water referred to as the

Arabikadal (Arabian Sea) continues to accumulate (Figure 13). *Arabikadal* is a depository for waste from the Colony drainage canals. The SCs are less likely to receive facilities relative to other community groups when they submit a petition or complaint to the Panchayat. The SCs also do not have sufficient resources (time and financial) to construct their own latrine facilities and they believe that the GOTN and/or the Panchayat are responsible for taking action on their behalf. One woman stated,

I am collecting drinking water from the open tank, otherwise the garden. There are no drinking water facilities here. There are no drainage facilities and no toilet facilities. Nobody [Panchayat] has taken any action. There is already one toilet constructed, but it has no water facility and no handpump facility. We have asked the Panchayat for water facilities but they have not taken responsibility. We are collecting the water from gardens. Sometimes the garden owners give permission; sometimes they throw my pots outside.

Additionally, only households of higher socio-economic status have built their own latrines. Kurup *et al.* (1996) and van Wijk-Sijbesma (1998) indicate that there is a high correlation between latrine ownership and socio-economic status. Mukherjee (1990) argues that younger, literate and economically well-off people, who are more exposed to urban influences and media are more favourably disposed towards adopting latrines. The Planning Commission (2002) indicates that the sanitation problem for the majority of households is the lack of awareness and education rather than a lack of resources.



Figure 13: The *Arabikadal* located on the Eastern Border of the NE SC Colony, Sillamarathupatti

Household Responsibilities Relating to Water Supply and Environmental Sanitation

The number of domestic or productive responsibilities that household members have is directly related to household wealth. Social status determines some of the division of household responsibility for water collection, cattle care and solid waste disposal and the ability of household members to carry out these activities. Girls belonging to lower caste/class households hold greater responsibility for domestic activities than children from higher caste/class households. van Wijk-Sijbesma (1998) shows that large demands of work in water supply and waste disposal reduce the time and energy available for other direct and indirect economic tasks, thus forcing women to choose between their productive and reproductive tasks or to involve their children, particularly daughters. Many girls from the SC Colonies are solely responsible for household water collection and solid and cattle waste disposal. Some boys were also observed to be responsible for cattle care. The increased responsibilities given to children of lower caste/class households is because of the necessity for their mothers to contribute to the family income as labourers. Alternatively, children from higher caste/class households have a greater opportunity to attend school regularly and are encouraged to focus their energies on their studies until at least twelfth standard.

Box 4: Summary: The Influence of Socio-cultural Norms on Village Water Supply and Environmental Sanitation

- household division of responsibility for water supply and environmental sanitation management is influenced by and sometimes directly related to gender and caste/class
- household wealth is related to the number of domestic responsibilities that household members have
- women are mainly responsible for household water collection and management
- households whose members share the responsibility of household water management are a minority and some men, children or relations occasionally collect water to help the women
- water collection and management for cattle varies with women, men, children or labourers taking responsibility
- women are mainly responsible for household solid waste disposal
- villagers of upper castes/classes have access to a greater supply of water and sanitation facilities
- low castes/classes depend on the generosity of villagers to meet their daily water needs
- people will risk conflict in order to secure the welfare of their household; conflict over environmental sanitation facilities is not as prominent as conflict resulting from the division of water supply
- social organisation dictates that women of lower caste can more easily collect water from a farther distance than women of upper caste
- water use is related to socio-economic status (*i.e.*, wealthy households use more water)
- water collection patterns are related to the socio-economic status of households and affected by the necessity to share water facilities between caste-based community groups
- necessity to share village-managed water facilities between community groups may have contributed to the decline of traditional caste-based restrictions
- there is a marked gender division in the relationship that women and men have with latrine use

Perceptions about Village Water Supply and Environmental Sanitation and the Relationship to Community Health

Yacoob (1994) and Yacoob and Whiteford (1994) indicate that the nature of perception itself is the realisation that different groups of people have different models for understanding and interpreting what they perceive to be reality. Mehta (2000) argues that water is a multifaceted resource and in everyday contexts it has different faces and meanings and can be simultaneously perceived as a free, social, economic, cultural or symbolic resource. Furthermore, Melchior-Tellier (1991) argues that different cultural groups have specific values that favour cleanliness and practices intended to prevent pollution; however, these beliefs and practices may not be effective or intended to prevent illness.

Boot and Cairncross (1993) indicate that local perceptions about the causes and prevention of water- and sanitation-related diseases vary and change with time. UNICEF's India-wide study in 1988 to 1989 confirmed the necessity to research people's knowledge, attitudes and practices in order to build a strong foundation for social mobilisation and behavioural change strategies (Mukherjee, 1990). The findings continue to be discussed in the literature (Boot & Cairncross, 1993; van Wijk-Sijbesma, 1998), indicating continued ignorance by practitioners toward a comprehensive approach inclusive of local perceptions on water supply and environmental sanitation. According to Chauhan and Gopalakrishnan (1983), the perceptions at the global and the village level contain inaccuracies, half-truths and oversimplifications. Over time these perceptions become myths, partly reflecting the real situation and partly obscuring it.

Village 'Drinking Water' and 'Salt Water' Supply

Good and Bad Drinking Water

In Sillamarathupatti there is a clear distinction between how 'drinking water' and 'salt water' are perceived, and thus, on the priority given to each water source for domestic use regardless of season. When asked what constitutes good drinking water, the most common response from both women and men was that river water is good for drinking because it is 'tasty'. Other descriptors cited include: good, clean, no dust, quenches thirst, good for cooking, comes from a river, better than 'salt water', lighter (fewer minerals) than 'salt water', cool, and good because everyone collects river water. Three men defined good water based

on biological qualities: mixed with medicine (powdered bleach), boiled and filtered, and hygienically pumped and purified. Only one woman and seven men indicated that 'salt water' was good for drinking.

The responses for what constitutes bad drinking water were more varied, particularly responses from men. The most common response from women was that bad drinking water is 'salt water' because it is 'salty'. The majority of men indicating that either 'salt water' is bad drinking water or that there is no bad drinking water. Additional reasons cited for why 'salt water' is bad drinking water include: increases thirst, not clean, rice turns yellow if cooked with 'salt water', dusty, comprised of several sources, and uncovered and not used daily. Other definitions of bad drinking water include: water with worms; drainage water; water mixed with sand; 'drinking water' mixed with drainage water; rainwater; pond water; river water and dusty water during the rainy season; water that causes diarrhoea, cold and fever; river water when the tank is not cleaned; water that has sat in a tank for ten to fifteen days; water that is collected from an open source; water that is not purified scientifically; and water that has not been boiled. Overall, both formally educated and uneducated villagers define good and bad drinking water by contrasting the characteristics of the available water sources.

There is continuity on what is perceived as good drinking water in India. Studies have shown that many villagers believe that water that looks, tastes and smells good is clean, rather than defining cleanliness based on the biological quality (Chauhan & Gopalakrishnan, 1983; Mukherjee, 1990). Additionally, the research complements Manikutty's (1997) argument that perceptions of what constitutes good or bad drinking water cannot be solely attributed to one's level of formal education. For example, Manikutty's research (1997) revealed that despite the high literacy rate in Kerala, the health awareness of the people is low and the majority of people believe that well water is safe.

Relationship between Bad Drinking Water and Health

When asked to identify the health problems caused by bad drinking water, the most common responses from women and men were that bad drinking water causes fever, cold and/or cough—symptoms that do not have a direct relationship to drinking unsafe water. Additionally, men commonly identified diarrhoea and headache. Twenty-six percent of the women and 14 percent of the men indicated that bad water does not cause any health problems with some indicating that they do not get health problems because they only drink

river water. Five percent of the women and four percent of the men indicated that they did not know if bad water causes health problems. The remainder of responses from women and men were numerous, including cholera, stomach pain, typhoid, malaria, asthma, all kinds of diseases, itchiness, tuberculosis, sinus trouble, vomiting, skin disease and influenza. The research supports Mukherjee's (1990) conclusion that the majority of people lack factual knowledge about the relationship between bad drinking water and health, and thus they use misconceptions and vague guesses to explain the relationship.

Village Environmental Sanitation

Relationship of Environmental Sanitation to 'Cleanliness'

Differing levels of 'cleanliness' as described by Mukherjee (1990), help to understand the perceptions of the majority of people in Sillamarathupatti. Mukherjee (1990) reports that 'cleanliness' is understood as a holistic concept, emanating from within the person—from one's thoughts and behaviour and extending first to one's physical self, secondly to one's home and lastly to one's environment. Traditional practices in Sillamarathupatti consist of the disposal of household solid waste and defecation in open areas outside of the village; as long as one's physical self and one's home was free of waste, people felt clean. However, with increasing solid waste because of industrialisation and increasing population, greater pressure has been exerted on the environment and waste has moved closer to and into the village. Ninety-three percent of both women and men indicated that the current open areas are inadequate for defecation because of increasing population pressure and housing construction. Privacy for defecation has decreased, and thus, more people share one area and many use roadsides. However, even with increasing competition for open space in Sillamarathupatti, only nine percent of the women and 28 percent of the men indicated that public latrines should be constructed because most prefer practicing open defecation.

Mukherjee (1990) indicates that people in rural India are still far from being adequately aware that there are feasible, affordable and more hygienic alternatives to defecating outdoors. van Wijk-Sijbesma (1998) indicates that studies have shown that the degree of demand for facilities to dispose of human excreta is strongly related to the local physical and socio-cultural environment. van Wijk-Sijbesma (1998) indicates that high-risk areas are characterised by high settlement density and low access to facilities and services for sanitary disposal of human excreta and other types of waste. Additionally, Mukherjee (1990)

indicates that Tamil Nadu has the largest population within India that expressed disinterest in obtaining a household latrine. Yacoob (1994) and Yacoob and Whiteford (1994) argue that sanitation innovations are harder to implement than water supply innovations because of social influences such as belief, culture and change. Chauhan & Gopalakrishnan (1983) found that there is a strong cultural feeling against having latrines too close to the living area of a house and especially to the cooking area. Furthermore, Manikutty (1997) suggests that Indian villagers maintain many traditional beliefs, some of which result in habits that affect people's health.

Relationship Between Environmental Sanitation and Health

The majority of the villagers seem unaware of the relationship between open defecation and illness, but rather complain about the practice in terms of it creating a bad smell, the existence of too many plants growing in the area, there not being enough privacy, or that there are no light or water facilities (Table 12). Additionally, 18 percent of the women and 11 percent of the men indicated that the open areas would be adequate if the Panchayat took the responsibility of cleaning the areas on a regular basis. Furthermore, the researcher found it difficult to explain that she was ill because of intestinal worms. When the researcher had a combination of roundworm and hookworm some villagers believed that she was sick because of *kan padudhal* or 'the casting of an evil eye'. In order to free the researcher from the effects of *kan padudhal*, a large bundle of chillies wrapped in newspaper were burnt after circling the bundle around the researcher's head three times. Furthermore, it is believed that the evil eye cast is as vehement as the bursting chillies—if the chillies do not burst the individual was not affected by the casting of an evil eye. If the chillies do burst it is believed that the effects of the evil eye have disappeared. Similarly, Chauhan and Gopalakrishnan (1983) identified various types of diarrhoea that are based on social taboos.

Table 12: Gender-specific Expectations for the Maintenance of Open Defecation Areas

Expectations of Women	Expectations of Men
it would be good if the Panchayat swept the area and if they built a wall because it is very difficult for women	the Panchayat should sweep the open areas
the women want a common open space because there are no water facilities	the Panchayat should clean the area once a month and build a water tank
it would be enough if the Panchayat spread some bleaching powder over the area once a month	there should be separate places for men and women and water facilities would be good
there are a lot of plants in the open space, so it would be good if the Panchayat removed them	there is no need for maintenance because open spaces are hygienic
the areas should be cleaned once a week	the open areas cannot be cleaned because area is privately owned
it would be good if there is no longer a bad smell in the open space	there is no need to clean the open area because the forest is very large
the Panchayat should clean the open place; it would also be nice if they opened the constructed latrines	the pigs come, so maintenance is not necessary
there is no need for any maintenance	maintenance is not necessary for the areas men use; but, cleaning the area & providing water facilities is a must for women
it does not matter if the Panchayat cleans it or not	maintenance is not necessary for men but a separate place for women would be nice
it would be good if the Panchayat provided a new constructed toilet instead of maintaining the open areas	open toilets must be banned; human waste can be converted into methane gas and used for energy (lights, cooking)
we want a constructed toilet with light & water facilities	women need a constructed latrine because they are becoming ill from the dirtiness of open areas

Alternatively, when asked to identify the health problems caused by clogged drainage the common responses of both women and men were that clogged drainage causes an increased number of mosquitoes, fever and a bad smell. Men also commonly identified malaria as a resulting health problem. However, 20 percent of both women and men indicated that clogged drainage does not cause any health problems. One woman stated: "When the rain comes, the drainage water comes into the [Northeast] colony. The water stays for a long time, especially in the area without constructed streets. The drainage water storage area [*Arabikadal*] does not affect our health; the nearest house is only affected." This statement reflects a common perception that the health of people is only at risk from the

village environmental sanitation management practices if their house is adjacent to waste disposal areas (defecation, drainage, household solid waste)—a belief rooted in the cultural concepts of purity and pollution.

'Story with a Gap' (Appendix V; 106) was a useful method for engaging women and men to discuss their perceptions of an unsanitary and sanitary village environment. The villagers' reliance on the GOTN and the Panchayat for maintaining the village water supply and environmental sanitation facilities was reinforced during the discussion. The women participants described the gap between the images without providing detailed information about what each image depicted. All of the women indicated that after the villagers complained, the GOTN and/or the Panchayat provided facilities, including a handpump, 'drinking water' taps, trees, a latrine, drainage canals, clean roads, a separate solid waste disposal area and new houses. For example, one woman indicated that, "The village people complained to the Government [GOTN], telling them that because their village is very dirty sickness is coming. So, the Government [GOTN] constructed houses, a handpump, clean roads, a separate garbage area, and a toilet facility. The village used to be very dirty but now it is very clean." Another woman related the images to the situation in Sillamarathupatti by stating that the village changed because, "The woman complained to the Panchayat. The people from the Panchayat came and helped the woman. The Panchayat provided a handpump, house, some nice trees, toilet and a clean road. Illness would never come if we maintain our village [Sillamarathupatti] this way." Although the second woman's statement that "illness would never come if we maintain our village this way" indicates that villagers should take responsibility, both women placed emphasis on the Panchayat's responsibility to improve facilities and ultimately village sanitation.

The men provided detailed descriptions of both images and emphasised that the first image showed an unsanitary environment because there were no designated spaces for different activities. For example, one man described the images as follows:

Defecation near the house is not good, spitting near the house is not good, tying the cow near the house is not good and the man laying down in the centre of the yard is not good. So, there is a chance of illness coming. A separate place for the latrine is a must, a separate cattle house for the cow tying area is a must, a dustbin [solid waste disposal area] is a must, and drinking water, latrine and bathroom facilities. If all of these things were available I would be happy (Image 1).

In the second photo there are dustbin facilities on the side of the road, latrine facilities in a separate area, drainage facilities, the houses are nicely spaced, and the household areas are clean. In this type of situation no illness comes, so it is a happy life (Image 2).

Another man related the first image to Sillamarathupatti indicating that the picture shows "people living in a very dirty place. Mosquitoes, hens and cows are shown, so the place is very dirty and this is causing illness. It is possible that the type of illness is contagious. This kind of situation might have been in Sillamarathupatti before, but now this kind of situation is not here." The man's statement that the first image does not reflect the current situation in Sillamarathupatti is partially true because people do not conduct all activities in one area next to their house. As discussed previously, there are designated areas for solid and liquid waste disposal and defecation; however, with population pressure and decreasing space available, the efficiency and sustainability of the water supply and environment sanitation practices are questionable.

Box 5: Summary: Perceptions about Village Water Supply and Environmental Sanitation and the Relationship to Community Health

- there is a clear distinction between how 'drinking water' and 'salt water' are perceived and thus, on the priority given to each water source for domestic use
- there is a continuity in India of perceptions relating to good drinking water
- traditional environmental sanitation practices are based on perceptions of pollution and purity—as long as one's physical self and one's home is free of waste, people feel clean
- most people believe that current open defecation areas are inadequate because of increasing population pressure
- most people are not comprehensively aware of the relationship between unsanitary environments and community health

Efficiency and Sustainability of the Village Water Supply and Environmental Sanitation

van Wijk-Sijbesma (2001) argues that there has been continuing failure, well documented in the literature, to provide reliable domestic water supply services with sufficient and safe water to meet at least basic household requirements. Reddy (1999) argues that drinking water problems in rural areas are mainly due to the mismanagement of the resource rather than the water scarcity. Additionally, the Planning Commission (2001b) indicates that the Government's responsibility to provide a minimum water supply of 40 lpcd free of cost has led to a disregard for demand. Manikutty (1997) argues that sanitation programmes, which rely mainly on sources of financing and implementation from outside the communities, have a low level of sustainability. A new water supply can, when

adequately designed, installed, maintained and managed, serve a growing population for ten to thirty years, while a latrine programme's coverage goes down the moment construction ends unless capacity is developed through which new households build and use latrines with their own resources. van Wijk-Sijbesma (2001) shows that a lack of user participation in design choices and local planning, maintenance, and management of services are major reasons for inefficient and unsustainable water supply and environmental sanitation services. Furthermore, Gross *et al.* (2001) indicate that greater equity is achieved by providing greater voice and choice to all villagers during the process of establishing services.

For the purpose of the research, sustainability is defined as the capacity to maintain efficient water supply and environmental sanitation services at the community level without detrimental effects on the community and the environment (adapted from Narayan, 1993). Efficiency includes the optimal, hygienic and consistent use and maintenance of water supply and environmental sanitation facilities to maximise the benefits and minimise the negative consequences over an extended period of time (adapted from DDWS, 2001b; GOTN, 2001b; Narayan, 1993; van Wijk-Sijbesma, 2001). The numerical analysis of the efficiency and sustainability of water supply and environmental sanitation facilities within the village is limited to the data obtained from the 57 households that participated in the semi-structured questionnaire. A comparison between the levels of access to water supply facilities between and within community groups was unfeasible because of limited time and resources.

Optimal Use of Water Supply Facilities

The optimal use of water supply facilities is assessed according to the National and State Governments' norms for rural drinking water supply (DDWS 2001b; TWAD, 2001b) and Narayan's (1993) measures for effective use. The following factors are considered: number and characteristic of those who use the water sources; coverage and adequacy of the water supply; time required to use the water facilities; and the conservation and management of the water sources. As previously discussed, the people of Sillamarathupatti rely on a variety of 'drinking water' and 'salt water' sources and access to these sources varies with household location and community groups. In assessing the optimal use of water supply facilities the responses from the 57 women household heads are mainly considered because women are mainly responsible for household water management.

Number and Characteristics of those who Use the Water Sources

The Government established norm of one handpump or one stand post per 250 persons is a difficult parameter to determine. Dividing the total population by the total number of public functioning facilities (6320/78), including street taps, handpumps, open aeration tanks and GLR tanks, suggests that there are approximately 81 people per facility. However, people do not have equal access to the public water supply facilities and the availability varies by street and community group. Additionally, some households with their own tap share with others, however an average of 85 percent of the women with their own household tap indicated that they do not share. People collect water from public facilities by forming a queue and equally dividing the number of pots collected per household. One woman indicated, "when we collect the water from the drinking water place [open aeration tank], the first person there collects water, then the second person collects the water. Sometimes the second person wants to collect water first and this causes problems." Forty-six percent of the women indicated that they use two to three 'drinking water' sources and 54 percent indicated that they only use one source. Twenty-eight percent of the women indicated that they use two to three 'salt water' sources, 60 percent indicated that they use one source and 12 percent indicated that they do not collect salt water (Table 13). To obtain a true representation of the number of users per facility further research would be necessary to determine the water sources available to each street and colony and the division of use between households.

Table 13: The Number of 'Drinking Water' and 'Salt Water' Sources used per Household as Indicated by Women

# of Source(s)	Water Source (%)	
	Drinking	Salt
2 to 3	46	28
1	54	60
None	0	12

Coverage and Adequacy of the Water Supply

The ARWSP focuses on physical coverage of all rural habitations with the established norms of 40 lpcd of safe public drinking water (DDWS, 2001b; TWAD, 2001b) and 55 lpcd for households with access to personal connections (TWAD, 2001b). Furthermore, TWAD has established four categories of coverage status for rural habitations: not covered (no water supply); no safe source (water quality problems); partially covered (water supply < 40 lpcd); and fully covered (\geq 40 lpcd). Seventy-two percent of the women indicated that their total water supply coverage ('drinking water' + 'salt water') is no less than 40 lpcd—a calculation based on the assumption that each woman uses a 15 litre container to collect water (Table 14). Additionally, 'drinking water' makes up a larger portion of the total lpcd. The total average amount of water obtained from both sources is 77 lpcd with an average of 53 lpcd of 'drinking water' and 28 lpcd of 'salt water'. As per the Government norms, Sillamarathupatti is classified as a fully covered rural habitation; however, as previously indicated, water distribution is inequitable. Furthermore, when women were asked whether there is enough 'drinking water' and 'salt water' for their household use the response was 86 percent and 82 percent respectively (Table 15). However, there is a large discrepancy between the responses from women and men. One man indicated:

If the drinking water becomes available daily, the people would become happy. Now, drinking water comes once every two or three days. Whenever the main pipeline is broken the drinking water does not come. There is not enough drinking water or salt water...the river water has been coming to my area for the last year; previously, there were more drinking water problems. At that time we were collecting water from the agricultural area, otherwise, we collected water from a handpump near the bus stop on the Bodi to Thevaram road.

Additionally, 75 percent of the women respondents indicated that they use 'drinking water' for a variety of purposes: drinking, cooking, bathing, washing clothes, cattle care, and cleaning vessels.

Table 14: Households with Full and Partial Water Supply Coverage as Indicated by Women for 'Drinking Water', 'Salt Water' and the Total Water Supply

Coverage Status	Source (%)		Total Water Supply
	'Drinking Water'	'Salt Water'	
Full (\geq 40 lpcd)	47	16	72
Partial (< 40 lpcd)	53	84	28

Table 15: Households with Adequate 'Drinking Water' and 'Salt Water' Supply as Indicated by Women and Men

	Source (%)	
	'Drinking Water'	'Salt Water'
Women	86	82
Men	42	50
Average	64	66

An Assessment of the Time Required to Use the Water Facilities

The third factor considered in determining the optimal use of the water supply facilities is the time required to use the facilities. The established norms indicate that the water source(s) should be located within 1.6 km of the village (DDWS, 2001b). The majority of the water sources used by the households in Sillamarathupatti are located within the village and are within the established distance. However, when a round trip is considered the 'drinking water' from Bodi Ammapatti and the garden wells are located outside of the established distance. When asked how long it takes to collect household 'drinking water' and 'salt water', women indicated an average of 35 minutes and 66 minutes respectively (approximately 0.5 to 1.5 hours daily) (Table 16 and Table 17). The data also demonstrates a clear trend in the time required to use the household facilities, public facilities and garden wells. Overall, collecting water from a household source takes less time than collecting water from other sources. The greatest amount of time is required to collect water from the open aeration tank, handpump and garden for a variety of reasons: these sources are located farther away from most households than other sources; the open aeration tank is shared among the largest number of people; the handpumps are difficult to pump water from because of the low water table; and the gardens are located outside of the village.

Table 16: Time Required to Collect 'Drinking Water' by Facility as Indicated by Women and Men

	Household Tap (min)		Public Facilities (min)		Average (min)
	Inside	Outside	Street Tap	Open Aeration Tank	
Women	28	29	32	50	35
Men	29	27	33	94	46
Average	28	28	33	72	

Table 17: Time Required to Collect 'Salt Water' by Facility as Indicated by Women and Men

	Facility (min)					
	Household Bore Well	Street Tap	GLR Tank	Handpump	Garden	Average
Women	120*	47	37	61	67	66
Men	27	41	27	48	56	40
Average	74	44	32	55	62	

*The data is not representative because only one woman responded.

Conservation and Management of the Water Sources

There are no specific Government guidelines for the assessment of the management and conservation of the available water sources. However, the lack of facilities and practice clearly show that water conservation and management practices in Sillamarathupatti are not efficient or sustainable. There is a need for improved conservation measures such as constructing household rainwater harvesting systems and rehabilitating the traditional ponds and rainwater storage tanks. The villagers do not have adequate facilities to harvest an optimal amount of rainwater. Forty-nine percent of the women respondents indicated that their household collects rainwater. However, through participant observation the amount of rainwater collected was found to be minimal since water was only collected in a few spare buckets. Only seven percent of the women indicated that they reuse water for purposes such as watering plants, toilet use and cleaning the floor. Additionally, households with cattle were observed to save water used to wash rice and *dal* for the cattle to drink. A more efficient drainage system should be constructed whereby the rainwater can be directed into a traditional tank. Currently most of the rainfall is lost to the village through overland flow. Similarly, Reddy (1999) indicates that in Jodhpur District, Western Rajasthan, that dependency on the reliability of modern systems has led to the disuse of traditional systems in rural areas. Furthermore, the absence of state support to strengthen traditional systems and their neglect at the local level (as a result of the villagers' hopes of getting improved water supplies), has led to these systems falling into disuse and disrepair.

The Planning Commission (2001b) suggests that pipe-oriented solutions to water supply problems (scarcity, brackishness and excess fluoride) are not very efficient. Rather, there is a need for water harvesting and conservation measures with emphasis on direct or indirect artificial recharge of aquifers by using surplus run-off. Revival of traditional

technologies for rainwater harvesting can prove to be economical, successful and a long-term solution, and therefore should receive emphasis by all States, particularly those with water scarcity. TWAD (2002) indicates that the total annual rainfall in Tamil Nadu occurs during three or four months, and thus the water collected during the monsoon would have to be stored for use throughout the year. Storing the rainwater from the monsoon would require the ability to hold large volumes of water, therefore TWAD (2002) suggests that it would be more feasible to use rainwater for recharging aquifers.

Reddy (1999) also argues that the maintenance of traditional systems and judicious rainwater harvesting methods could greatly contribute to solving current water problems. As of April, 1999, the GOI began providing funding incentives to the State Governments in order to initiate steps for institutionalising community participation in the ARWSP. In order to acquire the additional funds, the State Governments are required to implement a sector reform process comprised of (Planning Commission, 2001a; TWAD, 2001b):

- the adoption of a demand-driven approach based on community empowerment to ensure full participation in the project through a decision-making role in the choice of scheme design and management;
- a focus on village level capacity building through the establishment of village water and sanitation management committees;
- to ensure an integrated service delivery mechanism by streamlining the functions of the agencies involved in project implementation.;
- 10% minimum capital cost sharing by users in the form of cash or kind (labour, land or material); and
- conservation measures for sustained water supply through rainwater harvesting and ground water recharge structures.

However, the Planning Commission (2001a) indicates that sector reforms such as improving local capacity for water management are politically and administratively unpopular. Furthermore, the Planning Commission (2001a) argues that the drinking water problem is a governance issue, which requires changes toward community control over funds and programmes, effective monitoring and a transformation of the implementation of government programmes.

Hygienic Use of Water Supply and Environmental Sanitation Facilities

The hygienic use of the water supply and environmental sanitation facilities is assessed according to water treatment and quality (village and household); water transport and storage practices; and environmental cleanliness, including the presence and state of waste disposal provisions (water, household solid waste and faeces).

Practices to Improve Water Quality: Village and Household Level

The research did not analyse the water quality and thus it is uncertain whether the 'drinking water' and 'salt water' can be classified as 'safe'. However, the current level of environmental sanitation poses a risk for contamination of the water sources. The maintenance of the water system is inconsistent, allowing for contamination at different stages of distribution. Both the Ouppukkottai Pumping Station and the Sillamarathupatti Panchayat are responsible for maintenance of the 'drinking water' supply. Management of the public water supply does not follow all of the precautions that TWAD (2001a) indicates as necessary to protect the quality of public drinking water supplies:

- drinking water sources should be fenced and well protected;
- no defecation should be permitted near these sources;
- pollution from domestic, industrial and agricultural wastes should not find access to these sources;
- drainage carrying sewage and other liquid wastes should be diverted away from drinking water sources;
- solid wastes should not be dumped near these sources;
- formation of cesspools, allowing the cattle to graze near the drinking water source, tying cattle around the water structure *etc.* should be prevented;
- bathing, washing *etc.* should not be practiced near wells, hand pumps and other drinking water sources;
- ponds and lakes used as drinking water sources should not be used for bathing or washing of cattle and vehicles;
- open wells and hand pumps should have platforms—the wastewater should be drained out into soak pits located away from the sources; and
- leakage and bursts in pipelines should be attended to immediately.

There is only limited water treatment and maintenance of both the 'drinking water' and 'salt water' supplies. Treatment of the 'drinking water' consists of a filtering system and

specifications for cleanliness using powdered bleach. 'Dust' (leaves, worms, insects) is filtered out of the river water at the Oupukkottai Pumping Station via a fine meshed metal filter. Once a week the sump is cleaned with powdered bleach and a broom while empty. Twenty-five kilograms of powdered bleach are dissolved in water and added to the sump when it is refilled. Once per month the Pumping Station provides one 25 kg package of powdered bleach to each village Panchayat. (electrician, Oupukkottai pumping station, personal communication, February 2002). The Sillamarathupatti Panchayat is responsible for cleaning the main 'drinking water' storage tank with powdered bleach and mixing 600 g of powdered bleach into the tank once every fifteen days (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). Additionally, the Bodi Ammapatti Pumping Station cleans their tank with powdered bleach once per month (electrician, Bodi Ammapatti pumping station, personal communication, February 2002).

Greater precaution for water quality is taken during the rainy season by mixing 25 kg of powdered bleach into the Oupukkottai sump twice per day (electrician, Oupukkottai pumping station, personal communication, February 2002). The electrician (Oupukkottai pumping station, personal communication, February 2002) indicated that "we [Pumping Stations] used to mix bleaching powder into the water daily, however the people did not like it; therefore we [Pumping Station] only mix bleaching powder into the water daily whenever diarrhoea comes." Similarly, Chauhan and Gopalakrishnan (1983) found that the water supply in the village of Guruvarajapalayam, Vellore District, Tamil Nadu was not regularly chlorinated for a variety of reasons: chlorine was not always available; calculating and measuring out the necessary amount of each well is laborious; and the villagers are not convinced of the value of chlorination, stating that the water does not taste good. During the rainy season the Sillamarathupatti Panchayat advises the villagers via *dbandoram* and the GPHC informs their patients to boil the water before drinking. One woman indicated that: "sometimes they [Panchayat] add medicine to the 'drinking water'. They tell us anything of importance, but they only say it at the colony entrance; they [man with *dbandoram*] do not come into the [SC] colony." However, the Panchayat President (personal communication, January 2002) indicated that although it is the Panchayat's responsibility to advise the people to boil their water, he was unsure if the people adhered to the advisory. One man indicated:

Drainage water mixes with the drinking water during the rainy season. At this time the Panchayat mixes bleaching powder into the drinking water and then supplies it to the people. During the rainy season the water becomes dusty, causing children to get jaundice, typhoid and fever. Small worms also become mixed with the water and when children drink it they get fever, stomachache and headache.

The majority of households do not treat their water before drinking: 28 percent of the women indicated that they treat their household's 'drinking water'; and 19 percent of the women indicated that they treat 'salt water' (out of 46 percent of women who indicated their household drinks 'salt water'). However, the confidence of these values is uncertain. Through informal discussions and community mapping exercises many people indicated that they only boil and/or filter their water during the rainy season or when somebody in their household is ill. Additionally, filtering can include one or more methods, including a stainless steel filter, mesh filter or cloth filter. Furthermore, it is inefficient or impossible for the poor to boil their water because of limited access to wood or kerosene fuel. Similarly, Chauhan and Gopalakrishnan (1983) found that people with a scarce amount of fuel are unable to boil 'drinking water' in Vellore District, Tamil Nadu. The research also complements Manikutty's (1997) conclusion that there is need to educate villagers in rural India about the hazards of drinking water without boiling.

Water Transport and Storage Practices

Treating the 'drinking water' prior to distributing the supply to the people of Sillamarathupatti does not guarantee water quality. There are reasons to believe that the water becomes contaminated during transport and storage: inadequate infrastructure (*e.g.*, some of the water pipelines run through the drainage canals) (Figure 14); carrying open containers; leaving drinking water containers uncovered in the home; and obtaining drinking water by dipping cups directly into the water. There is a large risk of contamination of the 'drinking water' in the open aeration tanks. One man stated, "I definitely want safe and clean water via a pipeline [common tap]. But, this facility is not available in this village. When the people collect water from the open tank, they put their hand and leg in the water so it is unclean—this water is used for drinking." Additionally, Mr. S. Surilivel, Sillamarathupatti Panchayat President (personal communication, January 2002) indicated that some people have complained to the Panchayat about drainage water contaminating the 'drinking water' in the open aeration tank on Bodi Ammapatti Road. For example, one woman indicated,

"sometimes the drainage water mixes with the open tank water because there is a drainage canal next to the open tank." Furthermore, another woman stated that "in the rainy season, the water from the open tank mixes with the drainage water. We [members of the Northeast SC Colony] know this happens, but we have no choice, so we drink this water." The Panchayat plans to reconstruct the open aeration tank, however they currently do not have enough government funding (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002).



Figure 14: 'Drinking Water' Pipeline Running through a Drainage Canal, Sillamarathupatti

Environmental Cleanliness: The Presence and State of Waste Disposal Provisions

The areas surrounding the 'drinking water' and 'salt water' facilities are not hygienically maintained. There is a risk of water contamination because of unhygienic environmental sanitation practices such as open defecation and indiscriminate solid waste (household and cattle) and liquid waste disposal. For example, the cattle in Ouppukkottai are washed in the river at the pumping station and the riverbank is used for open defecation. Furthermore, solid household waste surrounds many of the public facilities and wastewater is improperly drained from the area (Figure 15 and Figure 16).



Figure 15: Open Aeration Tank: Overflowing and Surrounded by Solid Waste, Sillamarathupatti



Figure 16: Stagnant Water at a Public 'Salt Water' Tap, Sillamarathupatti

The Panchayat employs five part-time sweepers (one woman and four men) who are responsible for cleaning the drainage canals and solid waste on public land (e.g., the *Mundbai Kulam* every six months). The male sweepers are responsible for deciding what canals should be cleaned and they also respond to complaints from villagers and orders from the Panchayat. The solid waste is dug out of the canal and put on the side of the road in large

piles, which are left to dry for approximately one week (Figure 17). The sweepers collect the waste with a bullock cart and dispose of it in the village burial grounds (Figure 18). The woman sweeper cleans human faeces from the drainage canal in front of the Panchayat Office six days per week (Mr. S. Surilivel, Sillamarathupatti Panchayat President, personal communication, January 2002). However, many of the villagers complain that the drainage facilities are inadequately maintained.



Figure 17: Drainage Solid Waste Piled on the Roadside to Dry, Sillamarathupatti



Figure 18: Sweepers Collection Drainage Solid Waste from the Roadside using a Bullock Cart, Sillamarathupatti

When asked to explain the role of the Panchayat in maintaining the drainage facilities, the respondents indicated that the canals are cleaned once per month, twice per month, anywhere between two and six months or only during Panchayat elections and festivals (*e.g., Deepavali, Pongal*). For example, one woman indicated that "the scavengers [sweepers] only clean the drainage during the festival time. They ask for money; we never give them any. Since the drainage was constructed, we are the only ones who have cleaned it. We use our hands and a *man vadi* [pick-axe] to clean the drainage." One man indicated, "the drainage is clogged because it is never cleaned. The drainage is cleaned once every five or ten years. My house is west of the clogged drainage, so it is difficult to live here. One hundred people on [our] street signed a petition to complain to the Panchayat; the Panchayat did not take any action." Furthermore, when the solid drainage waste is left on the roadside to dry, hens push some of it back into the canal when they search for food.

Consistent Use and Maintenance of Water Supply and Environmental Sanitation Facilities

The people of Sillamarathupatti use the 'drinking water' and salt water' supplies consistently and the facilities are fairly reliable. However, during the five month research period the pipeline needed repairs on an average of once per month, leaving the people without 'drinking water' for up to four days at a time. One man indicated that the "drinking water is only available once every two days. The people do not know when the water will come. The people collect water whenever it comes...whenever the main pipeline is broken the 'drinking water' does not come." The electrician from the Bodi Ammapatti pumping station (personal communication, February 2002) indicated that when the pipeline breaks, the repairs take "only two or three days. The pipeline is repaired very quickly, so it is no problem. The pipeline breaks because of the high pressure and the pipe is also very old." The water use patterns are not largely affected by season. However, as previously indicated, a small amount of rainwater is collected for household use and a greater number of people boil and/or filter their water during the rainy season. The most significant change in water use patterns was the construction of the *Kuttu Kudineer Thittam*. The majority of people indicated that the quantity and quality of the village water supply improved with the *Kuttu Kudineer Thittam* while the quantity and quality of the 'salt water' has been declining. One woman stated, "now both waters continue to come so there are only some water problems. Before [the 'drinking water' came] there were many water problems here."

Box 6: Summary: Efficiency and Sustainability of the Village Water Supply and Environmental Sanitation

- the water supplies are efficient based on the National and State Governments' norms used to assess optimal use
- the number and characteristics of the users of the available water sources was difficult to determine because of the unequal distribution of facilities based on caste/class
- the number of people sharing one facility varies with the type and location of the facility
- Sillamarathupatti is classified as a fully covered rural habitation—the water supply coverage is no less than 40 lpcd and is comprised of a larger amount of 'drinking water'
- the majority of daily household water supply is comprised of a larger proportion of 'drinking water' than 'salt water'
- most women believe there is enough 'drinking water' and 'salt water' for their household's use
- the majority of the water sources are located within the village and within 1.6 km
- household water collection takes women an average of approximately 0.5 to 1.5 hours daily
- there is a clear trend in the division of time between household facilities, public facilities and garden wells
- water conservation and management practices are not optimally efficient and sustainable
- the state of environmental sanitation poses a risk of contaminating the water sources
- maintenance of the water system is inconsistent and does not prevent contamination in the distribution, collection, and storage
- there is reason to believe that the water becomes contaminated during transport and storage
- increased precaution for water cleanliness is taken during the rainy season
- most women do not treat their household's water supply on a regular basis because they are unconcerned about or do not clearly understand the relationship between water quality and health and/or because they do not have sufficient resources
- 'drinking water' and 'salt water' are used consistently and the facilities are fairly reliable
- most people indicated that 'drinking water' has increased the available quantity and quality of water, however the quantity and quality of the 'salt water' has been declining

Chapter Five

Summary, Conclusions, Recommendations and Reflections

Summary

This research provides continuity with a collaborative project on Community Action Plans (CAPs) for restoring the environment in the Thevaram Basin, Theni District, Tamil Nadu (Kumaran *et al.* 1999; Kumaran & Hyma, 2001) and follows-up on recommendations by Tummon (2001). Natural resource- and socio-economic-based problems were assessed through PRAs. Women and men identified water quality and scarcity as one of the key natural resource-based problems and latrine and drainage facilities as key socio-economic problems in their communities (Kumaran *et al.*, 1999; Kumaran & Hyma, 2001). Therefore, the purpose of this thesis was to examine the efficiency and sustainability of the existing community water supply and environmental sanitation facilities and how these facilities are influenced by socio-cultural norms and community perceptions in the village of Sillamarathupatti, Theni District, Tamil Nadu, India. The research was founded on four objectives:

1. To examine past and current village water supply- and environmental sanitation-based initiatives (schemes, projects or programmes).
2. To identify how socio-cultural norms influence village water supply and environmental sanitation activities.
3. To identify women's and men's perceptions about water supply and environmental sanitation and the relationship to community health.
4. To examine the efficiency and sustainability of existing village water supply and environmental sanitation.

The study was conducted in the village of Sillamarathupatti because of its proximity to the CAP study villages and because no previous research had been conducted on water supply and sanitation in Sillamarathupatti. Sillamarathupatti has 1, 614 households (Village Administration Office, personal communication, September 2001) and a population of 6, 320, of whom 15 percent are Scheduled Caste (SC) and 4, 620 are eligible to vote.

The research methods were mainly qualitative with a participatory community-based gender-sensitive approach and the research was conducted over a period of five months (September 2001 to January 2002). The following PRA methods were employed: community

mapping; transect walks; informal interviews; semi-structured interviews; and story with a gap. Participant observation was used as a complementary qualitative method and a semi-structured questionnaire was used to collect qualitative and quantitative data. Participation was encouraged from a diversity of people based on gender, caste, class and age in order to obtain comprehensive information. The following was conducted: community mapping and transects with between six and thirty people on thirteen streets, two SC Colonies and the Backward Caste Colony; fifteen individual (four with women and ten with men) and three group informal interviews; four semi-structured interviews; story with a gap with 11 women and 11 men; and the semi-structured questionnaire with the woman and man household heads of 57 households. Two research assistants, one woman and one man, aided in translations, guidance in cultural sensitivity, data collection and recording. The major findings are summarised below.

The existing village water supply and environmental sanitation facilities have been constructed through supply-driven, Local and State Government initiatives, with a larger amount of resources invested in improved water supply. Projects are initiated on the basis of village needs, community complaints, government suggestions and government schemes. The Panchayat is responsible for management of water supply and drainage facilities; minimal responsibility is taken for managing open areas on public land. The village water supply is comprised of 'drinking water' and 'salt water'. The majority of households rely on multiple sources/facilities to meet their daily needs. Villagers of all community groups strongly rely on local and State Government.

Socio-cultural norms affect community and household management of water supply and environmental sanitation, including: access to water and sanitation facilities; water collection patterns; and the household division of responsibility. Women are mainly responsible for household water collection and management and household solid waste disposal. Water collection and management for cattle varies with women, men, children or labourers taking responsibility. Sharing water sources between community groups may have contributed to the decline of rigid traditional caste-based restrictions on water supplies. People will risk conflict in order to secure the welfare of their household—conflict over environmental sanitation facilities is not as prominent as conflict over water supply.

Perceptions influence the management of household and village water supply and environmental sanitation. There is a clear distinction between how 'drinking water' and 'salt water' are perceived and therefore on the priority given to each water source for domestic use. Traditional environmental sanitation practices are based on perceptions of pollution and purity—as long as one's physical self and one's home is free of waste, people feel clean. The majority of villagers are not comprehensively aware of the relationship between unsanitary environments and community health.

The efficiency and sustainability of village water supply and environmental sanitation is related to the optimal use, hygienic use and consistent use of facilities. The number of people sharing one facility varies with the type and location of the facility. 'Drinking water' and 'salt water' are used consistently and the facilities are fairly reliable. Sillamarathupatti is fully covered and the majority of the water sources are located within 1.6 km of the village. Household water collection takes women, on average, approximately 0.5 to 1.5 hours daily. Water conservation and management practices are not efficient and sustainable. Maintenance of the water system is inconsistent and does not prevent contamination during distribution, collection and storage.

Conclusions

Conclusions derived from the findings of this study are drawn under each of the four objectives.

Village Water Supply- and Environmental Sanitation-based Initiatives

The GOI and GOTN have developed comprehensive policies for efficient and sustainable water supply and sanitation that are inclusive of community participation, specifically participation of women. However, policy has not reached the level of local development in rural Theni District despite the State's responsibility to implement a sector reform process inclusive of a demand-driven approach, village level capacity building, integrated service delivery, cost sharing by users and conservation. Additionally the CRSP strategy of including information, education and communication activities to increase awareness, specifically for women, in sanitation initiatives has not been followed. Supply-driven initiatives remain the norm for improved rural water supply and sanitation in rural

Theni District—initiatives lack components integral for sustainability. For example, the public latrines constructed for women (1998 and 1999) have remained unused.

A lot of financial and human resources have been put toward improved water supply. The village is supplied with water on a regular basis though there are challenges that need to be overcome. There is a need for improved sanitation in Sillamarathupatti. The DDWS (2001b) and the Planning Commission (2001b) have identified issues that have prevented effective implementation of the CRSP. However clear guidelines and educational campaigns to improve the effectiveness of water supply and sanitation initiatives have not been developed. A clear link between water supply and sanitation initiatives has not been established. The gap between water supply and sanitation is partly due to a focus on numerical targets without addressing socio-cultural norms through community-based initiatives. Although initiatives are supply-driven there is greater community demand for water facilities and thus, the initiatives are more efficient.

Consultation between different levels of government (GOTN, Theni Collector, Bodi Union Panchayat, Sillamarathupatti Panchayat) seems to be limited to the transfer of financial resources for construction of facilities and access to GOTN schemes. Additionally, there is minimal consultation between government and community members. There is a strong reliance on the local and state government to provide village water supply and sanitation facilities in Sillamarathupatti. Communities have been slow to accept, become involved in, or benefit from the strategies implemented since the IDWSSD, especially for sanitation. The GOTN is responsible for providing safe drinking water and sanitation to rural areas. Government responsibility has translated into a colonialist top-down approach. Therefore, villagers have limited motivation to mobilise because they expect the local and State government to improve the "public" facilities. However, the government does not seem to take responsibility for these "public" facilities. The Panchayat is supposed to represent the entire community. However, the Panchayat members are also villagers and their choice of initiatives appears to be biased toward benefits for their own community groups based on caste/class.

Influence of Socio-cultural Norms on Village Water Supply and Environmental Sanitation

Socio-cultural norms continue to be overlooked in rural water supply and sanitation initiatives, although the New Delhi Statement declares, "some for all rather than more for some" and the GOI Ninth Five-year Plan places emphasis on a people-centred approach with specific reference to women. The researcher agrees with Mehta (2000) that unequal access to and control over water is a main component of Indian water crises. Gender, caste and class beliefs are deeply embedded in Sillamarathupatti and thus, increasing the complexity of assessing and ensuring the efficiency and sustainability of the water supply and environmental sanitation. Gender, caste and class affect community and household management of water supply and environmental sanitation, including access to facilities, household division of responsibility and water collection patterns. Upper castes/classes receive better access to water supply and environmental sanitation facilities than lower castes/classes because they have more power within the community. Household status is directly related to the level of access to facilities and the number of domestic or productive responsibilities that household members bear. Caste-based restrictions on water collection have been affected by the introduction of public facilities because people of different community groups are forced to share water facilities.

The research in Sillamarathupatti complements numerous studies on water supply in rural India that indicate that women are mainly responsible for household (domestic) water collection and management (Chauhan & Gopalakrishnan, 1983; Kurup *et al.*, 1996; Mehta, 1997; Mukherjee, 1990; Nigam *et al.*, 1998; Reddy, 1999; Tummon, 2001; UNICEF, 1995b). However, responsibility for collection and management of water for productive use within the household (*e.g.*, cattle care, goat care and file making) varies within and between households and is based on household wealth.

There is a greater sense of ownership for water supply facilities than there is for environmental sanitation facilities. Villagers are protective of the public water supply facilities on a street-by-street basis; they will risk conflict (*e.g.*, collecting water from a garden without permission or jumping the queue to collect water) in order to secure their household water supply. Minimal conflict over environmental sanitation facilities reinforces the conclusion that there is a lack of demand for improved sanitation within the village.

Similar to Mehta's research (1997), this study concludes that some of the water restrictions on lower castes have dissolved in Sillamarathupatti. However, low castes/classes must risk humiliation and/or conflict to seek the 'generosity' of other villagers to meet their daily water needs. The fact that different community groups have 'adjusted' to sharing water facilities out of necessity shows that integrating socio-cultural norms into village initiatives may not be as undesirable as the Planning Commission indicates (2001a, 2001b). Incorporating community participation into water supply and sanitation development and management can break down social barriers and lead to more equitable distribution within the village.

There is a marked gender division in the relationship that women and men have with latrine use. The research complements studies (Samanta & van Wijk, 1998; van Wijk-Sijbesma, 1998) that confirm that latrine use is greatest and most consistent among women and that women are more motivated than men to adopt latrines (Mukherjee, 1990). The research also shows that men are equally motivated to have latrines constructed for women. Men more openly discussed issues of open defecation and latrine use and a large number of men indicated concern that latrines should be constructed for women. Men are interested in protecting their wives' dignity by ensuring that they have a private and safe area for defecation. Therefore, both women and men need to be equally involved in the planning and management of latrine facilities, even if the latrines are only constructed for women.

Perceptions about Village Water Supply and Environmental Sanitation and the Relationship to Community Health

There are distinct differences in perceptions of the international community, GOI and GOTN and rural communities in Tamil Nadu about water supply and sanitation. Post-IDWSS the international community has supported the concept that "governments do not solve problems, people do" (van Damme, 1999). People-centred approaches have been placed at the centre of planning and action because of the recognition that water and sanitation are basic human rights. Additionally, the conceptual framework of VISION 21 is based on the premise that people have the aspirations and energies to fulfil the human right of a clean and healthy world with access to hygienic conditions, sanitation and water for everyone (WSSCC, 2000). However, the research in Sillamarathupatti shows that people may

not see sanitation as a basic human right. There is a clear distinction between how access to water is viewed and how access to a sanitary environment is viewed.

This research complements previous studies (Chauhan & Gopalakrishnan, 1983; Mukherjee, 1990) on Indian perceptions of good drinking water. There is a clear distinction between how 'drinking water' and 'salt water' are perceived and thus on the priority given to each water source for domestic use. People's perceptions are gender-differentiated and are based on their relationship with the environment, their social status (*i.e.*, caste, class) within the village and to a lesser extent their level of education. Villagers' definitions of what constitutes bad drinking water have some validity for biological quality. However, villagers do not perceive a clear link between bad water and health problems nor do they clearly understand the causes of health problems.

Perceptions about water supply and environmental sanitation are also based on concepts of cleanliness, pollution and purity. An examination of the management of drainage facilities in Sillamarathupatti suggests that villagers have a greater understanding of and are more willing to take action on issues that appear to directly affect their household, but not on issues that directly affect the public or the environment. Concern for cleanliness at the household level may be attributed to their need to protect their family and their personal space.

Efficiency and Sustainability of the Village Water Supply and Environmental Sanitation

This research reinforces the evidence (Carter *et al.*, 1999; Hoque, 2000; McGarry, 1991; Mehta, 1997, 1999, 2000; Nicol, 1999; van Wijk-Sijbesma, 2001; WHO & UNICEF, 2000; WSSCC, 2000; Yacoob, 1994) that suggests that water supply and environmental sanitation initiatives need to be evaluated based on their efficiency and sustainability including how they are influenced by socio-cultural norms and the environment. The international community, the GOI and the GOTN accept a demand-responsive approach as a necessary means to achieve efficient and sustainable water supply and sanitation. However, communities lack motivation without demand and they may lack demand without education and awareness. The researcher suggests that awareness should be added as the first link to the chain suggested by Carter *et al.* (1999): awareness, motivation, maintenance, cost recovery and continuing support.

The research was unable to conduct a comprehensive examination of the optimal use of the water supply facilities. The water supplies are classified as efficient when based the GOI and GOTN norms used to assess optimal use. According to the Government norms of no less than 40 lpcd for public supply and 55 lpcd for households with their own water connection, Sillamarathupatti is classified as a fully covered rural habitation. The actual coverage levels and distribution of water supply cannot be determined without conducting an assessment on a street-by-street basis placing emphasis on divisions between community groups. Additionally, the actual coverage cannot be determined without an examination of the water source(s) and facility or facilities available on a household basis. The Planning Commission (2001b) indicates that the Government's responsibility to provide a minimum water supply of 40 lpcd free of cost has led to a disregard for demand—the Government bases water supply coverage on a litres per capita per day basis without assessing whether all villagers have access to the public water supply or whether the access meets villagers' needs.

The Planning Commission (2001b) states that there is a scarcity of drinking water in approximately half of the villages in India. Water scarcity may be: a direct result of mismanagement of natural resources and the environmental including deforestation, desertification and agricultural production practices; and minimal or nonexistent conservation practices. For example, water conservation and management practices in Sillamarathupatti are not efficient and sustainable. Reliance on the Panchayat-managed water facilities has led to the disuse of traditional water harvesting systems. There is no substantial demand within the village to rehabilitate the traditional tanks or to invest in other rainwater harvesting structures. Villagers of upper caste/class who can afford to construct roof-top rainwater harvesting structures have no demand for the facility because they have access to a more than adequate supply of 'drinking water' and 'salt water'. Sillamarathupatti is located in a grey block, whereby exploitation is 65 to 85 percent of the estimated recharge (IWAD, 2001a). The current reliance on groundwater for the village water supply seems unreliable and unsustainable for the long-term.

According to the DDWS (2001b), access to safe drinking water in some rural areas has become increasingly more difficult because of increased water pollution from industrial activities, population growth and increasing agricultural requirements. However, the state of environmental sanitation in rural areas also poses a risk of contaminating the water sources.

With population pressure and decreasing available space, the efficiency and sustainability of the water supply and environmental sanitation practices are questionable. Management and treatment of water supplies and sources do not follow the precautions suggested by TWAD (2001a). The villagers also do not take the necessary precautions to ensure that water is safe either because they do not see why such practices are necessary or they do not have the necessary resources. Maintenance of the water system is inconsistent and does not prevent contamination during distribution, collection and storage.

The use of 'drinking water' and 'salt water' is consistent and the facilities are reliable. The most significant change in water use patterns was the construction of the public drinking water supply (*Kuttu Kudineer Thittam*). The majority of people indicated that the 'drinking water' supply has increased the available quantity and quality of water, while the quantity and quality of the 'salt water' has declined. The current reliance on the piped 'drinking water' supply may be unsustainable without incorporating appropriate management of the water sources within the village.

Recommendations

Based on the conclusions, recommendations are made under three domains: research, policy and action.

Recommendations for Research

Three recommendations are made for continued research on water supply and environmental sanitation in Theni District, Tamil Nadu:

1. Further examination of the influences of socio-cultural norms (gender, class, caste, religion) should be conducted with a focus on traditional knowledge, religious/spiritual practices and domestic and productive activities.
2. An assessment of the immediate needs of community groups is required in order to determine the best approach to implement a sustainable water supply and sanitation project.
3. A comparative study, including an evaluation of governmental and non-governmental water supply and sanitation projects in rural Tamil Nadu, is required to develop adequate guidelines for implementing initiatives.

Recommendations for Policy

Four recommendations are made for water supply and sanitation policy:

1. The GOI and GOTN need to develop more comprehensive indicators and guidelines for assessing efficiency and sustainability that include: consideration of community inequalities based on gender, caste and class; an assessment of the time required to collect water from specific facilities; and measures for conservation and protection.
2. Sanitation should be incorporated as an integral part of GOI and GOTN water supply initiatives.
3. The GOI and GOTN should change the policy language to clearly identify household and community groups based on caste/class as the prime catalysts for social change.
4. Funding agencies, including government, need to factor in the time required to implement community-based approaches inclusive of those who are marginalised. Projects would produce more sustainable results through long-term development and planning. The current strategy pushes practitioners to report on numerical achievements and embellish community participation and social change.

Recommendations for Action

Seven recommendations are made for action in regard to water supply and sanitation:

1. The Sillamarathupatti Panchayat would benefit from partnerships with NGOs and other institutions to successfully lobby for access to GOTN initiatives (*i.e.*, sector reform and CRSP projects).
2. It is imperative for the Panchayat to introduce village water conservation measures (*e.g.*, reusing water, constructing household rainwater harvesting systems, rehabilitating traditional ponds and rainwater storage tanks) and to incorporate conservation into future development of water supply facilities.
3. The Panchayat needs to shift from provider (supply-driven) to enabler (demand-driven).
4. In order to increase demand for adequate sanitation facilities the GOTN and Panchayat should incorporate people's perceived needs and hygiene education into water supply and sanitation initiatives.
5. The GOTN should seriously consider implementation of an educational campaign and the provision incentives for Panchayats and household owners to construct and maintain rainwater structures in rural Tamil Nadu.
6. It is recommended that TWAD conduct stricter monitoring of public water supply facilities.
7. TWAD should incorporate evaluation procedures and an educational component into all water supply and sanitation initiatives.

Research Reflections

The dynamics of interpersonal and intercultural communication was the most challenging part of conducting the research. Conducting research and living in a different cultural context and relying on others to translate thoughts and words into action required patience, time and perseverance. Tamil to English language translations were rigorous and sometimes frustrating for both the researcher and the research assistants. The researcher learned to adopt a less direct approach to communication—a reversion from the directness that is valued in western society. During most of the research process the researcher was over-conscious of her status as an 'outsider' and neglected to realise that her urban Tamil research assistant was also an 'outsider' in the village context. One should be aware of one's positionality, however one must also recognise the validity of their personal instincts.

Time was taken to establish a strong rapport and relationships with people in the village. People were fairly honest and their answers were not influenced by their perceptions of the resources a 'foreigner' could give to the village. Many of the traditional difficulties related to conducting research as a 'foreigner' were not an issue because Sillamarathupatti is not a tourist destination nor has it been a part of any large-scale non-governmental projects. The researcher lived in the village and was accepted into the community, into families and into friendships.

Obtaining information from women and lower castes was often difficult because they were always busy, they were reluctant to discuss anything in detail and they seemed unsure of the validity or importance of their answers. Women felt more comfortable in an informal setting, showing the most difficulty in responding to the semi-structured questionnaire. The semi-structured questionnaire was too long and some of the questions proved to be unimportant for the research. Limited time made it impossible to adequately test the questionnaire before conducting it with the research sample of households. However, the questionnaire did provide a wealth of valuable information aiding in a more comprehensive analysis of the findings.

Story with a gap was a useful method for engaging women and men in a discussion about their perceptions of an unsanitary and sanitary village environment. If there was more time, greater emphasis would have been placed on pictorial participatory methods. Pictorial participatory methods seem to be more appropriate and less imposing than questionnaires or

structured interviews in the rural context. Focus groups based on a SWOT (strengths, weaknesses, opportunities and threats) analysis with village leaders and a variety of community groups conducted separately with women and men would have been useful for gathering information on people's water supply- and sanitation-related priorities and encouraging discussion within community groups.

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APPENDIX

Appendix I: International Development Agenda on Water Supply and Sanitation, 1971-2000

Decade	Pivotal Conferences	Development Focus
1971-1980	<ul style="list-style-type: none"> • 1976: United Nations Conference on Human Settlement, Vancouver • 1977: United Nations Water Conference, Mar del Plata, Argentina 	<ul style="list-style-type: none"> • UN initiative and the birth of the water decade • classical public health paradigm of engineering solutions to overcome development challenges
1981-1990	<ul style="list-style-type: none"> • 1990: New Delhi Conference, New Delhi 	<ul style="list-style-type: none"> • International Drinking Water Supply and Sanitation Decade • introduction of low cost technologies • capacity building • realisation that community participation is key for sustainable projects • New Delhi came out with a clear declaration for a plan for the future • women seen as managers of domestic water collection and waste disposal • formation of the World Water Supply and Sanitation Collaborative Council, 1990
1991-2000	<ul style="list-style-type: none"> • 1992: International Conference on Water and the Environment, Dublin • 1992: UN Conference on Environment and Development: Agenda 21, Rio de Janeiro • 1994: Ministerial Conference on Drinking Water and Environmental Sanitation, Noordwijk, the Netherlands • 1998: International Conference on Water and Sustainable Development, Paris • 2000: Second World Water Forum, The Hague 	<ul style="list-style-type: none"> • endorsement of the importance of water supply and sanitation issues by Agenda 21 • water supply and sanitation identified as a priority area for UN and all concerned • participation of women a necessity for development with women recognised as providers and users of water • recognition that communities and households do not have homogenous sets of interests, needs and knowledge • need for gender desegregation established • reduction in actual global investment in water supply and sanitation • formation of the World Water Council and Global Water Partnership • the household recognised as the prime catalyst for change • decade of talk, conferences and new institutions

Source: Compiled from Ghosh, 1999; Neto & Tropp, 2000; van Damme, 1999; van Wijk-Sijbesma, 1998; WSSCC, 2000.

Appendix II: National Water Supply and Sanitation Policy, Five-year Plans, India

Plan	National Policy Statements
1951-1956	<ul style="list-style-type: none"> public health engineering to design, execute, & maintain water supply & drainage works only piped water supply to a group of villages from a single or multiple sources emphasis on technological inputs for water supply & sanitation; education in sanitary habits more important than provision of latrines
1956-1961	<ul style="list-style-type: none"> training facilities for public health engineers, overseers, sanitary inspectors focus on drinking water supply for backward classes
1961-1966	<ul style="list-style-type: none"> effective coordination necessary between all agencies concerned priority to areas with: water scarcity, salinity & endemic water-borne diseases greater attention to sanitation, specifically the sanitary disposal of excreta participation of local people to help implement low-cost latrines health education important aspect of sanitation
1969-1974	<ul style="list-style-type: none"> bulk of provision for water supply & sanitation schemes used in areas of scarcity central assistance is given to institutions for training in public health engineering water supply schemes properly maintained water supply schemes as a paid service; collect capital contributions & levies
1974-1979	<ul style="list-style-type: none"> main objective: to provide safe water supply in difficult & problem villages
1980-1985	<ul style="list-style-type: none"> cover all problem villages without reliable drinking water source, with endemic diseases, & where water has excess salinity, iron, fluorides or other toxic elements State Governments develop engineering solutions; 1 source potable water per village block & village level functionaries responsible for operation & maintenance should recover at least operating expenses extension efforts needed for adoption of low-cost sanitation facilities
1985-1990	<ul style="list-style-type: none"> scope of coverage extended to all villages State Governments ensure regular maintenance with provision of separate fund & by encouraging community participation
1992-1997	<ul style="list-style-type: none"> priority for no source villages for sustainable, & adequate drinking water partially covered villages fully covered with sustainable, & safe drinking water full coverage drinking water: Scheduled Castes, Scheduled Tribes, & other weak members information, education & communication integral part of sanitation
1997-2001	<ul style="list-style-type: none"> universal coverage of drinking water: no source, partially covered & water quality problems cost recovery of 10% from users in all new drinking water supply projects increasing service level beyond 40 lpcd water supply should be demand-driven not supply-driven Panchayat & the local administration responsible for operation & maintenance; subsidy for sanitation complexes for women where other options unfeasible encourage & mobilise private sector in construction & maintenance; specifically women legislation to control groundwater over-exploitation; manage as common property resource demand-driven low-cost sanitation approach preferred over supply-driven approach
2002-2007	<ul style="list-style-type: none"> emphasis on coverage of remaining habitations as per the existing data implementing agencies reassess actual coverage of habitations priority for water quality; habitations with no safe source treated as not covered demand-driven approach: empowerment & capacity building; specifically women integrate service delivery by streamlining the functions of agencies involved at least 10% capital cost sharing & 100% sharing of operation & maintenance conservation measures: rainwater harvesting, groundwater recharge structures

Source: Compiled from Ghosh *et al.*, 1995; DDWS, 2001b; Planning Commission, n.d.

Appendix III: Average Rainfall and Rural Habitations with Partial and Full Coverage of Water Supply, Districts of Tamil Nadu, 2001

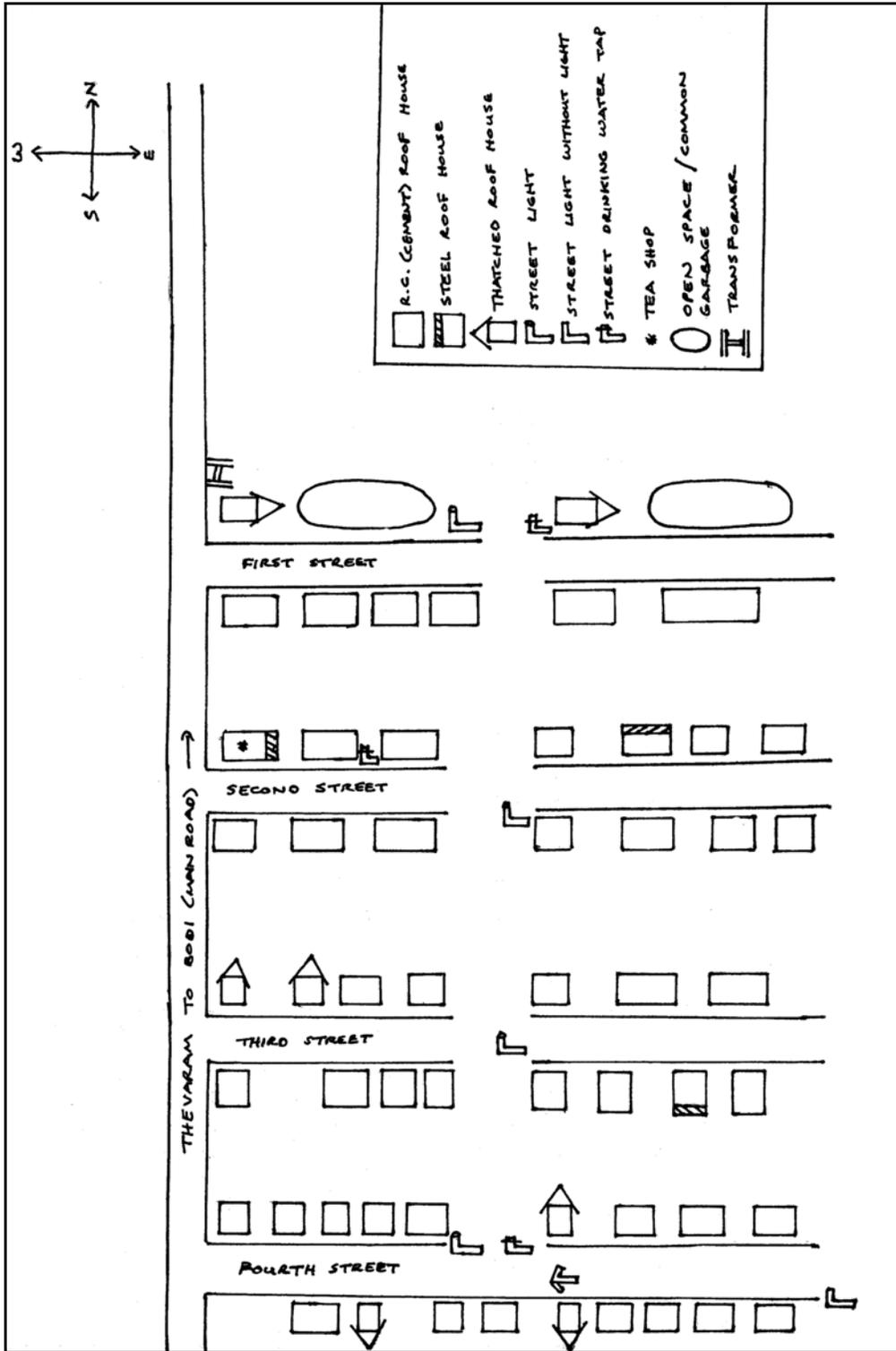
District	Average annual rainfall over a 50 yr. period) (mm)	Coverage (%)			
		1-10 lpcd	11-39 lpcd	Total	Full ≥ 40 lpcd
Kanyakumari	1488	9	91	59	41
Dindigul	899	37	62	58	42
Ramanathapuram	949	24	76	53	47
Thanjavur	987	21	79	47	53
Nagapattinam	1288	36	63	47	53
Tiruvarur	1157	31	68	46	54
Virudhunagar	792	40	60	44	56
Kancheepuram	1163	7	93	43	57
Madurai	863	17	83	40	60
Theni	1068	10	90	40	60
The Nilgiris	1960	5	95	39	61
Erode	700	14	85	39	61
Pudukkottai	908	18	82	38	62
Villupuram	1089	11	89	38	62
Tiruvannamalai	951	36	64	36	64
Karur	633	20	80	35	65
Perambalur	985	19	81	34	65
Tiruchirapalli	800	24	76	34	66
Salem	960	23	77	33	66
Tuticorin	811	10	90	33	67
Tirunelveli	811	17	83	33	67
Sivagangai	912	31	69	33	67
Namakkal	785	24	76	32	68
Coimbatore	1053	7	93	32	68
Vellore	951	19	81	30	70
Dharmapuri	857	23	77	29	71
Cuddalore	1164	22	76	27	73
Tiruvellore	1167	0	100	1	99
Tamil Nadu Average	1005	20	80	38	62

Source: Compiled from TWAD, 2002.

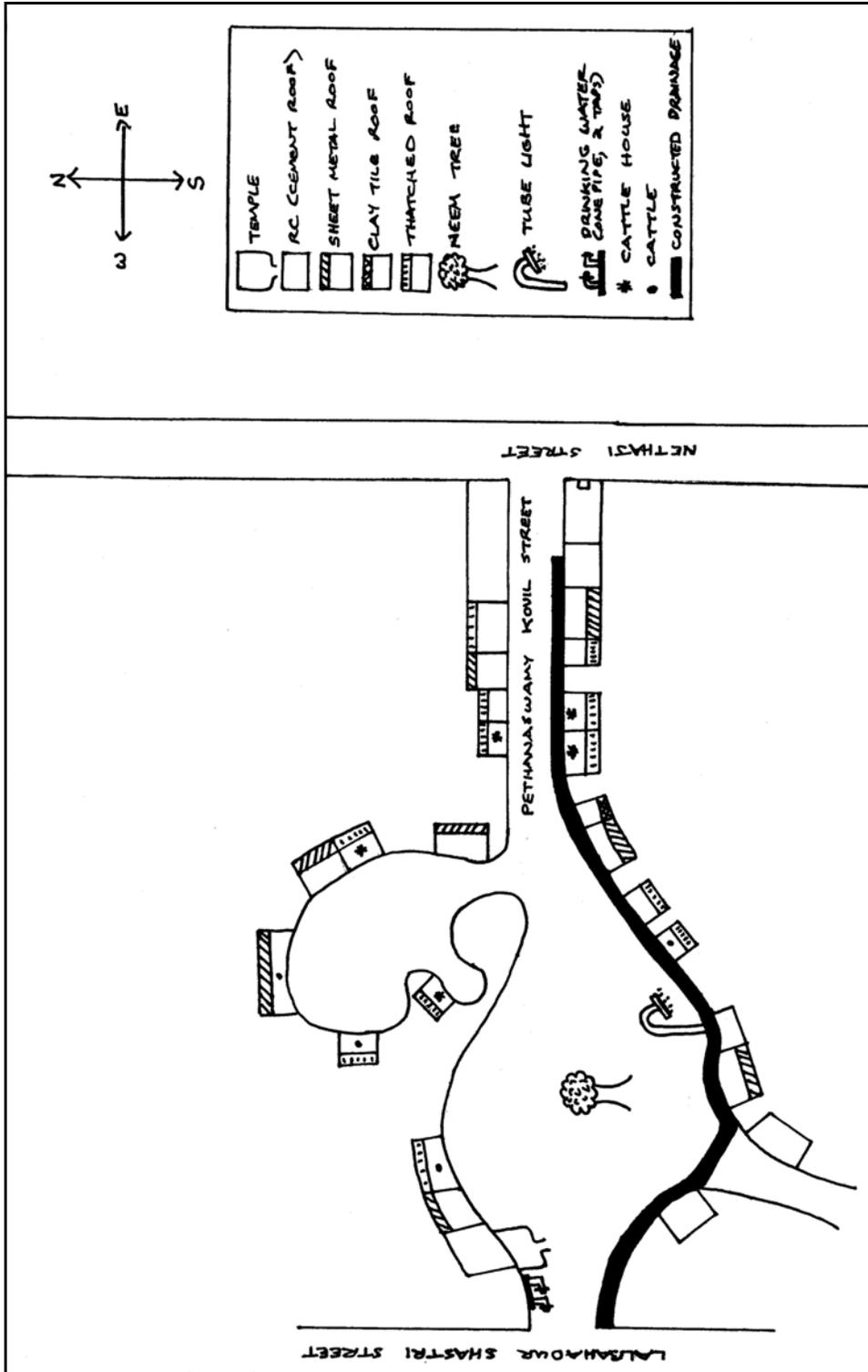
Data may not sum to 100 because of rounding.

lpcd=litres per capita per day

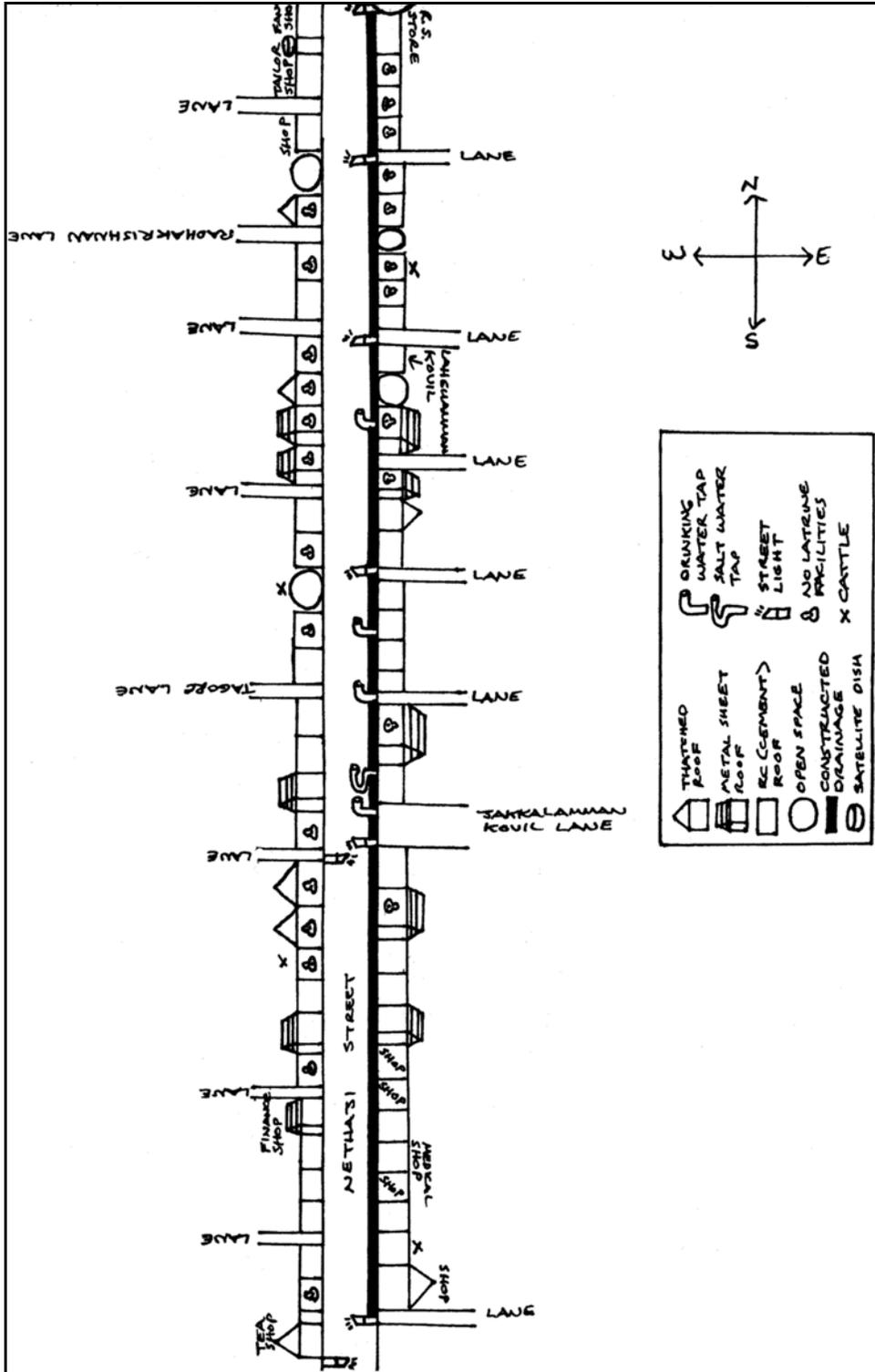
Appendix IV: Examples of Community Maps, Sillamarathupatti, Theni District, Tamil Nadu, India



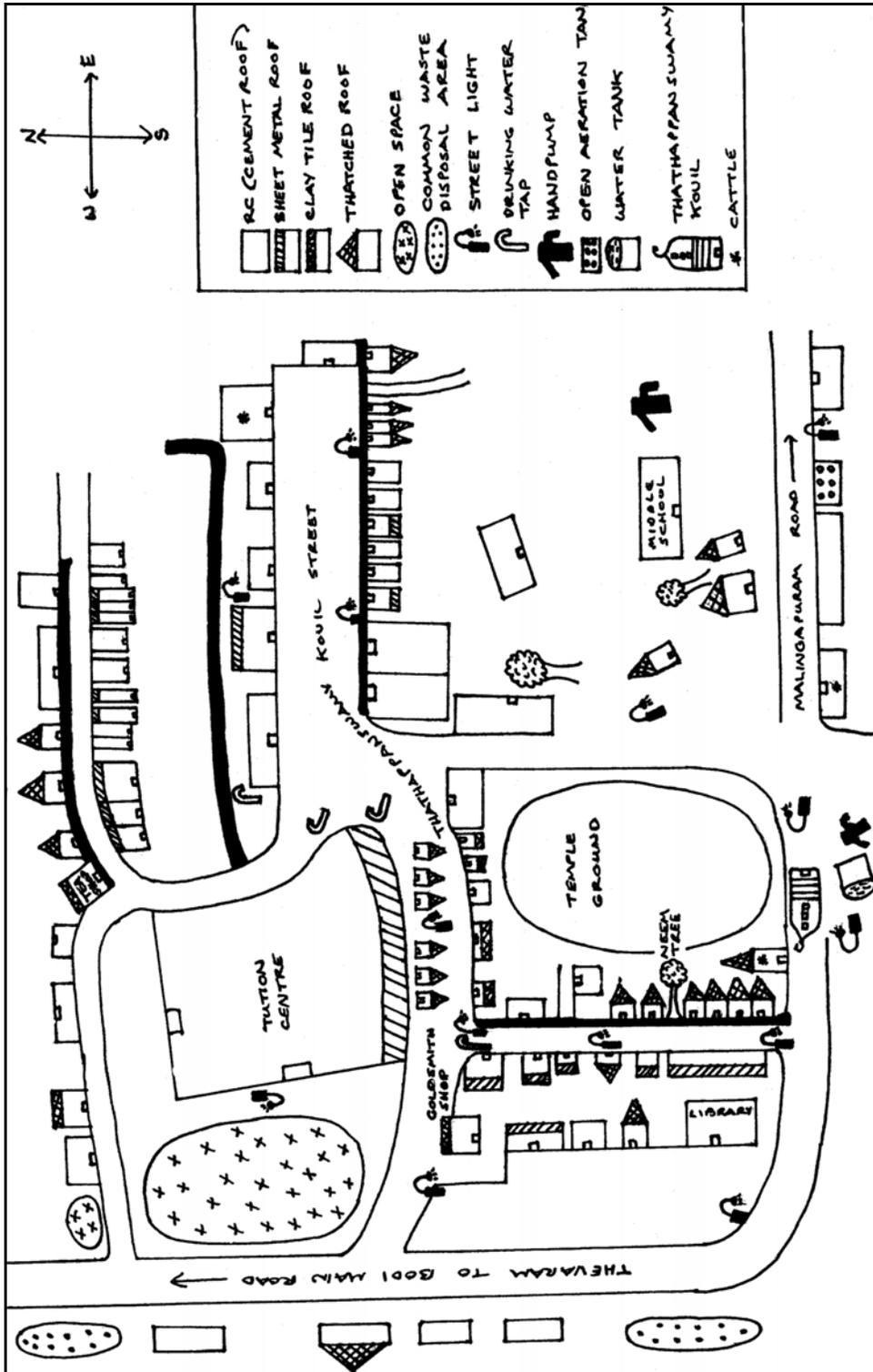
Southwest Scheduled Caste Colony, Sillamarathupatti, October 30, 2001



Pethanaswamy Kovil (Dhobi) Street, Sillamarathupatti, November 01, 2001



Nethaji Street, Sillamarathupatti, November 03, 2001



Thathappanswamy Kovil Street, Sillamarathupatti, November 04, 2001

Appendix V: Story with a Gap

In the village of Anumanthanpatti, a poor farmer and his family live in their own house. The eldest son is seven years old and the youngest son six years old. The family has one cow and some hens. One cow is standing near the house and there are a lot of mosquitoes living near the cow. Some hens are playing nearby. The youngest son is defecating next to the house and the hens. To the right of the boy is where the household disposes of their solid waste. In the centre of all of these activities the father lays down on a cot. The father is always coughing and he sometimes spits in the yard. The mother is washing the clothing and cleaning the vessels in the same area and there is a large amount of dirty water. The water has caused the number of mosquitoes to increase. The oldest boy is urinating near the washing area. Flies and mosquitoes are playing very freely in these surroundings and sometimes they play in the house. The father was ill for a long time and he did not take responsibility for his health by going to the hospital. The father was the only one responsible for the family's welfare. The father died suddenly and a few days later the cow died. The mother became worried about her ability to maintain the family and her youngest son became ill. The mother got an idea about what was causing illness in her family and she decided to tell to her friends and her relations. Two years later, the village environment changed. How?



Image 1: Unsanitary Village Environment



Image 2: Sanitary Village Environment, two-years later

Source: UNICEF, n.d.

Appendix VI: Semi-structured Questionnaire, English Version

Household Details

1. Ward/Block/Door Number: _____
2. House Construction:
 - a. Cement (RC)
 - b. Sheet Metal
 - c. Clay Tiles
 - d. Thatched
 - e. Other _____
3. Name: _____
4. Age: _____ years
5. Sex:
 - a. Male
 - b. Female
6. Community:
 - a. SC (Scheduled Caste)
 - b. BC (Backward Caste) _____
 - c. MBC (Most Backward Caste) _____
 - d. OC (Other Castes) _____
7. Education: _____
8. Occupation: _____
9. Spouse's Occupation: _____
10. Family Members:
 - a. Total Members: _____
 - b. Elders: Men: _____
Women: _____
 - c. Children: Boys: _____
Girls: _____
11. What fuel does your household use for cooking?
 - a. Gas _____
 - b. Kerosene _____
 - c. Wood _____
 - d. Other - _____
12. How many cattle does your household have? _____ (total number)

Water Supply-General

13. Who collects water for your household (describe)?

- a. Wife _____
- b. Husband _____
- c. Daughter(s) _____
- d. Son(s) _____
- e. Relation(s) _____
- f. Other(s) _____

14. Who is responsible for water management in your household?

- a. Collection: _____
- b. Storage: _____
- c. Household Use: _____
- d. Cattle Care: _____
- e. Other: _____

15. Does your household collect rainwater during the rainy season?

- a. Yes _____
- b. No _____

16. What do you reuse water for?

17. What is the role of the Panchayat in maintaining the village water supply facilities?

'Drinking Water' (Mullai River) Supply

18. What sources of drinking water are available for your household's use?

- a. Household Tap (inside) _____
- b. Household Tap (outside) _____
- c. Public Street Tap _____
- d. Open Aeration Tank _____
- e. None _____
- f. Other _____

19. How many households share the 'drinking water' source(s) with your household (total number)?

- a. Household Tap (inside) _____
- b. Household Tap (outside) _____
- c. Public Street Tap _____
- d. Open Aeration Tank _____
- e. None _____
- f. Other _____

20. How does your household share the 'drinking water' facility/facilities with other households?

21. When is 'drinking water' available?

- a. Household Tap (inside) _____
- b. Household Tap (outside) _____
- c. Public Street Tap _____
- d. Open Aeration Tank _____
- e. None _____

22. What does the 'drinking water' availability depend on?

- a. Household Tap (inside) _____
- b. Household Tap (outside) _____
- c. Public Street Tap _____
- d. Open Aeration Tank _____
- e. None _____

23. When does your household collect 'drinking water'?

- a. Household Tap (inside) _____
- b. Household Tap (outside) _____
- c. Public Street Tap _____
- d. Open Aeration Tank _____
- e. None _____

24. How long does it take to collect 'drinking water' for your household?

25. How many pots of 'drinking water' are collected for your household?

- a. Household Tap (inside) _____
- b. Household Tap (outside) _____
- c. Public Street Tap _____
- d. Open Aeration Tank _____
- e. None _____

26. What do you use 'drinking water' for?

- a. Drinking Only _____
- b. Bathing _____
- c. Clothes washing _____
- d. Cattle care _____
- e. Vessel cleaning _____
- f. Other _____

27. Is there enough 'drinking water' available for your household's use?

- a. Yes _____
- b. No _____

28. How is 'drinking water' treated in your home (describe)?

- a. Boil _____
- b. Filter _____
- c. Boil and Filter _____
- d. None _____
- e. Other _____

29. Does the Panchayat treat the 'drinking water'?

30. How does the 'drinking water' quality change during the rainy season?

31. How is the 'drinking water' supply (quality/quantity) different than in the past?

32. What is good 'drinking water'?

33. What is bad 'drinking water'?

34. What health problems does bad 'drinking water' cause?

'Salt Water' Supply (Groundwater)

35. What sources of 'salt water' are available for your household's use?

- a. Household Tap (inside) _____
- b. Public Street Tap _____
- c. Public Tank _____
- d. Public Handpump _____
- e. Garden _____

36. How many households share the salt-water source(s) with your household (total number)?

- a. Household Tap (inside) _____
- b. Public Street Tap _____
- c. Public Tank _____
- d. Public Handpump _____
- e. Garden _____

37. How does your household share the 'salt water' facility/facilities with other households?

38. When is 'salt water' available?

- a. Household Tap (inside) _____
- b. Public Street Tap _____
- c. Public Tank _____
- d. Public Handpump _____
- e. Garden _____

39. What does the salt-water availability depend on?

- a. Household Tap (inside) _____
- b. Public Street Tap _____
- c. Public Tank _____
- d. Public Handpump _____
- e. Garden _____

40. When does your household collect 'salt water'?

- a. Household Tap (inside) _____
- b. Public Street Tap _____
- c. Public Tank _____
- d. Public Handpump _____
- e. Garden _____

41. How long does it take to collect salt water for your household?

42. How many pots of 'salt water' are collected for your household?

- a. Household Tap (inside) _____
- b. Public Street Tap _____
- c. Public Tank _____
- d. Public Handpump _____
- e. Garden _____

43. What do you use 'salt water' for?

- a. Drinking _____
- b. Bathing _____
- c. Clothes washing _____
- d. Cattle care _____
- e. Vessel cleaning _____
- f. Other _____

44. Is there enough 'salt water' available for your household's use?

- a. Yes _____
- b. No _____

45. When 'salt water' is used for drinking how is it treated in your home (describe)?

- a. Boil _____
- b. Filter _____
- c. Boil and Filter _____
- d. None _____
- e. Do not Use _____

46. Does the Panchayat treat the 'salt water'?

47. How does the 'salt water' quality change during the rainy season?

48. How is the 'salt water' supply (quality/quantity) different than in the past?

Drainage Facilities

49. What type of drainage facilities does your household use?

- a. Open-Constructed _____
- b. Closed-Constructed _____
- c. Stone-made _____
- d. Sand-made _____
- e. None _____

50. How often does the drainage on your street become clogged?

51. Why does the drainage on your street become clogged?

52. What type of health problems does clogged drainage cause?

53. How is the drainage on your street cleaned?

54. What is the role of the Panchayat in maintaining the village drainage facilities?

Solid Waste Disposal

55. How is your household's solid waste disposed of?

56. Who is responsible for disposing of your household's solid waste?

- a. Wife _____
- b. Husband _____
- c. Daughter(s) _____
- d. Son(s) _____
- e. Relation(s) _____
- f. Other(s) _____

57. How is your household's cattle waste (dung, food) disposed of?

58. Who is responsible for disposing of your household's cattle waste (dung, food)?

- a. Wife _____
- b. Husband _____
- c. Daughter(s) _____
- d. Son(s) _____
- e. Relation(s) _____
- f. Other(s) _____

59. How is/are the solid waste collection area(s) used by your household cleaned?

60. What is the role of the Panchayat in maintaining the village solid waste facilities (common areas)?

Latrine Facilities

61. What latrine facility/facilities does your household use?

62. When is it comfortable for you to use the open toilet?

63. What are your expectations for maintenance of the open/public toilet?

64. Are the common village latrine facilities adequate?

65. Why have the constructed public ladies latrine facilities not opened?

Community Organisation

66. Have there been any water supply or sanitation related programmes or schemes implemented in this village by private organisations?

67. Have there been any water supply or sanitation related programmes or schemes implemented in this village by the Government and/or Panchayat?

68. Have the people from this village been consulted/involved in the planning/implementation of any schemes or programmes?

69. How/why are water supply and sanitation facilities constructed in this village?

Appendix VII: Semi-structured Questionnaire, Tamil Version

குடும்ப விவரங்கள்

1. Ward / Block / Door Number: _____
2. வீட்டின் அமைப்பு
a) சிமிண்ட் (RC)
b) தகரம்
c) மண் ஓடு
d) கூரை
e) மற்றவை
3. பெயர்: _____
4. வயது: _____ (வருடங்களில்)
5. பாலினம்
ஆண்:
பெண்:
6. பிரிவினர்
a) தாழ்த்தப்பட்டவர்
b) பிற்படுத்தப்பட்டவர்
c) மிகவும் பிற்படுத்தப்பட்டவர்
d) மற்றபிரிவினர்
7. கல்வி: _____
8. தொழில்: _____
9. கணவர்/மனைவி தொழில்: _____
10. குடும்ப நபர்கள்
a) மொத்தநபர்கள்: _____
b) பெரியவர்
ஆண்கள்: _____
பெண்கள்: _____
c) சிறியவர்கள்
சிறுவர்கள்: _____
சிறுமியர்கள்: _____
11. உங்கள் வீட்டில் சமையலுக்கு என்ன வகையான எரிபொருள் பயன்படுத்தப்படுகிறது?
a) வாயு
b) மண்எண்ணை
c) விறகு
d) மற்றவை
12. உங்கள் வீட்டில் எத்தனை மாடுகள் உள்ளன?

பொதுவான தண்ணீர் வசதி

13. உங்கள் வீட்டில் தண்ணீர் யார் எடுப்பார்கள்?

- a) மனைவி
 b) கணவர்
 c) மகள்
 d) மகன்
 e) உறவினர்
 f) மற்றவர்

14. உங்கள் வீட்டில் தண்ணீரை உபயோகப்படுத்துவதில் யார்பொறுப்பு?

- a) சேகரித்தல்
 b) சேமித்தல்
 c) வீட்டுப்பயன்பாடு
 d) கால்நடை பராமரிப்பு
 e) மற்றவை

15. உங்கள் வீட்டில் மழைகாலங்களில் மழைநீர் சேகரிக்கப்படுகிறதா?

- a) ஆம்
 b) இல்லை

16. பயன்படுத்திய நீர் மீண்டும் எதற்காக பயன்படுத்தப்படுகிறது?

17. கிராமத்திற்கு தண்ணீர் வசதி செய்வதில் பஞ்சாயத்தின் பங்கு என்ன?

குடிநீர் அளிப்பு (முல்லைபாறு)

18. உங்கள் வீட்டில் எந்த வகையான நீர் ஆதாரத்திலிருந்து குடிநீர் பெறப்படுகிறது?

- a) வீட்டுக்குழாய் (உள்ளே)
 b) வீட்டுக் குழாய் (வெளியே)
 c) பொதுக் குழாய்
 d) திறந்தவெளி தொட்டி
 e) இல்லை
 f) மற்றவை

19. நீங்கள் பயன்படுத்தும் குடிநீர் ஆதாரத்தினை எத்தனை வீடுகளுடன் பகிர்ந்துகொள்கிறீர்கள்? (மொத்த எண்கள்)

- a) வீட்டுக்குழாய் (உள்ளே)
 b) வீட்டுக் குழாய் (வெளியே)
 c) பொதுக் குழாய்
 d) திறந்தவெளி தொட்டி
 e) இல்லை
 f) மற்றவை

20. நீங்கள் குடிநீரை எப்படி மற்றகுடும்பங்களுடன் பகிர்ந்துகொள்கிறீர்கள்?

21. குடிநீர் எப்போது கிடைக்கும்?

- a) வீட்டுக்குழாய் (உள்ளே)
 b) வீட்டுக் குழாய் (வெளியே)
 c) பொதுக் குழாய்
 d) திறந்தவெளி தொட்டி
 e) இல்லை
 f) மற்றவை

22. குடிநீர் வருவது எதைச்சார்ந்துள்ளது?
- a) வீட்டுக்குழாய் (உள்ளே)
- b) வீட்டுக் குழாய் (வெளியே)
- c) பொதுக் குழாய்
- d) திறந்தவெளி தொட்டி
- e) இல்லை
- f) மற்றவை
-
23. உங்கள் வீட்டில் குடிநீர் எப்போது சேகரிக்கப்படுகிறது?
- a) வீட்டுக்குழாய் (உள்ளே)
- b) வீட்டுக் குழாய் (வெளியே)
- c) பொதுக் குழாய்
- d) திறந்தவெளி தொட்டி
- e) இல்லை
- f) மற்றவை
-
24. உங்கள் வீட்டில் குடிநீர் சேகரிக்க எவ்வளவு நேரம் ஆகும்?
25. உங்கள் வீட்டில் குடிநீர் எத்தனை பாணைகள் சேகரிக்கப்படுகின்றன?
- a) வீட்டுக்குழாய் (உள்ளே)
- b) வீட்டுக் குழாய் (வெளியே)
- c) பொதுக் குழாய்
- d) திறந்தவெளி தொட்டி
- e) இல்லை
- f) மற்றவை
-
26. நீங்கள் குடிநீரை எதெற்கெல்லாம் பயன்படுத்துகிறீர்கள்?
- a) குடிக்க மட்டும்
- b) குளிக்க
- c) துணி துவைக்க
- d) கால்நடை பராமரிக்க
- e) பாத்திரம் கழுவ
- f) மற்றவை
-
27. உங்கள் வீட்டு பயன்பாட்டிற்கு போதியளவு குடிநீர் கிடைக்கி தா?
- a) ஆம்
- b) இல்லை
28. உங்கள் வீட்டில் குடிநீர் எப்படி சுத்திகரிக்கப்படுகிறது?
- a) கொதிக்கவைத்தல்
- b) வடிகட்டல்
- c) இல்லை
- d) மற்றவை
-
29. பஞ்சாயத்தால் குடிநீர் சுத்திகரிக்கப்படுகிறதா?

30. மழை காலத்தில் குடிநீரின் தரம் எவ்வாறு மாறுபடுகிறது?

31. குடிநீரின் தரம் அளவு முன்காலத்தில் தற்போது எவ்வாறு மாறுபடுகிறது?

32. நல்ல குடிநீர் எது?

33. கட்ட குடிநீர் எது?

34. சுகாதாரமற்ற குடிநீர் என்ன உடல்நலக்கேட்டை ஏற்படுத்துகிறது?

உப்புநீர் அளிப்பு

35. உங்கள் வீட்டு தேவைக்கு எந்தவிதமான உப்புநீர் ஆதாரங்கள் பயன்படுத்தப்படுகின்றன?

- a) வீட்டுக்குழாய் (உள்ளே)
- b) வீட்டுக் குழாய் (வெளியே)
- c) பொது தெருக் குழாய்
- d) பொது தொட்டி
- e) பொது அடிக்குழாய்
- f) தோட்டம்
- g) மற்றவை

36. நீங்கள் பயன்படுத்தும் உப்புநீர் ஆதாரத்தினை எத்தனை வீடுகளுடன் பகிர்ந்துகொள்கிறீர்கள்? (மொத்த எண்கள்)

- a) வீட்டுக்குழாய் (உள்ளே)
- b) வீட்டுக் குழாய் (வெளியே)
- c) பொது தெருக் குழாய்
- d) பொது தொட்டி
- e) பொது அடிக்குழாய்
- f) தோட்டம்
- g) மற்றவை

37. நீங்கள் உப்புநீரை எப்படி மற்றகுடும்பங்களுடன் பகிர்ந்துகொள்கிறீர்கள்?

38. உப்புநீர் எப்பொழுது கிடைக்கும்?

- a) வீட்டுக்குழாய் (உள்ளே)
- b) வீட்டுக் குழாய் (வெளியே)
- c) பொது தெருக் குழாய்
- d) பொது தொட்டி
- e) பொது அடிக்குழாய்
- f) தோட்டம்
- g) மற்றவை

39. உப்புநீர் வருவது எதைச் சார்ந்துள்ளது?

- a) வீட்டுக்குழாய் (உள்ளே)
 - b) வீட்டுக் குழாய் (வெளியே)
 - c) பொது தெருக் குழாய்
 - d) பொது தொட்டி
 - e) பொது அடிக்குழாய்
 - f) தோட்டம்
 - g) மற்றவை
-

40. உங்கள் வீட்டில் உப்புநீர் எப்போது சேகரிக்கப்படுகிறது?

- a) வீட்டுக்குழாய் (உள்ளே)
 - b) வீட்டுக் குழாய் (வெளியே)
 - c) பொது தெருக் குழாய்
 - d) பொது தொட்டி
 - e) பொது அடிக்குழாய்
 - f) தோட்டம்
 - g) மற்றவை
-

41. உங்கள் வீட்டிற்கு உப்புநீர் சேகரிக்க எவ்வளவு நேரம் ஆகும்?

42. உங்கள் வீட்டிற்கு உப்புநீர் எத்தனை பாணைகள் சேகரிக்கப்படுகின்றது?

- a) வீட்டுக்குழாய் (உள்ளே)
 - b) வீட்டுக் குழாய் (வெளியே)
 - c) பொது தெருக் குழாய்
 - d) பொது தொட்டி
 - e) பொது அடிக்குழாய்
 - f) தோட்டம்
 - g) மற்றவை
-

43. உப்புநீர் எதெற்கெல்லாம் பயன்படுத்துகிறீர்கள்?

- a) குடிக்க
 - b) குளிக்க
 - c) துணிதுவைக்க
 - d) கால்நடை பராமரிக்க
 - e) பாத்திரம் கழுவ
 - f) மற்றவை
-

44. உங்கள் வீட்டு பயன்பாட்டிற்கு போதிய அளவு உப்புநீர் கிடைக்கின்றதா?

- a) ஆம்
- b) இல்லை

45. நீங்கள் உப்புநீரை குடிக்கப் பயன்படுத்தும்போது எப்படி சுத்திகரிக்கப்படுகிறது?

- a) கொதிக்கவைத்தல்
 - b) வடிகட்டல்
 - c) இல்லை
 - d) மற்றவை
-

46. பஞ்சாயத்தால் உப்புநீர் சுத்திகரிக்கப்படுகிறதா?
47. மழை காலத்தில் உப்புநீரின் தரம் எவ்வாறு மாறுகிறது?
48. உப்பு நீரின் தரம் அளவு முன்காலத்தில், தற்போது எவ்வாறு வேறுபடுகிறது?

சாக்கடை வசதிகள்

49. உங்கள் வீட்டிற்கு எந்தவகையான சாக்கடை வசதி உள்ளது?
- a) திறந்த அமைப்பு
- b) மூடிய அமைப்பு
- c) கல்லால் ஆன
- d) மண்ணில் வெட்டிய
- e) இல்லை
- f) மற்றவை
50. உங்கள் தெருவில் சாக்கடை அடிக்கடி அடைத்துக்கொள்கிறதா? எப்படி?
51. உங்கள் தெருவில் சாக்கடை ஏன் அடைத்துக்கொள்கிறது?
52. சாக்கடை அடைத்துக்கொள்வதால் எந்தவிதமான உடல்நலக்கேடுகள் ஏற்படுகின்றன?
53. உங்கள் தெருவில் சாக்கடை சுத்தப்படுத்தப்படுகிறதா? எப்படி?
54. கிராமத்தில் சாக்கடை வசதியை பராமரிப்பதில் பஞ்சாயத்தின் பங்கு என்ன?

திடக்கழிவு அகற்றுதல்

55. உங்கள் வீட்டில் திடக்கழிவுப்பொருட்கள் எவ்வாறு வெளியேற்றப்படுகின்றன?
56. உங்கள் வீட்டில் திடக்கழிவுப் பொருட்களை வெளியேற்றுவது யார் பொறுப்பு?
- a) மனைவி
- b) கணவன்
- c) மகள்
- d) மகன்
- e) உறவினர்
- f) மற்றவர்
57. உங்கள் வீட்டில் கால்நடைக்கழிவு எப்படி வெளியேற்றப்படுகிறது?

58. உங்கள் வீட்டில் கால்நடை கழிவை வெளியேற்றுவது யாருடைய பொறுப்பு?

- a) மனைவி
- b) கணவன்
- c) மகள்
- d) மகன்
- e) உறவினர்
- f) பிற்றைவர்

59. உங்கள் வீட்டில் திடக்கழிவுப் பொருட்கள் சேகரிக்கப்படும் இடங்கள் எப்படி சுத்தம் செய்யப்படுகிறது?

60. கிராமத்தில் பொதுகுப்பைகளை பராமரிப்பதில் பஞ்சாயத்தின் பங்கு என்ன?

கழிப்பிட வசதிகள்

61. உங்கள் வீட்டில் உள்ளவர்கள் என்ன வகையான கழிப்பிட வசதிகளை பயன்படுத்துகின்றார்கள்?

62. நீங்கள் திறந்த வெளி கழிப்பிடத்தை பயன்படுத்த எப்போது வசதியாக உள்ளது?

63. பொது அல்லது திறந்தவெளி கழிப்பிடங்களை எவ்வாறு பராமரிக்க வேண்டும் என எதிர்பார்க்கிறீர்கள்?

64. உங்கள் கிராமத்திற்கு போதிய அளவு கழுப்பிட வசதியுள்ளதா?

65. புதியதாக கட்டிய பெண்களுக்கான கழிப்பிடங்களை ஏன் இன்றுவரை திறக்கவில்லை?

66. ஏதேனும் தனியார் தொண்டு நிறுவனங்கள் கிராமத்திற்கு குடிநீர் அளிப்பு, சுகாதாரம் தொடர்பான நிகழ்ச்சி மற்றும் திட்டங்கள் நிறைவேற்றியுள்ளதா?

67. பஞ்சாயத்து மற்றும் தமிழக அரசு கிராமத்திற்கு குடிநீர் அளிப்பு சுகாதாரம் தொடர்பான நிகழ்ச்சி மற்றும் திட்டங்கள் ஏதேனும் நிறைவேற்றியுள்ளதா?

68. கிராமத்தில் நிறைவேற்றப்படும் பணிகள், திட்டங்கள் மக்களின் ஆலோசனையுடனும், பங்களிப்புடனும் நிறைவேற்றப்படுகின்றனவா?

69. இந்த கிராமத்திற்கு நீர் அளிப்பு மற்றும் சுகாதார வசதிகள் எப்படி கட்டப்படுகிறது ஏன்?