Background Report: Kurunegala, Sri Lanka

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WASPA Asia Project Report 1

This report in one in a series of project reports written by the Wastewater Agriculture and Sanitation for Poverty Alleviation in Asia (WASPA Asia) project. The WASPA Asia project aims to develop and test solutions for sanitation and wastewater management, to reduce the risks form wastewater use in agriculture. The approach involves the development of stakeholder coalitions at town and national level, called Learning Alliances, which will bring together the main stakeholders into a participatory process through which actions will be planned and implemented in a sustainable manner.

These project reports are essentially internal documents intended to inform the future activities of the project, particularly in relation to the development of Learning Alliances and participatory action plans. The reports have been made publicly available as some of the information and findings presented in them may be of use to other researchers, practitioners or government officials.

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Acronyms, Abbreviations and Technical Terms

CEA	Central Environmental Authority
CPH	Census of Population and Housing
DANIDA	Danish International Development Agency
DAS	Department of Agrarian Services
DCS	Department of Census and Statistics
DOA	Department of Agriculture
DOI	Department of Irrigation
DS	Divisional Secretariat
ECL	Engineering Consultants Limited
EPL	Environnemental Protection Licences
FAO	Food and Agriculture Organization
FOs	Farmer Organizations
GDP	Gross Domestic Product
GN	*Grama Niladhari*
HIES	Household Income and Expenditure Survey
MC	Municipal Council
MT	Metric tonnes
NWP	North Western Province
NWSDB	National Water Supply and Drainage Board
PEA	Provincial Environmental Authority
PHA	Provincial Health Authority
RYPS	Red-Yellow Podzolic Soils
UDA	Urban Development Authority
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAEP	United State Asia Environmental Partnership
WASPA	Wastewater Agriculture and Sanitation for Poverty Alleviation
WSDB	Water Supply and Drainage Board

Anicut	Weir
Chena	Traditional slash and burn agriculture
Ela	Stream or drain
Grama Niladhari	Lowest level of government office
Wewa	Irrigation water tank (similar to a pond)

1 Introduction

This report has been produced as part of the Wastewater Agriculture and Sanitation for Poverty Alleviation in Asia (WASPA Asia) project, funded by the European Commission under its Asia Pro Eco II Program. The objective of the project is to improve the livelihoods of urban and peri-urban farmers who are using wastewater in agriculture; and the communities who are responsible for producing the wastewater or consuming the agricultural produce. To do this a holistic approach and sustainable solutions are required along the whole chain of wastewater production and use; from improved sanitation to contaminant reduction, waste treatment, disposal, safe use in agriculture and promotion of hygiene behavior. At the same time a change of practice is required to integrate wastewater planning into urban water resource management, simultaneously applying technical solutions for wastewater treatment and disposal and a range of preventive measures to mitigate health risks in the short term.

The WASPA Asia project aims to achieve this by involving a wide range of stakeholders (Annex I) in developing and testing solutions for sanitation and decentralized wastewater management, and for mitigation of health risks from wastewater use in agriculture. In this process Learning Alliances are perceived to be the key to engaging these stakeholders and to achieving the overall objective of the work. Learning Alliances are defined by Moriarty *et al.* (2005, draft) as a "series of connected structured platforms at different institutional levels, designed to break down barriers to both horizontal and vertical information sharing". They therefore operate at a number of levels, in which their role at the local level is essentially to bring together: the various communities who produce or use wastewater, such as farmers, urban residents, industrialists and traders; those who regulate or manage wastewater such as the Municipal Council (MC), the Urban Development Authority (UDA), the Central Environmental Authority (CEA), the Provincial Environmental Authority (PEA); the National Water Supply and Drainage Board (NWSDB) and the Provincial Health Authority (PHA); those who are responsible for agriculture and irrigation such as the Department of Agrarian Services (DAS), the Department of Agriculture (DOA) and the Department of Irrigation (DOI); and non-governmental organizations (NGOs) who work to improve sanitation, health, hygiene and agriculture, and who work on issues such as community governance.

As can be seen this project therefore covers a number of sectors, issues and stakeholder groups and as a consequence it was felt that basic background data on the relevant sectors was required. The purpose of this report is therefore to describe the basic characteristics of Sri Lanka, that are relevant to the project including physical characteristics, administrative units, population statistics, poverty, water supply, sanitation, health, land utilization and industry. These are then related to the conditions in Kurunegala District, Kurunegala Divisional Secretariat (DS) Division, and where possible the municipality to show how it compares to the country as a whole, to justify its selection as a project site and to provide important

information as a basis for the project team's activities. The report describes the area selected for project interventions and the communities with which the project team will be working; and justifies their selection. It also touches on the administrative structures of Sri Lanka; some laws and acts; and the responsibilities of relevant government departments. It does not however critically analyze this data but simply outlines the prevailing situation.

This information has been collected exclusively from existing background material generated by the Government of Sri Lanka, principally through the Department of Census and Statistics (DCS); as well as other projects and with a limited number of interviews with relevant government departments. Since this report relies almost exclusively on secondary data there are some data gaps. In some cages this is problematic because the data is required for other aspects of the project; where this is the case primary research will be undertaken and reported in subsequent papers. The specific areas of interest for local level assessment are agriculture, water quality, sanitation, the institutional set-up and to a lesser extent health (this is limited due to the inherent difficulties in health studies rather than a lack of perceived need for this data). This report will be followed by further reports on these aspects which will include data collected through detailed surveys and focus group discussions.

2 Administrative Units and Level of Project Interventions

The objective of this section is to briefly describe the administrative framework within which project interventions will take place. It is a summary of a more detailed analysis which will follow, on roles and responsibilities of government agencies. In order to be able to effectively select project intervention sites; to start to understand the communities with which the project team will work; and to identify the government departments with whom the project team must cooperate it is necessary to have an understanding of the administrative units of the Government of Sri Lanka. This chapter therefore briefly describes those units and explains the levels at which the project will intervene. It does not however provide a full discussion of the roles and responsibilities of these levels of government or of other government departments that need to be engaged with to effectively implement the project as these are discussed in the relevant places in the document.

Administrative Units of Sri Lanka

Sri Lanka is a democratic republic and is governed under a unitary system of Constitution. In 1987 the country underwent decentralization of its government structure with the 13th Amendment of the Constitution and the promulgation of the Provincial Councils Act No. 42, under which Provinces were set up as larger administrative units than the previous District administration; each Province encompasses two or three Districts. The rationale for moving to this system was to concentrate greater autonomy and resources at the provincial level, away from the centre (Slater 1997). Provincial Councils are responsible for carrying out the activities planned by the Central Government Ministries and their departments and agencies. There are nine Provinces and eight Provincial Councils in Sri Lanka (Government of Sri Lanka, 2006). The Governor, who is appointed by the President, is responsible for execution of policies and statutes of the Provincial Council aided by five provincial ministers who comprise the Board of Ministers, one of whom is elected as the Chief Minister and is the political head of the Provincial Council. The Chief Secretary is also appointed by the President and is the chief accounting officer responsible for "all inter-departmental matters such as finance, planning and personnel" (Slater 1997).

Although the new Provinces now exist Sri Lanka is still divided into 25 Districts, each of which is appointed a District Secretary. The District Secretary is responsible for implementing national policies and programmes within the District and links to the political authority at the national level through the Chief Minister. The District functions mostly as an administrative structure supporting the Divisions, which are smaller political units to which much of the power of the District was devolved under the **Act No. 58 of 1992**. There are currently 330 Divisional Secretariats headed by Divisional Secretaries (DS), with 5-16 Divisions in a District (Figure 2.1).

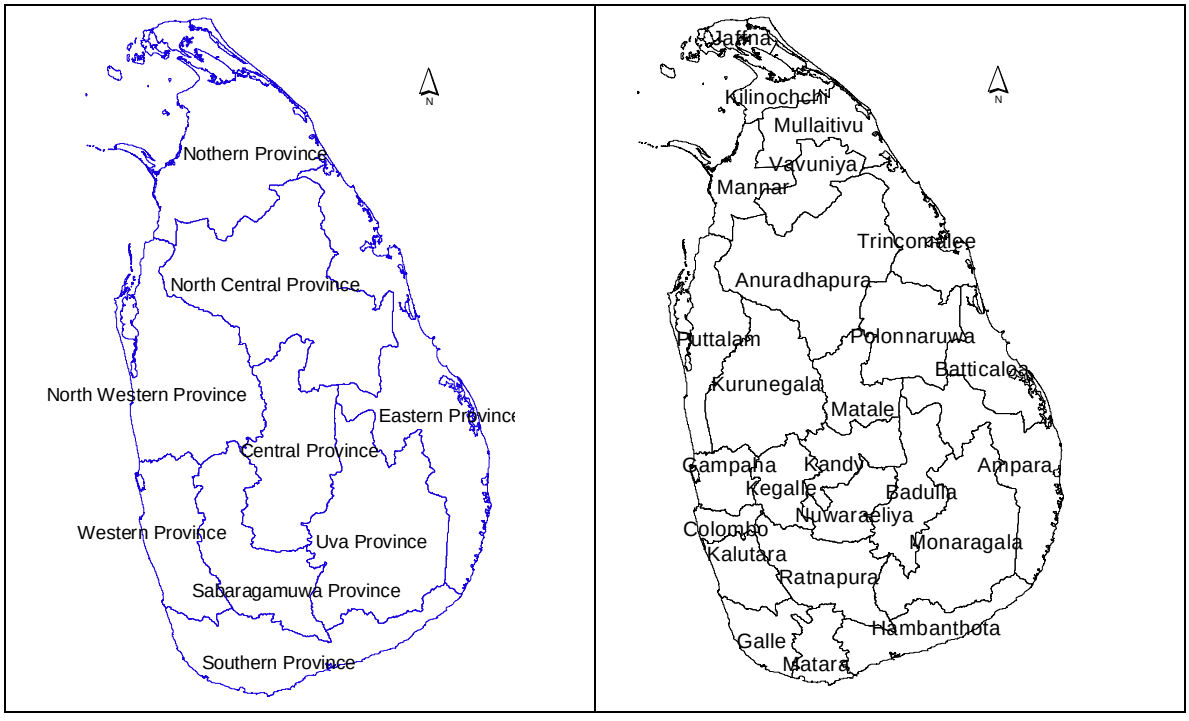
As a result of **Act No. 58 of 1992**, the Divisional Secretariat plays the main role as the implementing institution of the Provincial Council. The main tasks of the DS are: formulating proposals for investment at the Division level; identifying projects; and

monitoring the implementation of the Annual Provincial Investment Plan which sets out the development objectives for the Province (Government of Sri Lanka, 2006). The DS serves both the national government as well as the Provincial Councils (Sri Lanka Urban Development Sector Study, ADB July 2000).

Divisional Secretary Divisions are further divided and administered by a number of Grama Niladaris (GN). The GN Division is the lowest unit of government administration and comprises one or more villages. Consequently the GN is responsible for executing projects and activities at the village level.

There are three types of local authorities that function alongside the Divisional Secretariats. These political subdivisions are: Municipal Councils, for areas with a population of over 30,000; Urban Councils, for areas with populations of between 10,000 and 30,000; and *Pradeshiya Sabhas* for smaller towns and rural areas. The Provincial Councils are responsible for supervising the functioning of local authorities, which focus on environmental management and providing social services, including maintaining roads, thoroughfares, sanitation, health, water supply, solid waste management and sewerage. Local government operates parallel to the Divisional Secretariat, but does not have any authority over the planning and development functions that are the responsibility of the Division (Slater 1997), hence the two institutions remain separate.

Figure 2.1: Provinces and Districts in Sri Lanka



Project Interventions and Locations

The nature of the project, especially the Learning Alliances concept, means that activities must take place at a number of levels; and that knowledge generation and sharing must occur from the local through to the national level. One of the main benefits of the Learning Alliance is the engagement of a multitude of partners. A failure of many projects is that they focus exclusively on the household or community level and do not sufficiently involve the relevant authorities, which has the effect that pilot interventions are often not replicated (Moriarty *et al.*, 2005, draft). Including multiple partners from the outset facilitates the replication, scaling up and sustainability of project interventions beyond the funding period.

The project will therefore engage with partners at all the government levels discussed above but will also work to develop community-driven participatory action plans in smaller localities because, although the project seeks to reduce waste from the entire city and improve the quality of water reaching down stream users, specifically farmers, it is not feasible for the project to attempt to directly address issues in the entire city. Therefore, based on initial assessments it has been decided that the project will intervene in a few key areas: where there are low income communities; where farmers are using wastewater for agriculture; and where significant quantities of waste are being produced. Consequently the project will work at two levels: generally within the municipality; and in a more detailed way in four peri-urban GN Divisions. This is presented schematically in Figure 2.2 and described in Table 2.1.

Initial investigations have also revealed a number of other existing projects, and the WASPA Asia project will therefore link with these projects in such a way as to either enhance the activities of those projects or to address gaps in those projects due to the nature of their design or objectives.

Figure 2.2: Schematic of how the project area fits within the Municipality and Division

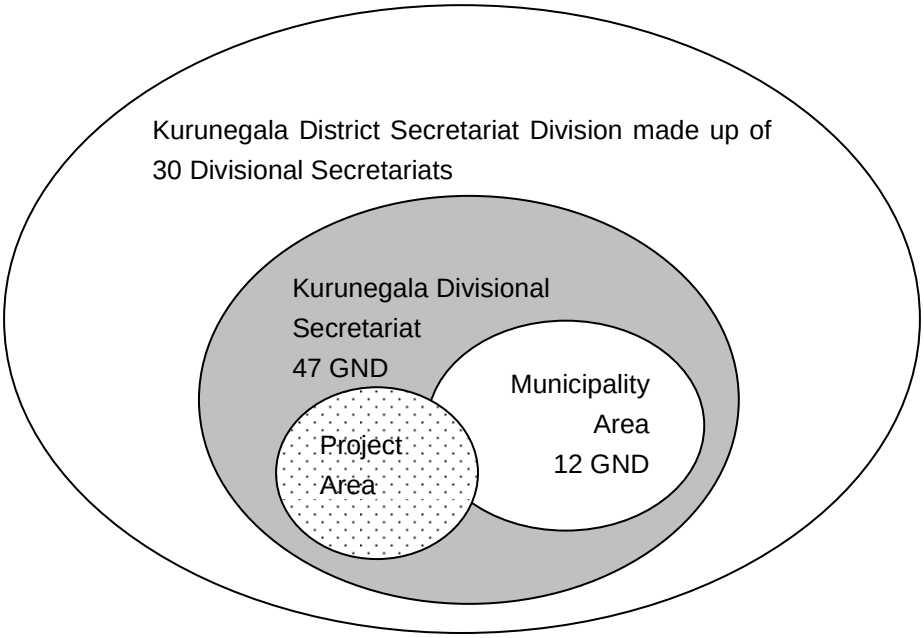


Table 2.1: Grama Niladhari Divisions in Kurunegla Municipal Area

Area	Grama Niladhari Division	Description of work	Generic activities
Municipality	• Kurunegala Town North • Gangoda • Gattuwana • Kurunegala Town North West • Kurunegala Town East • Theliyagonna* • Kurunegala Town West • Iluppugedara • Kurunegala Mid Town* • Kurunegala Kadaweediya • Kurunegala Town South* • Udawalpola*	Assessment of waste production especially from commercial or industrial units (including schools; hospitals; manufacturing units; retail units; hotels; and food outlets), as well as domestic waste. Monitoring of drain water quality. Development of waste minimization or treatment strategies.	Establishment of learning alliances at local community and local government levels to identify polluters, and develop and implement mitigation plans. Collaboration with other projects and in accordance with existing government plans.
Outside Municipality	• Aswedduma, • Dematagahapelassa • Kaudawatta • Wilgoda	Farming communities that use wastewater for irrigation – assessment and social mobilization to increase benefits and reduce negative impacts from wastewater use. Low income community – assessment and social mobilization to reduce waste, improve sanitation facilities and improve hygiene practices.	

3 Physical Characteristics

This chapter presents some of the basic physical and climatic characteristics of Sri Lanka and Kurunegala District to provide an understanding of the conditions within which agriculture takes places in Kurunegala, including seasons, rainfall, climate and soil type; and how the local conditions in Kurunegala compare with those across the country.

Kurunegala city is the capital of the North West Province (NWP) of Sri Lanka (Figure 3.1). It is situated 116 km from Colombo and 42 km from Kandy. The District covers an area of 4816 km^2, which is 7% of the total area of Sri Lanka and 61% of the Province. Of this 4624 km^2 is land and 192 km^2 is water bodies (Table 3.1).

Figure 3.1: Maps showing location of Kurunegala District and District Secretariat Division

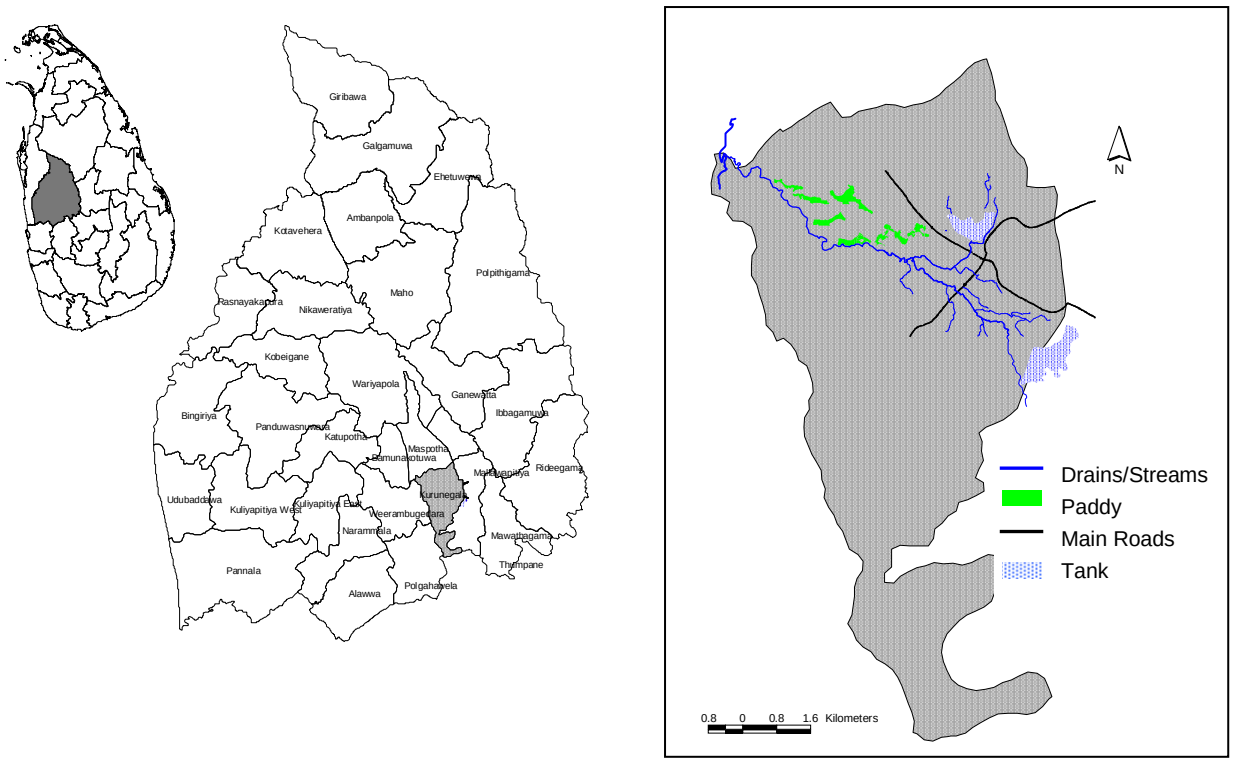


Table 3.1: Land and water area of Sri Lanka, NWP and Kurunegala District

	Total area		Land area		Water bodies	
	km^2	%	km^2	%	km^2	%
Sri Lanka	65610	100.0	62705	100.0	2905	100.0
North West Province	7888	12.0	7506	12.0	382	13.1
Kurunegala District	4816	7.3	4624	7.4	192	6.6

Source: Survey Department, 1988

Climate and Geography

Sri Lanka is divided in to three major climatological zones the Wet Zone, the Intermediate Zone and the Dry Zone. Kurunegala District covers part of the Dry Zone and the Intermediate Zone. The Dry Zone receives a mean annual rainfall of less than 1750mm and has a pronounced dry season. The Intermediate Zone receives a mean annual rainfall between 2500 to 1750mm (Survey Department 1988). Sri Lanka is also divided in to three major zones based on elevation, with Kurunegala falling into the Low Country with an elevation below 300m (Survey Department 1988). Above mentioned categories further divided in to 24 agro ecological zone depending on their soil types. Kurunegala district also spreads over two of the 24 agro-ecological zones of the country (Table 3.2).

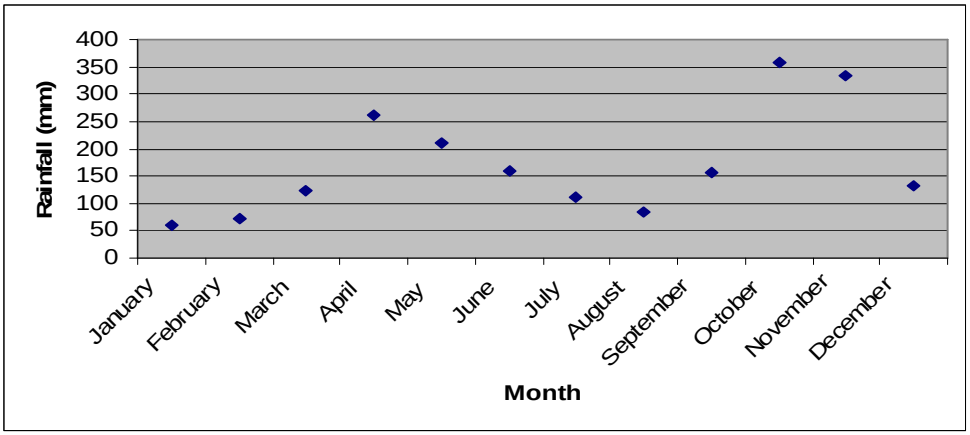
Table 3.2: Kurunegala District agro-ecological zones

Agro-ecological zones	Annual Rainfall	Soil Type
IL_1 – Intermediate zone low country 1	>1020 mm	Red-Yellow Podzolic soils (RYPS) with strongly mottled sub-soils, Low Humic Gley soils, RYPS with soft and hard laterite and Regosoles on old Red and Yellow sands
IL_3 – Intermediate zone low country 3	>900 mm	Reddish brown earths, Non Calcic Brown soils and Reddish Brown Earth
DL_1 - Dry zone low country 1	>775 mm	Reddish Brown Earths, Low Humic Gley

Source: Survey Department, 1988

Sri Lanka receives rainfall from two monsoons: the North-East monsoon brings rainfall from November to February called the *maha* season; and the South-West monsoon occurs in May to September called the *yala* season (Survey Department 1988). This periodicity can clearly be seen in the long-term average monthly rainfall data provided by the meteorological station in Kurunegala city (Figure 3.2; Annex II).

Figure 3.2: Long-term monthly average rainfall data for Kurunegala (1971-1998)



Source: Department of Meteorology; cited in Somaratne et al., 2003

Water resources

Kurunegala District falls within the upper part of the Deduru Oya River Basin which flows 140 km from central Sri Lanka to the west coast, reaching the sea at Chilaw (7.34_N, 79.48_E) through a basin area of 2623 km^2 and with 9 tributaries (Survey Department 1988; Somaratne et al. 2003).There are no inter-basin diversions and therefore the river only receives rainfall, amounting to an annual average of 1609 mm per year with a minimum of 56 mm in August and a maximum of 283 mm in November (Somaratne et al. 2003).

The city of Kurunegala receives most of its drinking water from Deduru Oya although at times of shortage this is supplemented by water from the recently rehabilitated Kurunegala Tank, which is situated within the city. Currently the city's demand is calculated to be 7000 m^3/day, of which 5000-6000 m^3/day is provided by the Deduru Oya, although this will be increased to 11000 m^3/day in future with the city expansion (Assistant General Manager, NWSDB, *pers. comm.* 14.09.06).

There are also thousands of ancient irrigation schemes in the District served by 2481 tanks (Panabokke 2000). Within Kurunegala DS Division there are three ancient tanks of which Wennaru Wewa and Thiththawella are used for irrigation; and Kurunegala is used for recreation and sometimes as a drinking water source. Wennaru Wewa, which is situated at the southern end of Kurunegala DS Division, has a capacity of 1.8 million m^3 (1490 acre feet) and serves a command area of 460 acres in both *yala* and *maha* seasons. There are two main canals that provide water for downstream irrigation. The left bank main canal irrigates 230 acres and feeds Wilgoda Anicut (weir) via the Beu Ela (pronounced Boo Ela).

About 78% of the town area of Kurunegala is drained by the Beu Ela and another stream, the Wan Ela. These streams flow some 6 km via residential, commercial and cultivated areas, collecting untreated sewage[1] and sullage that is

[1] Officially the drain does not receive sewage but in practice even the MC officials admit that there are illegal sewage connections.

discharged into the canals; they join within the city and flow on to the Maguru Oya at Watawehera estate, just outside the western boundary of the Municipality (NWSDB 2005; ECL 2000). There is an *anicut* located at Wilgoda (also called Vilgoda) after the confluence of the drains, and this is operated to provide irrigation water to the paddy fields in Aswadduma *Grama Niladhari* division. There is evidence to suggest that the closing of the *anicut* to retain irrigation water results in stagnation and some localized flooding, including flooding of residential areas, and appears to present a health and environmental hazard (ECL 2000; Nishshanka et al. 2006).

Consequently the Municipal Council has taken over the regulation of the *anicut* and only stores water just prior to irrigation (Municipal Council Engineer, Mr. S.M.B. Dissanayake, *pers. comm.* 14th September 2006).

Situated close to the *anicut* there are some drinking water wells that have apparently been abandoned due to groundwater pollution as a result of this prolonged stagnation of polluted water (ECL 2000). Dumping of solid waste into the canals has also been observed as a problem in the vicinity and is, according to the farming communities, impacting on agricultural production.

4 People

This chapter provides basic demographic statistics for Sri Lanka and Kurunegala including population, population density, ethnic composition and education levels. It also provides some socio-economic data including, income and main livelihood activities, poverty levels and employment. The main data sources for this chapter are: the reports by the DCS arising from the Census of Population and Housing (CPH) 2001; the Household Income and Expenditure Survey (HIES) 2002; and the 2004 Labour Survey.

Population, Diversity and Gender

According to the CPH 2001, the total population of Sri Lanka was 18.7 million in 2001, which increased by approximately 21% from 1981. Kurunegala District has also shown an increase but of slightly less than the national total at 20% (Table 4.1). The population density of Kurunegala district is higher than the national average (Table 4.1). The data for all districts is available in Annex III to facilitate comparison between Kurunegala and other districts.

Table 4.1: Population, annual growth rate between 1981 and 2001 and population density

	Population		Annual Growth Rate During	Population Density per km^2	
	1981	2001	1981-2001	1981	2001
Sri Lanka	14846750	18732255	1.1	230	299
Kurunegala District	1211801	1452369	0.9	254	314

Source: Census of Population Housing, 1981/2001

The population of Kurunegala DS Division is approximately 5.8% of the District and the number of households is just less at 5.3%. The GN divisions in which the project will work has a total population of 29628, some 30% of the District, and the four agricultural GN divisions are home to 5656 people and 1075 households (Table 4.2).

The gender split in Sri Lanka is such that there are slightly more females (50.5%) than males; however in the urban area of Kurunegala this trend is reversed with a slightly higher male population of 13928 individuals (51%). The adult (over the age of 18) population in the project area is 72% of the total (DCS 2001; DCS 2001b).

The population of Sri Lanka is a relatively complex mix, which for the purposes of the Census the DCS divides into nine categories, namely: Sinhalese, Sri Lanka Tamil, Indian Tamil, Burgher, Sri Lankan Moor, Malay, Sri Lanka Chetty, Bharatha and other. In Sri Lanka as a whole around 65% of the population are Sinhalese, 14% are Sri Lanka Tamil, 18% are Sri Lanka Moor. In Kurunegala District the proportion of Sinhalese people is higher than the national average, at almost 92%; however it is lower in the urban areas at around 76%. The composition in Kurunegala Municipality reflects that of the overall urban picture for the District, as there are few other urban centers (DCS 2001).

Table 4.2: Occupied housing units, households and occupants by GN division, 2001

G.N. Division number and name	Number of occupied housing units	Number of households	Number of occupants
Kurunegala District	376352	380213	1470667
Kurunegala D.S. division	19945	20292	85924
831 - Kurunegala Town - North	331	337	1608
832 - Gangoda	401	403	1813
833 - Gettuwana	416	424	1954
834 - Kurunegala Town - North East	675	676	3054
835 - Kurunegala Town - East	341	352	1533
836 - Theliyagonna	578	594	2736
837 - Kurunegala Town - West	837	855	4062
838 - Iluppugedara	698	710	3311
839 - Kurunegala Town - Central	293	294	1399
840 - Kurunegala Town - Bazaar	66	67	291
841 - Kurunegala Town - South	395	395	1810
842 - Udawalpola	272	272	1314
803 - Aswedduma	376	382	1601
804 - Dematagahapelessa	179	183	759
809 - Kavudawatta	238	238	982
811 - Vilgoda	323	332	1401
Total for project GN Divisions	6419	6514	29628
Percentage of Division	32	32	34

Source: DCS, 2001b

Education Levels

The literacy rate of the population aged 10 years and over in Kurunegala District in 2001 was 92.7%, just above the national literacy rate of 91.0%, and with a slightly higher literacy rate for males (93.9%) than females (91.5%). However, the female literacy rate in Kurunegala District exceeds the national average (DCS 2004). The DCS records education levels for all individuals over five years of age. Of this population, 41% passed grade 6-10, 22% passed grade 1-5, 18% passed GCE (O-Level) and 9% GCE (A-level) in Kurunegla DS Division (DCS 2003).

Labour Force, Livelihoods and Income

According to the 2004 Labour Force Survey, based on a sample of 20,000 households, the total working age population (over 10 years of age) was approximately 16,600,000 of which around 49% were economically active. Of the total estimated economically active population, 67% were male and 33% were female (Table 4.3). The labour force participation rate in Kurunegala District was found to be around 51% with almost twice as many men as women (DCS 2004; DCS 2003). Figures for the DS Division were not available.

Table 4.3: Economically active population aged 10 and over

		Population	
		Total	Economically active (%)
Sri Lanka	Total	16593431	49
	Urban	2425113	45
	Rural	14168317	49
Kurunegala District	Total	1428931	51

Source: DCS, 2004 (Note: Mullaitivu and Kilinochchi districts are not published in this report).

The total employed population of Sri Lanka in 2004 was calculated to be 7394029 individuals of whom 13% were employed in urban areas and 87% in rural areas. Of the urban population the majority (66%) were involved in services and 27% in industry. Of the rural employed population approximately the same number worked in agriculture and services (38% and 39% respectively). The overall split between sectors is services 42%, agriculture 34% and industry 24%; detailed figures are given in Annex IV (DCS 2004).

The survey also showed that around 667000 people were unemployed in 2004, amounting to 8.3% of the population of Sri Lanka. The unemployment rate in Kurunegala District was close to the national average at 8.9% (DCS 2003).

In Kurunegala DS Division 9% of the employed population work in agriculture and forestry and in the project site this is reduced to 4% because it is an urban area (Figure 4.1) however in the three GN divisions selected for the agricultural work this increases to 6% (DCS 2001b). As may be expected for an urban area pubic administration, community work, retail, hotels and restaurants account for almost half the employed population in both the project area and the Division (Figure 4.1).

Mean household income

According to the Household Income and Expenditure Survey (2002), the monthly mean household income of Sri Lanka was between Rs. 21088 and Rs. 8342, with a national average of Rs. 13038. In Kurunegala District the mean monthly income is somewhat below the national average at Rs.10771 (Table 4.4). These data are particularly important for the project as they have implications for people's ability to pay for infrastructure or improvements.

Table 4.4: Mean monthly household income 2002

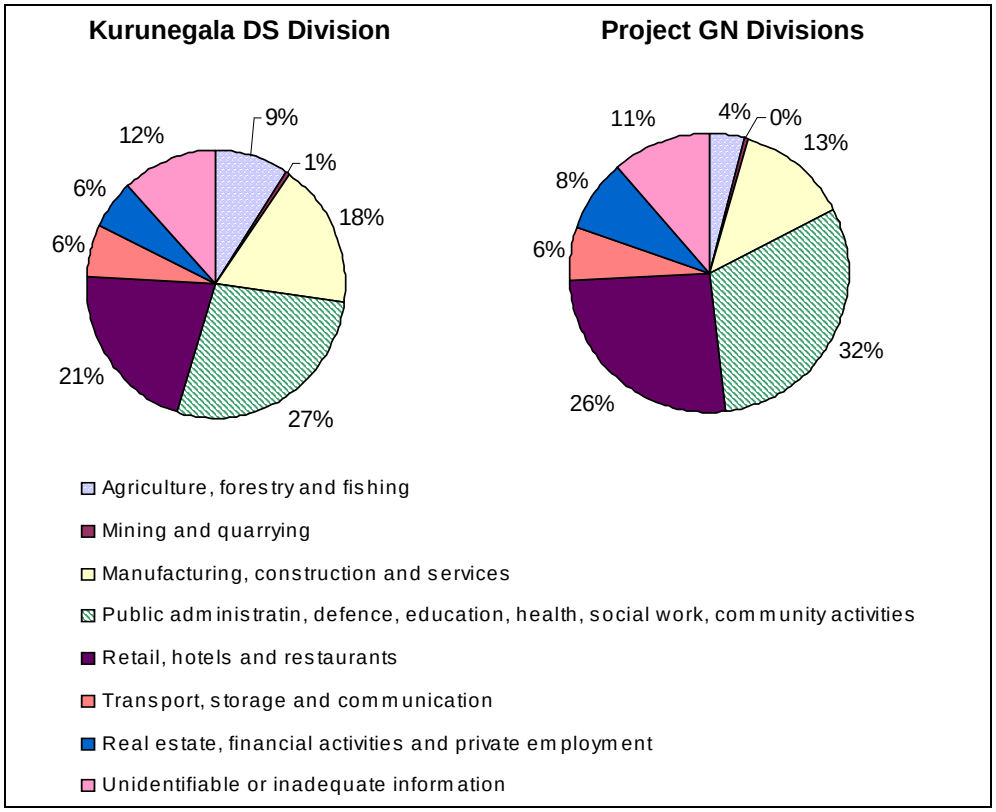
Level	Unit	Mean household income (Rs/month)
Sri Lanka	Total	13038
	Urban	23436
	Rural	11819
Kurunegala District		10771

Source: DCS, 2004

The percentage of the wages contribution is to the household income is 42%, 39% and 39% for the national province and district respectively; and the agricultural sector contribution is 8%, 12% and 10% respectively (DCS 2002b).

The Samurdhi Programme, the government led poverty alleviation programme initiated in 1995 and implemented across Sri Lanka, (excluding Jaffna) now covers around 51% of the population and provides income contributions of 1% at the national level, and 2% at the NWP and Kurunegala District level (Salih 2000).

Figure 4.1: Employed population aged 10 years and over by industry, 2001



Source: DCS, 2001b

Poverty Levels

The DCS defines the headcount ratio as "the percentage of the population whose monthly per capita total consumption expenditure falls below the district level poverty line" (DCS 2004). The official poverty line for Sri Lanka in 2002 was Rs. 1423 and the headcount ratio was estimated at 23%, with the urban sector showing the lowest level of poverty at 8% in 2001. The headcount ratio for Kurunegala District is around the national average at 25% with a much lower percentage in Kurunegala DS Division (Table 4.5).

Table 4.5: Headcount Index from 1990 to 2001

Level	Unit	Percentage of the population whose monthly per capita total consumption expenditure falls below the poverty line Rs. 1423		
		1990-91	1995-96	2000-01
Sri Lanka	Total	26	29	23
	Urban sector	16	14	8
	Rural sector	29	30	25
Kurunegala District		27	26	25
Kurunegala DS Division				15

Source: DCS, 2004

5 Water Supply and Sanitation

The UNDP Human Development Report (2005) states that the percentage of the population of Sri Lanka with sustainable access to an improved water sources (defined as piped water, public tap, borehole or pump, protected well, protected spring or rainwater but not including vendor-provided water, bottled water, tanker trucks or unprotected wells and springs) was 78% in 2002: an increase of 10% since 1990 (UNDP 2005). Similarly the population with sustainable access to improved sanitation (defined as facilities that hygienically separate human excreta from human, animal and insect contact, including sewers or septic tanks, pour-flush latrines and simple pit or ventilated improved pit latrines provided that they are not public and are properly constructed) has increased by 21% to 91% in the same period (UNDP 2005).

Figures provided by the DCS (2005) for 2001 differ slightly to those of UNDP (2005) but also provide rural-urban differentiation as well as data for various administrative levels. According to the census 70% of the households in Kurunegala District have access to improved sanitation and 86% to improved water sources, compared to national averages of 78% and 82% respectively (Table 5.1). As with much of the data, there appears to be no publicly available data disaggregated to the DS Division level.

Table 5.1: Access to improved sanitation and water sources in 2001

Administrative level	Households (%)	
	Sanitation	Water sources
Sri Lanka	67.5	82.0
Urban	77.8	95.9
Rural	67.5	81.2
NWP	69.6	87.9
Kurunegala District	70.5	86.2

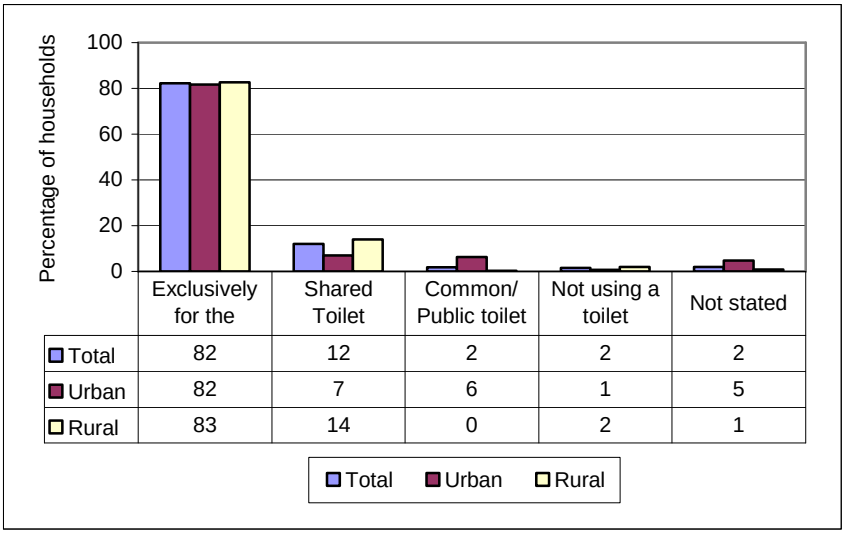
Source: DCS, 2005

Sanitation Facilities

According to the breakdown of sanitation facilities in the 2001 Census, 93% of households in Kurunegala District have access to some form of sanitation facilities based on the sum of all available toilet facilities including: those exclusively for the household (79%); those having a toilet but sharing with another household or using a toilet belonging to another household (8%); and those using a common or public toilet (6%). Another 6% did not use a toilet[2] and 1% did not give a response (DCS 2001b). Figures for Kurunegala DS Division are similar to those for the District although the percentage of households with exclusive toilets is slightly higher at 82%. Rural and urban figures are surprisingly similar although public toilets are more common in urban areas and shared toilets are more common in rural areas (Figure 5.1).

[2] The report did not specify what alternative they had but it may be open defecation or, as is the case in some household in the project area, defecating into polythene bags and disposing of them in the garbage.

Figure 5.1: Access to toilets in Kurunegala DS Division, 2001



Source: DCS, 2001b

The toilet type that each household has varies but the vast majority (87%) of the urban households of Sri Lanka has water sealed toilets while only 2% has no facilities. As would be expected a slightly higher percentage of households in rural areas have no facilities (7%) but the majority (70%) use water sealed toilets. Figures are similar for Kurunegala District but in the Municipal Council area over half the households have pour-flush toilets[3] (52%) and 42% have water sealed toilets (Figure 5.2). This was supported by figures collected during a meeting in 2006 with the Chief Public Health Inspector of the MC (Table 5.2).

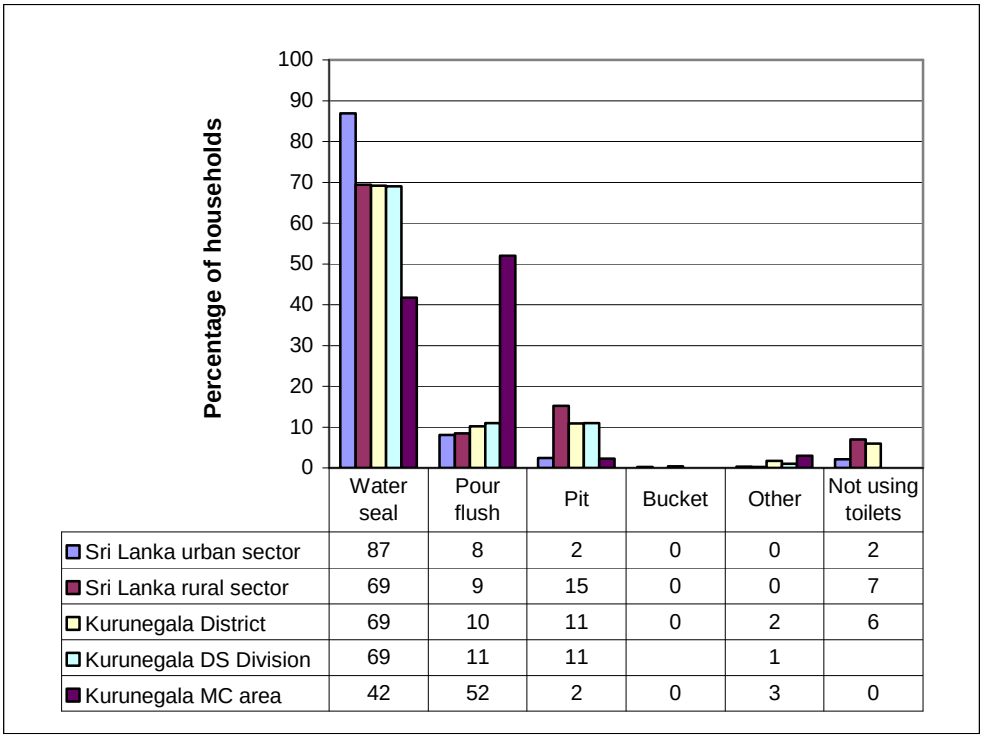
Table 5.2: Sanitary details within Kurunegala municipality area 2004

Unit	Number of households
Estimated Population	37500
Estimated number of houses	7500
Number of houses on sanitation register	7442
Number of houses without latrines	70
Number of houses with unsanitary latrines	442
Number of houses with sanitary latrines	6930

Source: Chief Public Health Inspector, *personal comment*, 2006

[3] Pour-flush latrines comprise of squatting pans and a pit into which feces and urine are washed using buckets of water. Water sealed latrines, are a modified version of this with a pipe leading to the pit that always holds some water, to provide a seal between the pit and the pan, thereby reducing odor and insect nuisance.

Figure 5.2: Sanitation facilities by type for different administrative levels in Sri Lanka



	Water seal	Pour flush	Pit	Bucket	Other	Not using toilets
Sri Lanka urban sector	87	8	2	0	0	2
Sri Lanka rural sector	69	9	15	0	0	7
Kurunegala District	69	10	11	0	2	6
Kurunegala DS Division	69	11	11		1	
Kurunegala MC area	42	52	2	0	3	0

Source: Source: WHO/UNICEF 2004; cited in Sri Lanka Demographic and Health Survey 2000; NWSDB, 2005; DCS, 2001b

Water Supply Facilities

In Kurunegala District 43% of households have protected wells within their premises, 35% have protected wells outside their premises and 13% have unprotected wells: only 4% have mainline water supplies. The percentage of households in Kurunegala DS Division with mainline supplies is higher than the District at 14%: a further 52% and 25% have protected wells respectively within and outside their premises. In the GN Divisions selected for the project 54% have protected wells and 40% have mainline connections (Table 5.3); although this is much lower in the agriculture areas and Wilgoda, Line where a total of 15 households have access to mainline supplies (Nishanka et al. 2006; Annex V).

Table 5.3: Occupied households by source of drinking water

Administrative unit	Kurunegala District	Kurunegala D.S. division	Total for project GN Divisions	Percentage for Project GN Divisions
Total households	380213	20292	6514	100
Protected well within premises	162055	10570	2645	41
Protected well outside premises	132462	5016	845	13
Un-protected well	47837	740	33	1
Tube well	13802	562	135	2
Tap within premises	6299	1104	946	15
Tap outside premises	8496	1839	1616	25
Other (Tank, River)	5422	54	20	0
Not reported	3840	407	274	4

Source: DCS, 2001b

6 Wastewater and Water Quality

Introduction: Issues in Sri Lanka

Sri Lanka faces a number of water and wastewater issues with water related health hazards affecting urban low income communities in particular. These problems arise primarily due to the depletion of water resources and degradation of its quality, part of which can be attributed to sewage and sullage disposal (Bandara 2003). The larger cities such as Colombo, Galle, Jaffna and Kandy have serious problems in the disposal of sewage, industrial effluents and industrial and domestic solid waste, as they generate large quantities but have no facilities for their treatment (UNEP 2001). For example, a report by UNEP (2001) estimated that each day in the Colombo Metropolitan Region 428 metric tonnes (MT) of sewage are released into the ground through septic tanks and pit latrines and 138 MT of sewage are released daily into waterways.

Legislation and Institutions

A number of initiatives have been taken by the Government of Sri Lanka to address the concerns associated with water resources management and pollution. The country is empowered with about 50 water related laws and 20 government agencies regulating water resources (Bandara 2003). However, there has been little coordination of their activities. At present, Sri Lanka has formulated legislations and imposed regulations for urban solid waste management, industrial water pollution and river basin management. The control of pollution of waterways with industrial effluent comes under the purview of the Central Environmental Authority (CEA). For this purpose, the CEA prepares pollution control guidelines, sets pollution control standards (as set out in Annex VI), conducts monitoring activities and issues Environmental Protection Licenses (EPL) for polluting industries. However, according to the CEA data, only about 50% of the industries with an EPL undertake pollution abatement measures (UNEP 2001). The National Environmental (Protection and Quality) Regulations, No. 1 of 1990 were gazetted specifying maximum permissible levels of pollutants that could be present in liquid effluents prior to discharging into waterways. The standards for use of industrial wastewater for irrigation purposes (for land discharge) are also prescribed in this regulation (Annex VI, Table 2). The United States Asia Environmental Partnership (USAEP 2002) report indicates that out of some 13 industrial wastewater treatment facilities inspected only seven complied with the standards. Therefore, an appropriate water quality monitoring program for industrial discharges is essential to support CEA's activities.

In addition to the existing water quality standards, ambient water quality standards are also proposed by the CEA for inland water bodies under an ADB funded project. These standards are classified into seven classes based on their designated use (CEA 2001) these are:

- CLASS I Waters
    - Nature conservation

    - Drinking water with simple treatment
- CLASS II Waters (sensitive waters)
    - Bathing
    - Fish and aquatic life
    - Drinking water, with conventional treatment
    - Irrigation and agriculture
- Class III Waters (general waters)
    - Minimum Quality (Other Uses)

The full proposed water quality standards are provided in Annex VII.

The quality of drinking water supplied by NWSDB is monitored in their central and regional laboratories; and the National Standards Institute has also published standards for and monitors potable water (SLS 614. 1983) and water extracted for public water supplies (SLS 722. 1985). However, water quality studies that have directly dealt with the wastewater issues of inland waters and the long term water quality monitoring to identify trends of water quality are rare. In 1998, the Ministry of Environment and Natural Resources initiated a water pollution control program called “Pavithra Ganga”, to keep the water bodies of Sri Lanka clean (www.unep.org). This program is coordinated in collaboration with the Provincial Commissioner of Local Government, Western Province, with the participation of 13 Local Authorities located within the project area, and other key institutions including the CEA, the Ministry of Industrial Development, the NWSDB, the Board of Investment, DOI, the Water Resources Secretariat and the Forest Department. The main feature of this project is facilitating collaborative decision making and planning to achieve the common goal of keeping the country’s water bodies clean, including the Mahweli River, Kelani, Maha Oya, Deduru Oya and Athanagalu Oya. Implementation will be undertaken by independent organisations based on the areas under their purview and will include a regular monitoring programme (Portfolio of Water Actions Secretariat 2003).

Wastewater Issues in Kurunegala

It is estimated that the wastewater generated by Kurunegala city is 4620 m^3/day, of which 68% is generated by households and 29% by industries (Ranaweera 2005); however, a detailed assessment of the number and type of small commercial and industrial units in the city has not been undertaken yet.

Not only does liquid waste pollute the drains of the city but Kurunegala city generates more than 50 MT of solid waste per day (Kurunegala Municipal Council 2004). Although most of this is collected twice a day by Kurunegala MC and transported to the dumping yard at Sundarapola, a small but un-quantified proportion ends up in the drains, as can be seen by physical observation and discussions with communities living close to the Wan Ela and Beu Ela. This exacerbates the water logging problems in Wilgoda Anicut by impeding the flow of the water draining out of the city. The Beu Ela also directly receives un-treated hospital waste because the treatment plant at the Kurunegala Teaching Hospital is no longer functioning (NWSDB 2005). Analysis of waste entering the Beu Ela from the hospital showed that: the pH was below the national discharge quality standards on two of the three sampling occasions; that BOD_5 was 10-20 times the standard at 328-667 $mg.l^{-1}$;

total phosphate was as much as 40 times the limit of 2.0 mg.l^{-1}; and both total coliform and faecal coliform counts were more than 500/100 ml (NWSDB 2005).

The NWSDB Initial Environmental Examination Report in Respect of Greater Kurunegala Sewerage Project (2005) of the Danish International Development Agency (DANIDA) funded Project concludes that the surface water of Beu Ela is extremely polluted and has identified the Kurunegala Teaching Hospital as a significant source of pollution. This report is a feasibility study for a proposed piped sewerage scheme in Kurunegala and includes some water quality analysis for the Beu Ela. Eight sample points were selected along Beu Ela, with the first three being sampled on the 23rd January 2004 and the other five being sampled on 26th March 2004 (Table 6.1).

Table 6.1: NWSDB feasibility study sampling points

Sampling date	Location number	Description of location
23.01.04	1	Drainage channel flowing to the Beu Ela beside the generator room, General Hospital, Kurunegala
	2	Drainage channel flowing to the Beu Ela through the Thalasemia ward, General Hospital, Kurunegala
	3	Treated waste water outlet of the waste water treatment plant, General Hospital, Kurunegala that is disposed to Beu Ela
26.03.04	4	Beu Ela – About 1 m upstream from the effluent discharging point of the teaching hospital
	5	Waste Water effluent at discharging point into Beu Ela
	6	Beu Ela about 1 m downstream from effluent discharging point
	7	Beu Ela near the service station at Negombo Road
	8	Beu Ela at Wilgoda Anicut

The results for total dissolved solids (TDS) where greatly in excess of the discharge quality standards for disposal to inland surface water bodies (National Environmental Regulations 1990). Chemical Oxygen Demand (COD) was only measured on one occasion and was just within the standard; and BOD was not measured[4].

Sulphide was high in two of the three samples for which it was tested; and fluoride was high in one of the samples. Nutrients were analyzed for in all eight samples. Total ammonia (NH_3-N) levels did not exceed the discharge standard of 50 mg.l^{-1} but did exceed the proposed standard for fish and aquatic life of 0.22-0.94 mg.l^{-1} on all occasions and "other uses" of 1.6-9.1 mg.l^{-1} on some occasions. Nitrate (NO_3-N) values were above the proposed value of 5 mg.l^{-1} in locations 1, 2 and 5; and phosphate values were above the proposed limit of 0.7 mg.l^{-1} in all except location 4 (Annex VII; Table 6.2).

[4] Which is unusual for water quality analysis for drainage water as design parameters for treatment plants are based on BOD; this wastewater treatment plant is no exception. It is assumed that the water was analyzed for BOD but that for some reason the results were not reported here.

Table 6.2: Surface water analysis of Beu Ela and wastes discharged into Beu Ela

				Sample Location							
				Sampled on 23.01.04			Sampled on 26.03.04				
Parameters	**Discharge limits[1]**	FAO severe restriction[2]	**Unit**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Colour			pt/co	220	570	560	83	495	196	270	116
Turbidity			NTU	110	125	120	36	120	68	85	57
Conductivity			us/cm	619	728	1694	712	1718	641	644	1138
Total solids			$mg.l^{-1}$				700	900	1700	660	800
Settlable Solids (60 minutes)			$mg.l^{-1}$				0.26	1.33	0.16	0.33	1.0
TDS	50	>2000	$mg.l^{-1}$				340	757	305	307	552
pH	6.0-8.5	>9		6.9	6.8	6.9	7.1	6.9	6.9	7.1	6.8
COD	250		$mg.l^{-1}$			240					
Chloride		>355	$mg.l^{-1}$	10	244	10	80	188	64	48	104
Sulfide (max)	2.0		$mg.l^{-1}$	36	22	0.51					
Fluoride (max)	2.0		$mg.l^{-1}$	Nil	0.49	252					
Alkalinity			$mg.l^{-1}$	208	184	14.12	196	612	216	244	280
NH_3-N	50.0		$mg.l^{-1}$	6.04	8.12	7.4	0.96	25	1.73	1.38	16.26
NO_3-N			$mg.l^{-1}$	6.8	10.6	0.016	2.8	6.8	1.2	3.5	1.8
NO_2-N			$mg.l^{-1}$	0.026	0.013	4.87	0.008	0.036	0.004	0.007	0.006
PO_4-P			$mg.l^{-1}$	2.87	4.56	296	0.68	4.26	0.67	0.72	2.44
Total Hardness			$mg.l^{-1}$	256	272	06					
Total Coliform			No/100ml	20	30	TMTC	>500	>500	375	300	>500
E.Coliform			No/100ml	10	10		>500	>500	205	275	>500

Source: NWSDB, 2005; [1]National Environmental Regulations, 1990; [2]Ayres and Westcote, 1985

The direct link between this water quality and health impacts is not proven in Kurunegala and a number of factors are of course likely to be important, however the NWSDB (2005) report also states that dysentery and diarrhoea outbreaks are the most frequent water related communicable diseases within the proposed project area; generally occurring soon after monsoon rains with significant increase of disease outbreak in April, May, October and November (Table 6.3).

Table 6.3: Number of cases of key water related diseases in Kurunegala

	Year		
Disease	1998	1999	2000
Cholera	22	10	24
Dysentry	71	29	26
Typhoid	07	08	04
Hepatitis	06	15	13
Malaria/Dengue	08	36	19

Source: Ministry of Health, cited in NWSDB, 2005

Water quality data was also collected by Ranaweera (2005) as part of a final year thesis at the University of Peradeniya researching “Wastewater its Quality and Conjunctive use for Paddy Irrigation in Kurunegala”. In this research water samples were taken from both the Wan Ela and the Beu Ela and were selected from each channel at the following sampling locations.

1. Just before Beu Ela reaching the town area.
2. Beu Ela at the end of the town area.
3. Beu Ela just before canals (Beu and Wan Ela) join together.
4. Just before Wan Ela reaches the town area.
5. Wan Ela at the end of the town area.
6. Wan Ela just before canals (Beu and Wan Ela) join together.
7. Just before the Wilgoda Anicut.
8. On the irrigation canal just before water reaches to the paddy fields.

In addition to these isolated sampling events the NWSDB carry out routine water quality monitoring for drinking water sources and supplies in Kurunegala but generally not on the drainage water. The Industrial Services Bureau (ISB) are currently carrying out water quality monitoring under the Community Led Environmental Awareness (CLEAN) project in the Kurunegala Tank which is used as a town water supply source at times of low water availability. This project seeks to involve communities, politicians, policy makers and the private sector in a dialogue and to actively work towards environmental protection (http://www.isb.lk, 2006).

Table 6.4: Quality parameters of Wan Ela, Beu Ela and irrigation canal

Quality Parameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
Conductivity (µS)	181.4	451.2	324.2	285.5	683.5	413.5	406.5	412.2
Salinity (%)	0.10	0.22	0.20	0.14	0.32	0.20	0.20	0.20
Temperature(^{0}C)	28.15	29.80	29.40	30.80	30.10	29.50	29.07	28.00
pH	7.81	7.37	7.35	7.61	6.88	7.30	7.07	7.18
BOD_5 (mg/l)	165.0	137.5	124.0	41.0	264.5	119.0	78.0	122.0
TDS (mg/l)	87.6	217.7	152.5	136.0	328.3	194.4	192.5	196.8
TSS (mg/l)	84.4	148.7	122.3	96.0	502.9	127.6	88.3	75.2
Total Volatile Solids (mg/l)	124.7	250.5	240.1	127.6	491.5	192.4	171.3	220.4
Total Solids (mg/l)	172.0	366.4	274.8	232.0	831.2	322.0	280.8	272.0
Phosphate (mg/l)	0.17	1.32	1.14	0.21	1.44	0.28	0.41	0.34
Potassium (mg/l) [1]	0.001	*	0.002	0.002	NA	0.002	*	0.003
Sodium (mg/l) [1]	0.43	*	0.61	0.75	NA	0.54	*	0.79
NO_3^- -N (mg/l)	5.47	*	9	6.57	NA	8.32	*	8.72
NO_2^- - N (mg/l)	0.03	*	0.5	0.33	NA	0.12	*	0.39
NH_4^+ -N(mg/l)	0.35	*	0.99	0.28	NA	2.69	*	3.19
Total Coloform/100ml	*	*	*	*	*	*	*	> 50
E.Coli / 100ml	*	*	*	*	*	*	*	27

Source: Ranaweera, 2005

*Not analyzed

[1] These figures are taken directly from the report but they seem very low. It is possible that there is an error with the units and that they should be in $\mu g.l^{-1}$.

Proposed sewerage treatment plant

To address the sanitation and water quality problems in Kurunegala the NWSDB intend to implement a project to sewer and treat the waste in part of the city. The project, which was put out for tender in September 2006, has three major components:

1. Sewage treatment plant using activated sludge and including bar racks, grit chambers, primary sedimentation tank, aeration tank, final settling tank, sludge drying beds;
2. Lifting station; and
3. Sewer network.

The sewerage treatment plant will be located where the hospital wastewater treatment plant is currently situated and the lifting station, which consists of a sump and pump house, will be located in Wilgoda. A wastewater collection network of approximately 42km will be laid as part of the project and individual service connections will be provided to all premises wherever possible (Table 6.5).

Table 6.5: Details of proposed service connections

Category	2005	2025
Domestic	1163	2214
Commercial	495	733
Hotel	06	09
Hospital	06	08
School	05	10
Total	1675	2974

Source: NWSDB, 2005

The effluent will be discharged into the Beu Ela and it is proposed that wetlands will be constructed along the *ela* as a polishing treatment before the final effluent reaches Wilgoda Anicut, after which is will be used to irrigate agricultural land.

7 Agriculture

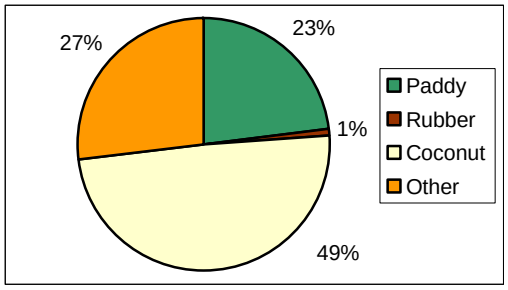
The purpose of this project is to improve the livelihoods of peri-urban farmers through improved health and agricultural production. Agriculture is an important economic sector in Sri Lana, contributing 20% of the Gross Domestic Product (GDP) of the country (Central Bank of Sri Lanka 2005). It is a significant employment sector and covers a large proportion (24%) of the total land area of the country. This chapter therefore presents some of the background statistics for Sri Lanka and Kurunegala to highlight this and to provide context for the project.

Land Utilization

The total land area of the Sri Lanka is 65,000 km^2 of which 24% (15315 km^2) is used for agriculture: paddy (7360 km^2); permanent crops such as coconut (2081 km^2), tea (916 km^2), rubber (487 km^2) and cashew (175 km^2); and other temporary crops (DCS 1995, DCS 2002).

According to the 2002 Agriculture Census there were about 272072 ha (2720 km^2) of agriculture lands in Kurunegala District at that time. Of this the majority (1336 km^2) was coconut and 625 km^2 (23%) was paddy land (Figure 7.1).

Figure 7.1: Distribution of crop area in Kurunegala District



Source: DCS, 2002

Of the land area devoted to paddy production in Kurunegala District, 39% was rainfed, 45% was under minor irrigation and the remainder was under major irrigation schemes in 2002/03 (FAO 2004). In Kurunegala DS Division, the proportion that is rainfed is much higher at 70% of the total paddy lands. These lands are cultivated with paddy in the *maha* season and other field crops such as chilly, mungbeen and ginger, in the *yala* season (Table 7.1).

Table 7.1: Extent of paddy by mode of irrigation, 2002/03 Maha

Area	Irrigation type	Kurunegala District (ha)	Kurunegala Division (ha)
Asweddumized (ready for cultivation)	Major irrigation	12928	166
	Minor irrigation	34577	441
	Rainfed	30190	1395
Sown	Major irrigation	12888	157
	Minor irrigation	33638	441
	Rainfed	29195	1373
Harvested	Major irrigation	10955	133
	Minor irrigation	28592	375
	Rainfed	24816	1167

Source: FAO, 2004

Land Tenure and Legislation

The communities in Sri Lanka have different forms of land ownership and tenure arrangements depending on the use to which the land is being put, for example paddy, *chena*, highlands and home gardens. A critical feature of Sri Lanka's land ownership pattern is the Government's ownership of large tracts of land: of Sri Lanka's total 6.6 million ha, about 86% is owned by the government, of which about 1.38 million ha is farmed by private farmers under varying tenure arrangements (World Bank 2003). Successive reforms of land legislation have increasingly liberalized land markets but only in 2002 did the Government decide to phase out some of the most restrictive features. The key components of the legislation are the:

- **Crown Lands Encroachment Ordinance 1840** transferred all lands without private title, including forests, wasteland, unoccupied or uncultivated land, to the state.
- **Land Development Ordinance (LDO) 1935** gave the government authority to distribute land to households under various schemes for cultivation and housing. These included: the dry zone colonization schemes; village expansion schemes; highland resettlement schemes; youth settlement schemes; regularization of encroachments; middle class allotments; land grants (special provisions); and rainfed farming settlement schemes. The LDO also established the Land Commissioner's Department, which is responsible for administering, protecting and developing all state land. Under the LDO the beneficiary received a restricted title in two stages, first as a permit to use and develop the land and second as a grant for a 99 year lease, once the land has been developed. The leaseholder and any successors are required to make annual payments to the State. Land provided under the LDO not be sold, leased, mortgaged, seized or sold in execution of a court decree nor subdivided; although it can be passed on through succession.
- **Sale of State Lands (Special Provisions) Law 1973** allowed eligible households to buy LDO alienated land. The household received the LDO grant on payment of the purchase price, which was calculated by taking the undeveloped value plus all other assistance paid to the settler for the development of the land.
- **Land Development (Amendment) Act 1981** replaced the Sale of State Lands Law (1973) and gave the Commissioner of Lands authority to determine the purchase amount for the LDO, which could be paid in installments over 10 years, or to waive payment altogether. The Act also replaced the 99 year lease with a perpetual grant. The amendment allowed LDO land to be mortgaged to obtain loans but to be sold only to persons of similar standing and with Government permission.
- **Agrarian Services Act 1979,** as amended in 1990, 1991, and 1993 regulates tenancy in Sri Lanka. It prescribed a ceiling of 2.20 ha (5 acres) on land that could be cultivated by a tenant, the rental payment and terms of succession. The 1991 amendment eliminated the restriction of cropping paddy lands only with paddy and provided for the establishment of

Agrarian Services Committees to ensure efficient management of all agricultural lands and Farmer Organizations to promote development activities.

- **Land Reform Law 1972 and 1975** imposed ceilings on land ownership of 20.2 ha (50 acres), of which no more than 10.1 ha (25 acres) could be held by a single family or an individual over 18 years of age. Any land in excess of the ceiling is taken over by the Land Reform Commission and then redistributed to small-holder tenants.
- **Land Reform (Special Provisions) Act 1981** permitted leasing of lands to individuals or companies over and above the ceiling of 20.2 ha (50 acres) for purposes of agricultural development, and encouraged the return of foreign and domestic companies to agriculture.
- **Agrarian Services Development Act, No. 46 2000** (page 25) states that *"(1) Paddy lands which have been identified by the Commissioner-General as paddy lands from which the maximum production can be obtained by the cultivation of paddy shall be cultivated with paddy during every season in which paddy can be cultivated thereon; (2) Where paddy cannot be cultivated during any season in an extent of paddy land, which has been identified above, due to a natural or other cause, an agricultural crop which is not a perennial crop may be cultivated on such paddy lands after obtaining the written permission of the Commissioner-General; and, (3) In the case of paddy lands from which satisfactory production can be obtained by the cultivation of any crop other than paddy, such paddy land may be cultivated with half yearly crops other than paddy after obtaining the written permission of the Commissioner-General. For the purpose of cultivating long-term crops in such paddy lands, the written permission of the Commissioner-General shall be obtained prior to the commencement of such cultivation*."

Agriculture in the Project Area

The total area cultivated under Wennaru Wewa is 460 acres of which 70 falls into the project area as the project will work in three GN Divisions: Dematagahapelassa, Kaudawatta and Asweduma. As explained earlier in the report, although these lands officially still receive irrigation water from Wennaru Wewa the water flows through the city and collects a considerable quantity of solid and liquid waste, which has a significant effect on the quality of the water reaching the agricultural land. Within the project area there are a total of 188 farmers of which 145 use this water to cultivate 56.5 ha and the remaining farmers use water from the nearby Thiththawella irrigation scheme which provides clean water.

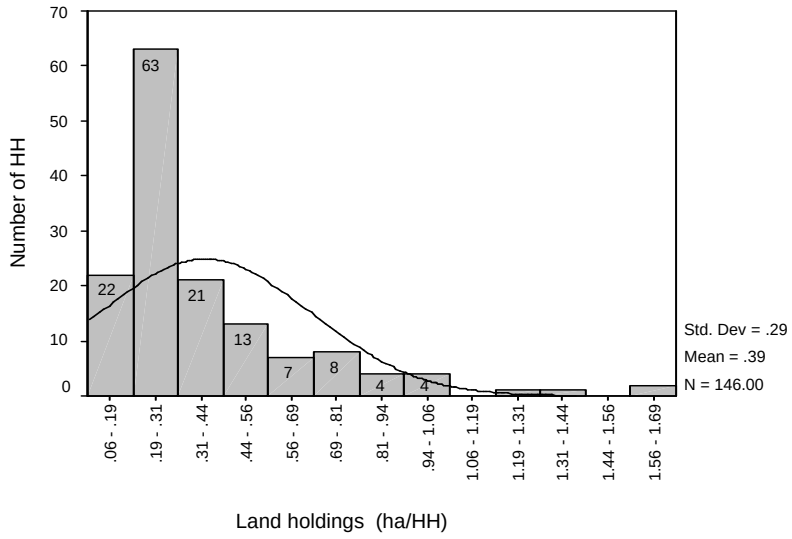
The land area cultivated by each of the households varies from as little as 0.06 ha to 1.39 ha. The majority of households (63%) have between 0.19 ha and 0.31 ha (Figure 7.2).

Table 7.2: Land area under Wennaru Wewa irrigation scheme

GND	Number of farmers	Cultivated extent (ha)
807 Henamulla	65	25
808 Weherabanda	122	42
804 Dematagahapelassa	46	17
842 Udawalpola	30	13
809 Kaudawatta	20	13
841 Kurunegala Town South	75	40
811 Wilgoda	12	5
836 Theliyagonna	42	24
803 Aswedduma	122	40
Total	534	220

Source: Agrarian Service Centre, Kurunegala, 2006

Figure 7.2: Histogram of the Kurunegala paddy farmers who are using wastewater

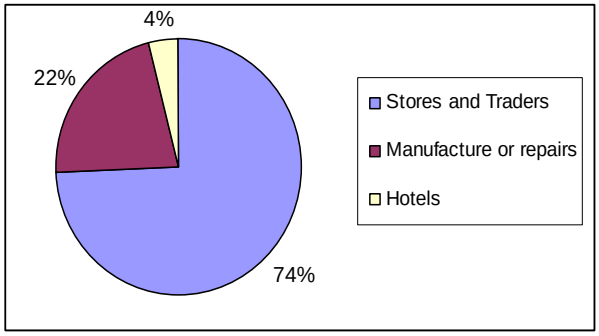


Source: Farmer interviews, 2006-2007

8 Industry

Kurunegala city is becoming the second most important commercial city on the island and an attractive location for new investment, particularly for industries (www.isb.lk). There are currently 425 registered industries and commercial units in the city of which some 315 can be described as stores and traders, although the likely waste that they could produce may vary widely. For example fertilizer and other agrochemical stores, paint and varnish stores, fish sellers and those selling metal items may produce more harmful waste than tea vendors for example, either as a result of spills and accidents, or due to disposal of old stock such as aluminium items into local drains. A further 94 commercial properties can be categorized as manufacturing or repairing units. These premises are likely to contribute more waste than the trading premises; but there may be exceptions. Those that may be of concern in relation to water pollution are metal workshops, service stations, motor repair workshops and leather goods producers (of which there are 12); however the type and quantity of waste produced is not yet known and work is on-going to map all the industries and commercial units in Kurunegala city. Summary statistics are presented in Figure 8.1 and the list and number of all registered industries is given in Annex VIII.

Figure 8.1: Summary of industrial and commercial units in Kurunegala City



Source: Municipal Council Assessment Section, 2006

It is important to note that these are the registered industries and it is well accepted that in most cities there are a high number of unregistered industries and commercial properties. Identifying the number and type of these units, and making an attempt to quantify the waste produced will be an important part of the project.

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Annex I: List of Stakeholder meetings

Key stakeholders meet during the one to one discussion	Institution/authority	Information collected
Deputy Commissioner Municipal Engineer Chief Public Health Inspector	Municipal council	Existing industries within the municipality that have registered with the UC Sanitary condition of the Municipality area
Deputy Director	Provincial Environmental Authority	Initial environmental Assessment Report for Greater Kurunegala Sewerage Treatment Project
Deputy General manager	National Water Supply and Drainage Board	
Commissioner	Department of Agrarian Service District Office	
Agrarian Development Officer; Agrarian Research and Production Assistants (Aswedduma, Dematgahapelassa, Kaudawatta GNs)	Agrarian Service Divisional Office	Agriculture
Farmer Organisations (FOs) Wilgoda Amuna, Aswedduma, Kaudawatta, Dematagahapelassa	Farmers (Aswedduma, Kaudawatta, Dematagahapelassa)	Details of Farmer Organisations and farmers Their problems
Regional Director of Irrigation	Irrigation Department; Kurunegala head office	
Project Manager	Greater Kurunegala Sewerage Treatment Project Office	Layout of greater Kurunegala sewerage scheme
GN	Various	
Program Director Field Officer	SEPA (NGO)	Need assessment report information Solid waste management project implemented in the Wilgoda Line houses

Annex II: Long-term average monthly rainfall 1971-1998

Month	Rainfall (mm)
January	59
February	73
March	124
April	262
May	211
June	160
July	112
August	85
September	156
October	359
November	334
December	132

Source: Department of Meteorology; cited in Somaratne et al, 2003

Annex III: **Population, Annual Growth Rate between 1981 and 2001 and Population Density**

District	Population		Annual Growth Rate During	Population Density per sq.km	
	1981	2001	1981-2001	1981	2001
1. Colombo	1,699,241	2,234,289	1.3	2,605	3,305
2. Gampaha	1,390,862	2,066,096	1.9	994	1,541
3. Kalutara	829,704	1,060,800	1.2	516	673
4. Kandy	1,048,317	1,272,463	1	554	664
5. Matale	357,354	442,427	1.1	180	227
6. Nuwara Eliya	603,577	700,083	0.7	354	410
7. Galle	814,531	990,539	1	487	613
8. Matara	643,786	761,236	0.8	516	599
9. Hambantota	424,344	525,370	1.1	164	210
10. Jaffna	738,788	490,621*	-2	795	528
11.Mannar	106,235	151,577*	1.7	53	81
12.Vavuniya	95,428	149,835*	2.2	36	81
13.Mullathivu	77,189	121,667*	2.2	39	50
14.Kilinochchi	91,764	127,263*	1.6	80	106
15.Batticaloa	330,333	486,447*	1.9	134	186
16.Ampara	388,970	589,344	2	86	140
17.Trincomalee	255,948	340,158*	1.4	98	135
18.Kurunegala	1,211,801	1,452,369	0.9	254	314
19.Puttalam	492,533	705,342	1.8	165	245
20.Anuradhapura	587,929	746,466	1.2	82	112
21.Polonnaruwa	261,563	359,197	1.6	77	117
22.Badulla	640,952	774,555	0.9	227	274
23.Monaragala	273,570	396,173	1.8	49	72
24.Ratnapura	797,087	1,008,164	1.2	246	312
25.Kegalle	684,944	779,774	0.6	412	463
Sri Lanka	14,846,750	18,732,255	1.1	230	299

Source: Census of Population Housing, 1981/2001

* Note: Out of the five Districts in the Northern Province, Jaffna, Kilinochchi and Mullathivu were not covered during Preliminary and Final Censuses. Vavuniya and Mannar were covered partially as explained earlier. In the Eastern Province, Ampara was covered completely and Trincomalee and Batticaloa were covered partially. As such, estimates for the Districts which were not covered or partially covered, are based on the information collected during the Listing and Numbering operation of the Census 2001, wherever possible. Wherever the Listing and Numbering operation was also not complete the Registrar General's Estimates based on the registration of Births and Deaths, have been used. The figures in blue colour given against the Districts in the Northern and Eastern Provinces, under Census 2001,are such estimates.

Annex IV: Employed population of Sri Lanka by gender and sector, 2004

		Agriculture		Industries		Services		Total
		Number	%	Number	%	Number	%	number
Urban	Total	67442	7	271762	27	657038	66	996241
	Male	53292	8	184966	26	471094	66	709352
	Female	14150	5	86796	30	185943	65	286889
Rural	Total	2407283	38	1509685	24	2480819	39	6397788
	Male	1506009	35	981993	23	1852071	43	4340074
	Female	901274	44	527692	26	628748	31	2057714
TOTAL		2474725	33	1781447	24	3137857	42	7394029

Source: DCS, 2004

Annex V: Households in occupied housing units by G.N. division and source of drinking water

G.N. Division number and name	Total households in occupied housing units	Source of drinking water							
		Protected well		Unprotected well	Tube well	Tap (Mainline)		Other	Not reported
		Within premises	Outside premises			Within premises	Outside premises		
Kurunegala District	**380213**	**162055**	**132462**	**47837**	**13802**	**6299**	**8496**	**5422**	**3840**
Kurunegala D.S. division	**20292**	**10570**	**5016**	**740**	**562**	**1104**	**1839**	**54**	**407**
803 Aswedduma	382	248	105	9	7	1	10	1	1
804 Dematagahapelessa	183	115	57	2	7	2	0	0	0
809 Kavudawatta	238	212	20	0	1	0	2	0	3
811 Vilgoda	332	115	207	2	6	1	0	0	1
831 Kurunegala Town North	337	92	62	1	11	11	133	1	26
832 Gangoda	403	213	50	0	37	40	43	4	16
833 Gettuwana	424	134	53	5	5	83	129	6	9
834 Kurunegala Town North East	676	346	58	0	4	76	180	1	11
835 Kurunegala Town East	352	82	57	3	11	35	149	2	13
836 Theliyagonna	594	117	26	5	9	238	168	1	30
837 Kurunegala Town West	855	402	35	4	15	162	152	3	82
838 Iluppugedara	710	143	17	1	12	76	395	0	66
839 Kurunegala Town Central	294	117	3	1	3	45	120	0	5
840 Kurunegala Town Bazaar	67	12	1	0	3	27	20	0	4
841 Kurunegala Town South	395	208	45	0	2	47	89	0	4
842 Udawalpola	272	89	49	0	2	102	26	1	3
Total for GN Divisions	6514	2645	845	33	135	946	1616	20	274

Source: DCS, 2001b

Annex VI: National Environmental (Protection and Quality) Regulations No.1 Of 1990

Table 1: General standards for discharge of effluents into inland surface waters

Determinant	Tolerance Limit
Total Suspended Solids, mg/l, max	50
Particle size of total suspended solids	Shall pass sieve of aperture size 850 micro m.
pH value at ambient temperature	6.0 to 8.5
Biochemical Oxygen Demand-BOD_5 in 5 days at 20^OC, mg/l, max	30
Temperature of discharge	Shall no exceed 40^oC in any Section of the Stream within 15 m down Stream from the effluent outlet.
Oils and greases, mg/l, max	10.0
Phenolic Compounds (as phenolic OH) mg/l, max	1.0
Cyandes as (CN) mg/l, max	0.2
Sulfides, mg/l, max	2.0
Flourides, mg/l, max	2.0
Total residual chlorine mg/l, max	1.0
Arsenic, mg/l, max	0.2
Cadmium total, mg/l, max	0.1
Chromium total, mg/l, max	0.1
Copper total, mg/l, max	3.0
Lead, total, mg/l, max	0.1
Mercury total, mg/l, max	0.0005
Nickel total, mg/l, max	3.0
Selenium total, mg/l, mg	0.05
Zinc total, mg/l, max	5.0
Ammoniacal nitrogen, mg/l, max	50.0
Pesticides	Undetectable
Radio active material (a) Alpha emitters micro curie/ml (b) Beta-emitters micro curie/ml	 10^{-7} 10^{-8}
Chemical Oxygen Demand (COD), mg/l, max	250

Note 1: All efforts should be made to remove colour and unpleasant odour as far as possible.

Note 2: These values are based on dilution of effluents by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the permissible limits are multiplied by 1/8 of the actual dilution.

Note 3: The General Standards cease to apply with regard to a particular industry when industry specific standards are notified for that industry.

Table 2: Tolerance limits for industrial effluents discharged on land for irrigation purpose

No	Determinant	Tolerance Limit
1	Total dissolved solid, mg/l, max	2100
2	pH value ambient temperature	5.5 to 9.0
3	Biochemical Oxygen Demand (BOD_5) in 5 days at 20^oC, mg/l, max	250
4	Oils and grease, mg/l, max.	10.0
5	Chloride (as Cl), mg/l, max.	600
6	Sulfate (as SO_4), mg/l, max.	1000
7	Boron (as B), mg/l, max.	2.0
8	Arsenic (as As), mg/l, max.	0.2
9	Cadmium (as Cd), mg/l, max.	2.0
10	Chromium (as Cr), mg/l, max.	1.0
11	Lead (as Pb), mg/l, max.	1.0
12	Mercury (as Hg), mg/l, max.	0.01
13	Sodium adsorption ratio, (SAR)	10 to 15
14	Residual Sodium Carbonate, mol/l, max	2.5
15	Radio active material: (a) Alpha emitters, micro curie/ml (b) Beta emitters, micro curie/ml	 10^{-9} 10^{-8}

Annex VII: Proposed Ambient Water Quality Standards for Inland Waters Sri Lanka

Parameter	Unit, type of limit	CLASS I Waters		CLASS II Waters (Sensitive waters)				Class III Waters (general waters)
		Nature conservation 1	Drinking water with simple treatment 2	Bathing 3	Fish and aquatic life 4	Drinking water, conventional treatment 5	Irrigation and agriculture 6	Minimum quality (other uses) 7
General								
1. Colour (after simple filtration	Pt mg/l, max.	n	20	-	-	100	-	-
2. Total dissolved solids (TDS)	Mg/l, max.	n	-	-	-	-	500	-
3. Conductivity	dS/m, max.	n	-	-	-	-	0.7	-
4. Odour	-	n	unobj	unobj	-	unobj	-	-
5. Taste	-	n	unobj	-	-	unobj	-	-
6. Turbidity	NTU, max.	n	5	-	-	-	-	-
7. Sodium absorption ratio (SAR)	-	n	-	-	-	-	6-15	-
8. Residual Sdium Carbonate (RSC)	Meq./l, max.	n	-	-	-	-	1.25	--
9. Total hardness	As $CaCo_3$ mg/l, max.	n	250 des. 600 max	-	-	-	-	-
10. pH	-	n	6.0-8.5	6.0-9.0	6.0-8.5	6.0-9.0	6.0-8.5	5.5-9.0
11. Dissolved Oxygen at 25^0C	Mg/l, min	n	6	5	3	4	3	3
12. BOD (5 days at 20^0C or 3 days at 30^0C)	Mg/l, max.	n	3	4	4	5	5	5
trients								
13. COD	Mg/l, max	n	15	20	15	30	-	40
14. Nitrates (No_3 – N)	mg/l, max.	n	5	5	5	5	5	5
15. Total ammonia (NH_3-N) - pH < 7.5 - pH= 8.0 - pH= 8.5	mg/l, max.	n - -	- - -	- - -	0.94 0.59 0.22	- - -	- - -	9.1 4.9 1.6

16. Total phospate (PO_4-P)	mg/l, max.	n	0.7	0.7	0.4	0.7	0.7	0.7
ıer Substances								
17. Chlorides (Cl)	mg/l,max	n	200	-	-	200	100	-
18. Cyanides (CN)	mg/l, max.	n	0.005	0.005	0.005	0.005	0.005	0.005
19. Fluorides (F)	mg/l, max.	n	1.5	-	-	1.5	-	-
20. Sulphates (SO_4)	mg/l, max.	n	250	-	-	250	1000	--
Metals								
21. Total cadmium (Cd)	µg/l, max.	n	5	-	**H** **Cd** <60 0.2 60-120 0.8 120-180 1.3 >180 1.8	5	-	5
22. Total chromium (Cr)	µg/l, max.	n	50	-	2	50	-	50
23. Total copper (Cu)	µg/l, max.	n	-	-	**H** **Cu** <60 2 60-120 2 120-180 3 >180 4	-	-	100
24. Iron (Fe)	µg/l, max.	n	300 des. 1000 max	-	300	200	-	-
25. Lead (Pb)	µg/l, max.	n	50	-	**H** **Pb** <60 1 60-120 2 120-180 4 >180 7	50	-	50
26. Manganese (Mn)	µg/l, max.	n	1000	1000	1000	1000	1000	1000
27. Mercury (Hg)	µg/l, max.	n	1	1	0.1	1	1	2
28. Nickel (Ni)	µg/l, max.	n	100	100	**H** **Ni** <60 25 60-120 65 120-180 110 >180 150	100	100	100
29. Selenium (Se)	µg/l, max.	n	10	10	1	10	-	-
30. Zinc (Zn)	µg/l, max.	n	1000	1000	30	1000	1000	1000
31. Boron (B)	µg/l, max.	n	-	-	-	-	500	--
32. Total arsenic (As)	µg/l, max.	n	10	50	50	10	50	50

33. Aluminium (Al)	µg/l, max.	n	200	-	-	200	5.0	-
Organic Micro Pollutants								
34. Phenol index	µg/l, max.	n	2	5	1	5	5	5
35. Oil and grease	µg/l, max.	n	100	200	10	100	-	300
36. Anionic surfactants (detergent) as MBAS	µg/l, max.	n	200	300	1000	200	1000	1000
37. Total pesticides	µg/l, max.	n	10	30	30	30	50	50
Micro Organisms								
38. Total coliform	MPN/100ml, (*P=95%)	n	5000	1000	20,000	5000	1000	-
39. Faecal coliform	MPN/100ml, (*P=95%)	n	250 des 600 max	50	-	-	-	-

Source: Central Environmental Authority. 2001.

Abbreviations : n = Nature or baseline values; H = Hardness in terms of $CaCO_3$ in mg/l; des. = Desirable highest level; max. - Maximum permissible substances; MBAS - Methylene blue active substances; *P=95% = 95% of the samples give a value that is equal to or less than the indicated limit; Mean – during longer period; Min. daily = average of daily waters; prevention of eutrophication, excessive weed growth, may require lower, site specific, for stagnant waters

Annex VIII: Registered industries within municipality area 2006

Type of Industry	Number
Wood stores	10
Fertiliser stores	04
Antique sellers	06
Selling metal products	11
Cement stores and sellers	07
Metal sellers	02
Tyre rebuilding	01
Battery sellers	04
Tube welding	04
Foot cycle repair	02
Furniture stores and sellers	17
Repairing jewellery	03
Tea stores	03
Textile stores and sellers	48
Coconut oil production and selling	04
Paint and varnish sellers	20
Welders	06
Metal workshop	06
Service stations	03
Press	07
Produce rubber products	01
Cool drinks sellers	05
Carpenters	01
Production of leather products	12
Selling leather products	10
Studios	08
Repair motor bikes	11
Coir selling	01
Tyre tube stores	14
Garment sellers	36
Tailors	01
Radio repair	02
Agro chemical sellers	01
Garments	02
Picture framing	04
Aluminium products sellers	02
Repair of vehicles	13
Electrical items stores and sellers	31
Potato stores and sellers	02
Rice mill	04
Saloon	02
Bakery	05
Cushion works	04
Depots	02
Dry fish stores and sellers	02
Flour or spice grinding mill	04
Grain stores	06
Hotels	16
Retail goods sellers	47
Chilled fish and meat sellers	08

Source: Municipal Council Assessment Section