

CHAPTER 2 GENERAL DESCRIPTION OF STUDY AREA

2.1 GEOLOGY

2.1.1 TOPOGRAPHY AND GEOMORPHOLOGY

Most of the Study area is a gentle slope area at an elevation of 200 m or less. The northern part of the Study area is a little hilly at an elevation of 200 m or above and partially mountainous at the elevation of 400 m or above. The southern part slopes gently to the coastal area.

A hilly area where inselbergs are developed is distributed in the northern part of Monaragala. Most part of the Study area is covered by Micro Relief Planation Surface with an inclination of 0.4 degree or less up to the elevation of 140 m from the coastal area to the inland area. Coastal lowlands are distributed in the southern coastal area.

2.1.2 GEOLOGY

(1) General Geology of the Country

Precambrian high-grade metamorphic rocks underlie 90% of the Island of Sri Lanka. The Precambrian rocks were divided into major three groups: Highland Complex, Vijayan Complex and Wann Complex. The distribution of these Complexes in the country is shown in *Figure 2.1*.

(2) Geology of the Study area

Geological map of the Study area is shown in *Figure 2.2*. Rocks of the Vijayan Complex underlie widely in the area while the Highland Complex is restricted to the northwestern hilly part and the western part of the Study area. Recent sediments occur in the southern and southeastern coastal belt.

1) Highland Complex

Rocks of the Highland Complex predominate in the western and northwestern part of the area and are characterized by interlayered metasedimentary rocks including garnet-biotite-sillimanite-graphite gneiss, crystalline limestone, calc-gneiss, quartzofeldspathic gneiss, garnet-biotite gneiss and garnet-bearing charnockitic gneiss.

2) Highland Complex Outliers

The outliers which are named the Buttala Klippe, the Monaragala Range, the Kataragama Complex and others occur within the Vijayan Complex in the area.

3) Vijayan Complex

The Vijayan Complex contains variably migmatized, upper-amphibolite facies gneisses with a wide variation in the proportion of hornblende and biotite. The gneisses range in composition from gabbro-diorite to syenogranite, with the dominant rock types, hornblende-biotite gneiss and biotite-hornblende gneiss, being of tonalite to quartz-diorite composition.

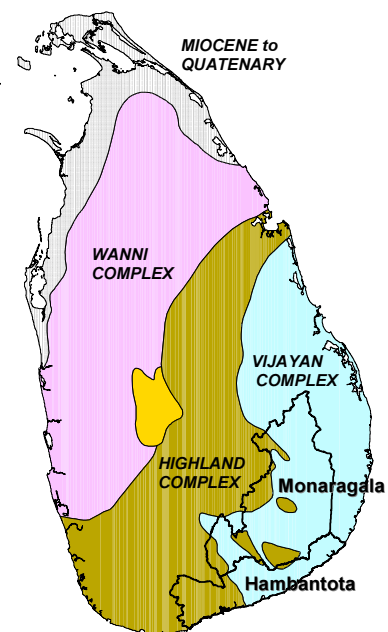


Figure 2.1 Distribution of Geological Complex

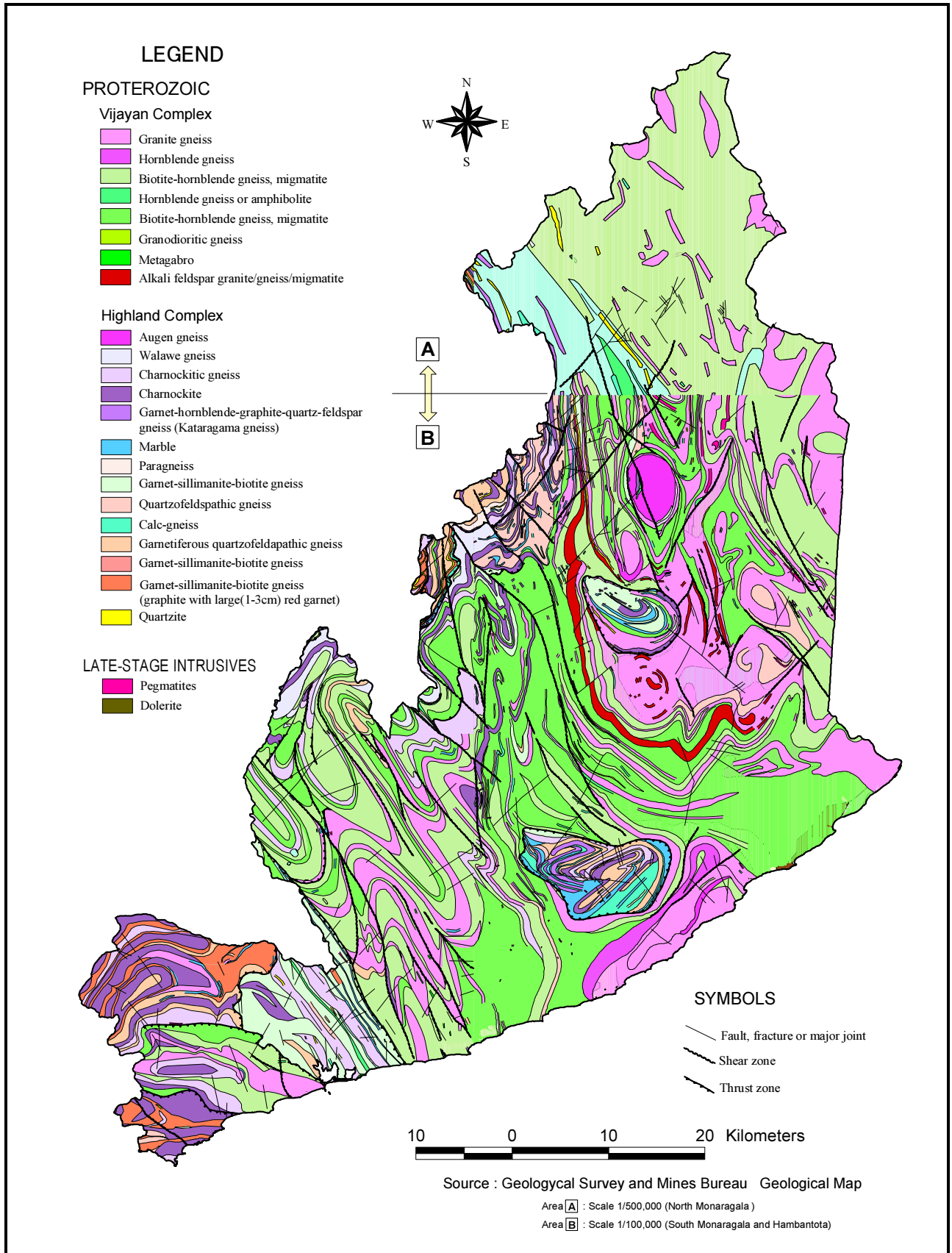


FIGURE 2.2 GEOLOGICAL MAP OF THE STUDY AREA

2.2 HYDROLOGY

2.2.1 METEOROLOGY

(1) General Climate of Sri Lanka

The climate of Sri Lanka is classified as “Tropical monsoon” climatic zone. The monsoonal conditions are separated into two periods: from May to September is in the southwest monsoon period and from December to February is in the northeast monsoon period. The climate condition generates dry zone in north and in southeast of Sri Lanka.

The average annual rainfall has considerable spatial variation. The higher rainfalls are on the central highlands. The minimum annual rainfall values are on the northwestern and southeastern lowlands of less than 1,000 mm. See *Figure 2.3*.

(2) Climate of the Study area

Climate of the Study Area is characterized as northeast monsoon and dry area.

1) Rainfall

The rainfall by a northeast monsoon is small in this area. The shallowest rainfall is in July of the period of southwest monsoon from May to September. A half of amount of annual rainfall is concentrated in three months from October to December. In general, the rainfall depth of Monaragala is larger than of Hambantota district.

2) Temperature

The variation of the mean monthly value is small, it is only 2°C, during period of 1961 to 1990. The highest temperature of 31.2°C is observed at April, meanwhile, the lowest one of 22.8°C is observed at January.

3) Relative Humidity

According to mean monthly relative humidity on average from 1995 to 2000 in Hambantota gauging station, the range of monthly humidity in daytime is 72% (March) to 79% (May), the range of monthly humidity in nighttime is 85% (February) to 88% (November). Rather high relative tendency can be observed during the period of southwest and northeast monsoon.

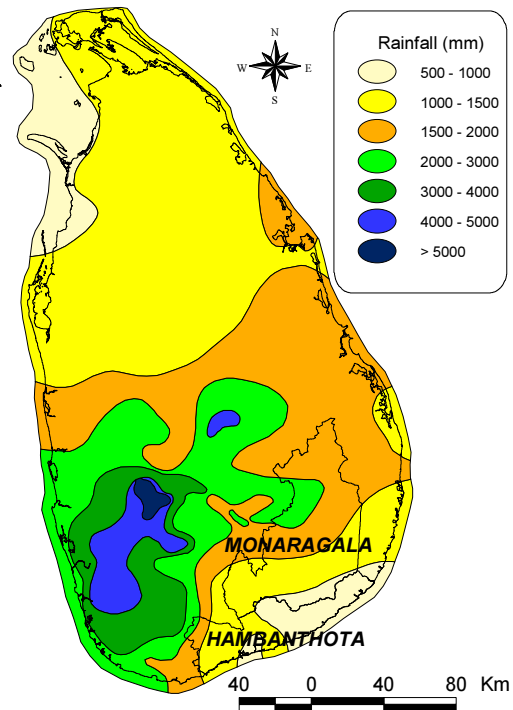


Figure 2.3 Annual Rainfall

2.2.2 HYDROLOGICAL CHARACTERISTICS

There are 23 river basins in the Study Area, having a total catchment area of 11,120 km². The rivers related to this study are listed in *Table 2.1*. Hydrological stations (rainfall stations and runoff discharge gauging stations) and river systems in the Study area is shown in *Figure 2.4*.

Table 2.1 Rivers in the Study area

No	Name of River	Catchment Area (km ²)	Number of Tanks in the Catchment	Related Districts and Areas
13	Sinimodera Oya	39	9	Hambantota
14	Kirama Oya	225	206	Hambantota
15	Rekawa Oya	76	113	Hambantota
16	Urubokka Oya	352	182	Hambantota
17	Kachchigala	223	150	Hambantota
18	Walawe Ganga	2471	777	Hambantota, Monaragala
19	Karagan Oya	58	28	Hambantota
20	Malala Oya	404	378	Hambantota, Monaragala
21	Embilikala Oya	60	20	Hambantota
22	Kirindi Oya	1178	334	Hambantota, Monaragala
23	Banbawe Ara	80	27	Hambantota, Yala National Park
24	Mahasiliwa Oya	13	5	Hambantota, Yala National Park
25	Butawa Oya	39	18	Hambantota, Yala National Park
26	Menik Ganga	1287	294	Hambantota, Monaragala, Yala National Park
27	Katupila Ara	87	45	Hambantota, Yala National Park
28	Kurundu Ara	132	35	Hambantota, Yala National Park
29	Nabadagas Ara	109	9	Hambantota, Yala National Park
30	Karamba Ara	47	2	Hambantota, Yala National Park
31	Kumbukkan Oya	1233	61	Monaragala, Yala National Park
32	Bagura Oya	93	19	Monaragala, Yala National Park
35	Wila Oya	490	65	Monaragala
36	Heda Oya	611	55	Monaragala
44	Gal Oya	1813	91	Monaragala
Total		11,120	2,923	

Data Source: Irrigation Department

(1) Distribution of Rainfall

Distribution of average annual rainfall in the Study area is shown in *Figure 2.5*.

1) Rainfall Distribution in the Study Area

The major features of the rainfall distribution in the Study area are summarized as follows:

- The mountain slope areas facing to the northeast have a large rainfall depth with an average annual rainfall of 3,000 mm or less, while the slopes facing to the southwest have smaller rainfall depth of less than 2,000 mm.
- The southern coastal area has a small average annual rainfall of 800 to 1,100 mm.
- Average annual rainfall in the inland flat areas ranges from 1,000 to 1,500 mm.

2) Yearly Rainfall Distribution:

Annual rainfall depths from October to September were calculated using monthly rainfall records. Major features are as follows:

- At Hambantota Station, in the years 1988/89 (625 mm), 89/90 (706 mm), 95/96 (737 mm) and 82/83 (800 mm) were dry (average 982 mm, maximum 1,350 mm).
- Dry years in the upper river basins were 82/83, 84/85 and 88/89 for the Menik Ganga, 86/87, 91/92 and 88/89 for the Kirindi Oya. Judging from the river discharge data, the year 88/89 was the driest.

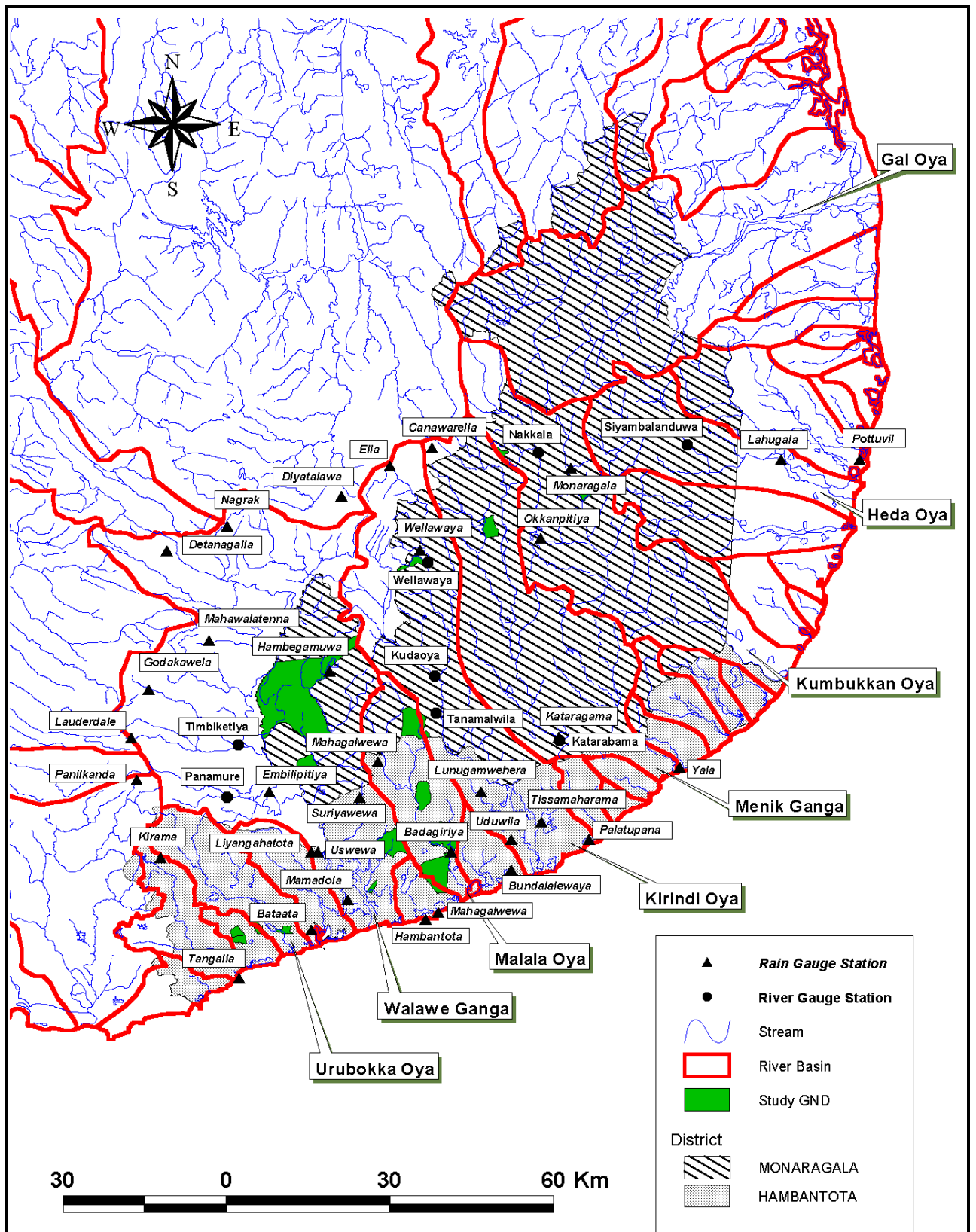


FIGURE 2.4 RIVER SYSTEMS AND HYDROLOGICAL STATIONS

THE STUDY ON COMPREHENSIVE GROUNDWATER RESOURCES DEVELOPMENT

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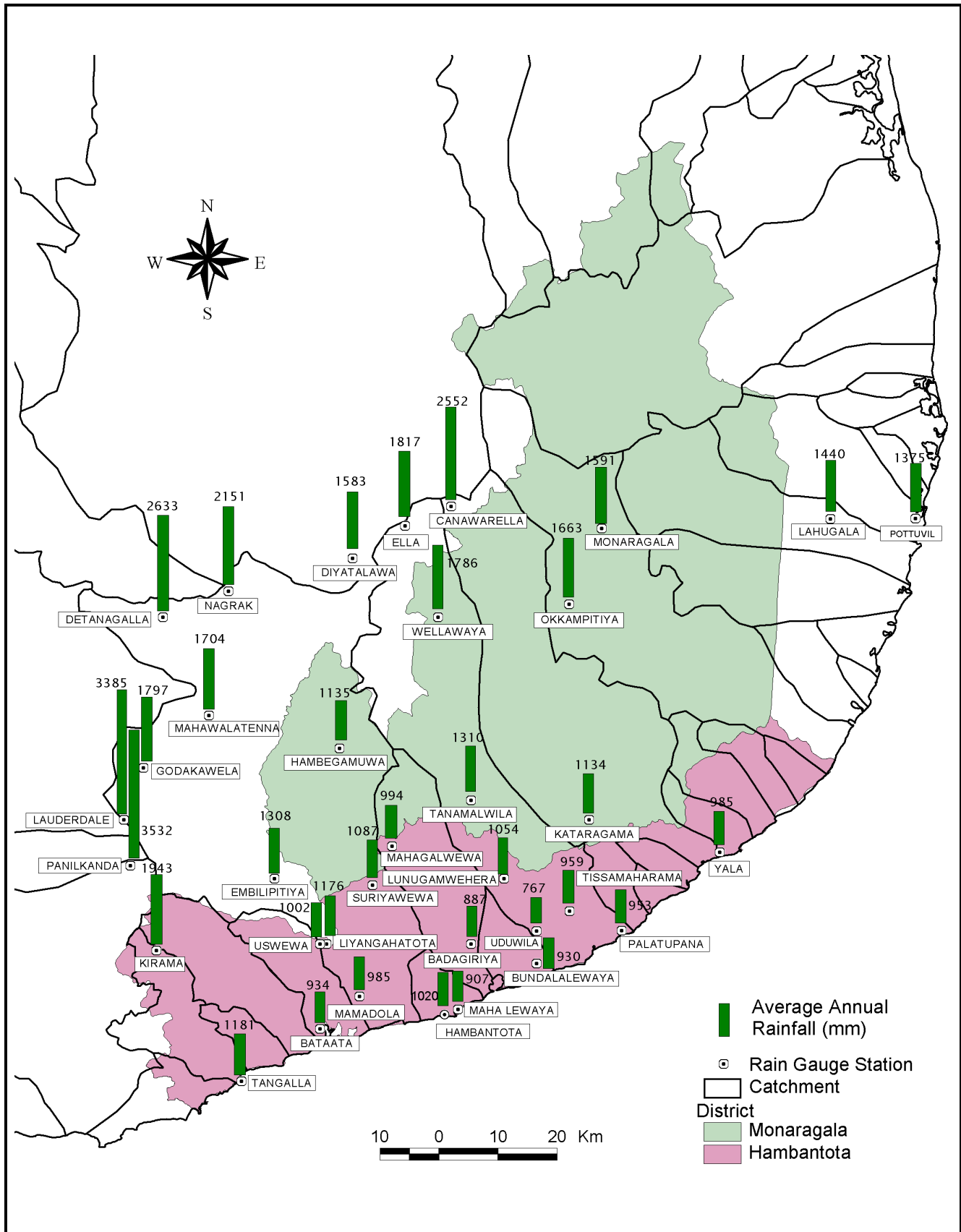


FIGURE 2.5 DISTRIBUTION OF AVERAGE ANNUAL RAINFALL

(2) Major Hydrological Findings

The Walawe Ganga has ample water even in the dry season because of its large catchment area and the large rainfall in its western basin.

The Kirindi Oya and the Menik Ganga do not have enough water in the dry season due to small rainfall in the basin, except small mountain areas in the north. Small rivers in Hambantota, except Urubokka Oya, do not have enough surface water.

There are many tanks (reservoirs) for irrigation in the Study Area. Some rivers were observed to have no flow in the dry season.

Most of the 15 Pilot GNDs are located in hilly areas with elevation of 30 to 375 m for Monaragala and 25 to 40 m for Hambantota. In these areas, dug wells usually dry up during the dry seasons.

The river waters in the Study Area are used mainly for irrigation. Average annual irrigation water volumes released from major tanks and “anicut” in total are 135 million m³ for Monaragala and 502 million m³ for Hambantota.

2.2.3 POTENTIAL RECHARGE TO GROUNDWATER

In this study, the potential groundwater recharge was regarded the runoff in the drought year as a potential groundwater recharge. This estimation was made under the assumption that almost all the river discharge in a drought year could be flowed out from groundwater, considering the balance between rainfall and infiltration. As the result, the annual recharge potential for the dry area in Hambantota and Monaragala are estimated to be 100 mm to 200 mm in a drought year. A value of minimum runoff was given by the following manners.

- In Hambantota, a lower value of 100 mm was given by considering that it is dry area.
- In Monaragala, a higher value of 200 mm was given to the area located at high elevation where annual rainfall is comparatively high, whereas a lower value of 100 mm was given to the area located at lower elevation.

The recharge potentials evaluated are estimates, but they are considered as reasonable. However, the recharge amount is also influenced by the potential of water head, which will vary depending on the scale of groundwater pumping. Therefore, if the project is implemented, it is necessary to examine the groundwater recharge by the long term monitoring of the groundwater head.

2.3 SOCIO-ECONOMIC CONDITIONS

2.3.1 ADMINISTRATIVE SETTINGS

In Sri Lanka, administrative unit consists of Provinces, Districts, Divisional Secretary's Division (DSD), Grama Niladhari Divisions (GND) and villages. There are 9 Provinces and 25 Districts in the country. The GND is considered the smallest administrative unit provided with statistical data. Therefore, GND was defined as a unit for groundwater development plans concerning the “Pilot GND”.

The Study covers two districts, Monaragala and Hambantota districts.

(1) Monaragala District

Monaragala district, which is one of the two districts of Uva province, consists of 11 DSDs. These DSDs are further divided into GND. In Monaragala district, each DSD has a Pradeshiya Sabhas (local administrative organization) and there is no Urban Council in any DSD.

There are seven Pilot GNDs in Monaragala district.

(2) Hambantota District

Hambantota district, which belongs to Southern province, consists of 11 DSDs. In Hambantota district, each DSD has a Pradeshiya Sabha which is the local authority. Hambantota and

Tangalla DSD have an urban council.

There are eight Pilot GNDs in Hambantota district.

2.3.2 POPULATION, ETHNIC AND RELIGIOUS COMPOSITIONS

The population of the Sri Lanka was estimated as 18,730,000 by the census 2001. The population density is 285 person/km². The average annual growth rate is estimated to be 1.14% during the period of 1990 to 2000 (past 10 years average). The annual growth rate is as high as 1.8% at Monaragala, as low as 1.1% at Hambantota.

In Sri Lanka, there are three major ethnic groups: Sinhalese (74% of the total population), Tamils (18%) and Sri Lanka Moor (8%). Regarding the religions, the majority (69%) are Buddhists consisting of mainly Sinhalese, 15% are Hindu (mainly Tamils) and the rest are Christians and Muslims.

(1) Monaragala District

The populations of each DSD in Monaragala district are estimated as shown in *Table 2.2*.

Table 2.2 Population of DSD in Monaragala District

Name of D.S. Division	Population
Badalkumbura	36,693
Bibile	35,435
Buttala	47,086
Katharagama	16,372
Madulla	28,302
Medagama	32,083
Moneragala	42,575
Sevanagala	36,683
Siyambalanduwa	47,437
Thanamalvila	23,158
Wellawaya	50,349
District Total	396,173

Source: The results of Census of Population and Housing, 2001, Department of Census and Statistics, Sri Lanka,

In Monaragala, Sinhalese, Sri Lanka Tamil, Indian Tamil and Sri Lanka Moor population comprises of 94.5%, 1.4%, 1.9% and 2% respectively. Predominance of Sinhalese to other ethnic groups is significant in the district.

The religious affiliations in the District show that out of the total population 94.4% are Buddhists, 3% are Hindus, 2.1% are Muslims, 0.4% are Roman Catholics and 0.2% are other Christian sects.

(2) Hambantota District

The populations of each DSD in Monaragala district are estimated as shown in *Table 2.3*.

Table 2.3 Population of DSD in Hambantota District

DSD	Population
Ambalantota	63,930
Angunakolapelessa	42,420
Beliatta	52,280
Hambantota	46,777
Katuwana	62,222
Lunugamvehera	25,148
Okewela	18,204
Sooriyawewa	35,620
Tangalle	62,804
Thissamaharama	60,941
Weeraketiya	55,024
District Total	525,370

Source: The results of Census of Population and Housing, 2001, Department of Census and Statistics, Sri Lanka, (DCS, 2001)

An annual population growth rate of the District is 1.1%. It is lower than the annual growth rate for Monaragala district.

Sinhalese, Sri Lanka Tamil, Indian Tamil and Sri Lanka Moor population comprises of 97.1%, 0.4%, 0.1% and 1.1% respectively. Predominance of Sinhalese to other ethnic groups is significant in the District.

The religious affiliations in the District show that out of the total population 96.9% are Buddhists, 0.3% are Hindus, 2.5% are Muslims, 0.2% are Roman Catholics and 0.2% are other Christians.

2.3.3 ECONOMY

According to the Household Income and Expenditure Survey, median monthly household income for the rural sector of Sri Lanka was about 4,000 Rupee in 1995/1996.

(1) Monaragala District

Employment composition in Monaragala district was determined by the questionnaire survey conducted in this Study. The employment in the agriculture sector accounts for 51.5%. This is higher than that of the whole country.

Monthly income distribution of the District was obtained by the questionnaire. Families with monthly income less than 4,000 Rupee exceeded 60% of the total households. The median for the district is apparently lower than that of national level of five years ago. Therefore, the District is considered to be a poor area in the country.

(2) Hambantota District

The major employment in Hambantota district is agriculture. The percentage of agricultural employment, which is more than 80%, is higher than that of Monaragala district.

The percentage of families of which income is less than 4,000 Rs/month, which is around 80%, is higher than that of Monaragala district. The result reveals that the income level in Hambantota district is lower than Monaragala district.