

Analysis of the Environmental Background of the Palipbothana

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Introduction

This chapter examines the environmental background of the *Rathmalgahawewa Palipbothana* area. This archaeological site is located close to the town of *Rathmalgahawewa* in the Anuradhapura District of the North Central Province of Sri Lanka. It is hydrologically imperative that this excavation site is located near the Malwathu Oya and Ma Oya watershed boundary area. Although the site area is in the north-central region, its natural environment is very different from the other regions. The north-central part could be identified as eastern and the western segments under the specific features (Rainfall, soil type, and Tank density) Panabokke, (1999).

Further, variation in landforms, soil, and underlying geology could be recognized from eastern to western. The interpretation of this site area's natural environment has been an important factor bearing on the distribution pattern and density of the small tanks and cascade ensembles that cut across this landscape. Significant characteristics are influence first-order or second-order streams running through this area. The site belongs to Palipbothana Grama Niladhari Division (GND) in Kahatagasdigiliya Divisional Secretariat (DS). Briefly describes the geographical location, climate, soil conditions, topography, water resources, forest cover, land use, biodiversity, and Environmental Change of the study area.

Methodology

The research methodology is employed to achieve the research's main objectives; Secondary data were used to study the Palipbothan area environmental background. As the secondary data sources, books, magazines, research papers, and suitable web sites were used. Primary data were collected from field visits to identify the land use pattern and changes. The data collected were analyzed qualitatively and quantitatively.

Location

Sri Lanka lies on the Indian Plate, a major tectonic plate formerly part of the Indo-Australian Plate. It is in the Indian Ocean southwest of the Bay of Bengal, between latitudes 5° and 10° N, and longitudes 79° and 82° E. The island consists mostly of flat to rolling coastal plains, with mountains rising only in the south-central part. The highest point is *Pidurutalagala*, reaching 2,524 meters (8,281 ft) above sea level. The Anuradhapura District

is situated in the dry zone of Sri Lanka, famous for its well-preserved ruins of an ancient Sinhala civilization. In the sacred city of Anuradhapura and the vicinity are a large number of ruins. The ruins contain three classes of buildings, dagobas, monastic buildings, and pokuna (ponds). The city had some of the most compound irrigation systems of the earliest world; situated in the country's dry zone, the administration built many tanks to irrigate the land. Most of the civilians are Sinhala, while Tamils and Sri Lankan Moors live in the district.

The "Rathmalgahawewa Palipbothana Megalithic Burial Site" is located in the Kahatagsadigiliya Divisional Secretariat of Anuradhapura District. The Kahatagsadigiliya divisional secretariat's divisions belonging to the central Nuwaragampalatha are bounded in Mihinthala, Galenbindunuwewa Horowpathana, Rambawewa, and Kebithigollewa divisional secretariat divisions. Kahatagsadigiliya Divisional Secretary's Division of the Anuradhapura District Walking distance of 35.2 km from the Anuradhapura sacred city to the small town center Kahatagsadigiliya. The total area is 351.99 km, and the entire population includes 119 villages. It belongs to the Udyiyankulam Koralya, Kalpa Koralya, and Kanadara Koralya according to the ancient Korale divisions. Globally, this divisional secretariat cannot be seen to be so large, and only the Yan Oya flows through this division. The area is comprised of Grama Niladhari Division, namely No: 224, Palipbothana. This site is located between Latitude 8.522350° N and Longitude 80.667340° E. The site comes under the DL1b agro-ecological zone. It has a bi-modal rainfall pattern with distinct rainfall peaks from March to May and October to December. The average annual rainfall in DL1b agro-ecological zone is above 900 mm. The average air temperature is about 30°C , although the maximum temperature may even exceed 33°C . January, February, March, June, July, and August are relatively the driest, but April is receiving adequate rainfall. Extensive mountain ranges cannot be seen in the area, and there are small mountain ranges.



Map 1-1 Study area

Source: Compiled by Researchers according to the Survey Department Data, 2007

Climate

Climate is the long-term average weather in a place or a region that covers average weather over 30 years. The climate in an area depends on various factors such as latitude, terrain, altitude, nearby water bodies and their currents. Climate is commonly measured using meteorological variables such as precipitation, temperature, humidity, atmospheric pressure and wind (Intergovernmental Panel on Climate Change: IPCC 2007). According to German climate scientist Wladimir Koppen, Climate is divided into five categories in the early 1900s based on the temperature, precipitation, and the year when precipitation occurs as tropical, dry, temperate, and continental and polar. These five categories are also depending on

regions' latitudes imaginary lines used to measure our earth from north to south from the equator. The tropical climate is situated near the equator, where the average temperature is greater than 64 °F (18 °C) throughout the year. Normal precipitation is more than 59 inches each year because it receives more sun rays than other regions because sun rays directly hit the equator region on earth. The polar area is situated in high latitudes from the equator and both north and south poles. These regions receive very low sun rays, not normally exceeding 50 °F (10 °C). Other climate regions are situated between tropical and Polar Regions where temperature and precipitation are changed occupationally (Scijinks 2020).

Climate change is a major challenge for the future world because many scientists and international research institutions have pointed out that the temperature increasing is continuing without boundary due to natural and human-made reasons. But 97 percent is proven that anthropogenic activities are the major reason for this phenomenon. According to IPCC assessment report 2007, it was projected that the temperature would increase 4.3° to 11.5°F with a high probability of 7.2°F. Still, according to the Massachusetts Institute of Technology, it was observed that temperature would rise 9.4 oF by 2100. Global average surface and global Average ocean temperate have been increased (Intergovernmental Panel on Climate Change:IPCC 2019). Since 1880 during the last 140 years, 2016 is reported as the warmest year, and when analyzing most ten warmest years during the past 140 years, all have been recorded since 2005. Due to the increase of global temperate, the global sea level has risen by about 8 inches since 1880, and it is projected to rise another 1 to 8 feet by 2100. This happens as the result of added water from melting ice and the expansion of seawater (Global Climate Change,NASA 2008). According to NASA, Global warming is caused due to the anthropogenic increase of greenhouse gases, mainly water vapor, carbon dioxide, Methane, Nitrous Oxide, and Chlorofluorocarbons. Among this atmospheric carbon, dioxides have increased 47% during the last 170 years from 280ppp to 415ppp by November 2020 (Global Climate Change,NASA 2008). The following Chart 1-1 shows the trend of increased global temperature from 1880 to 2020.

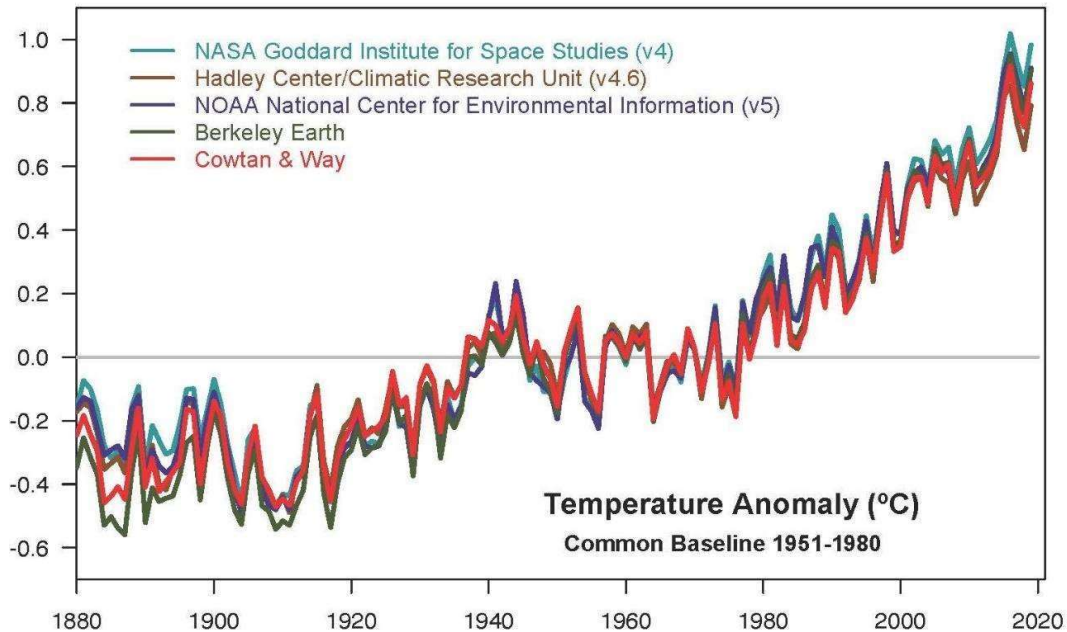
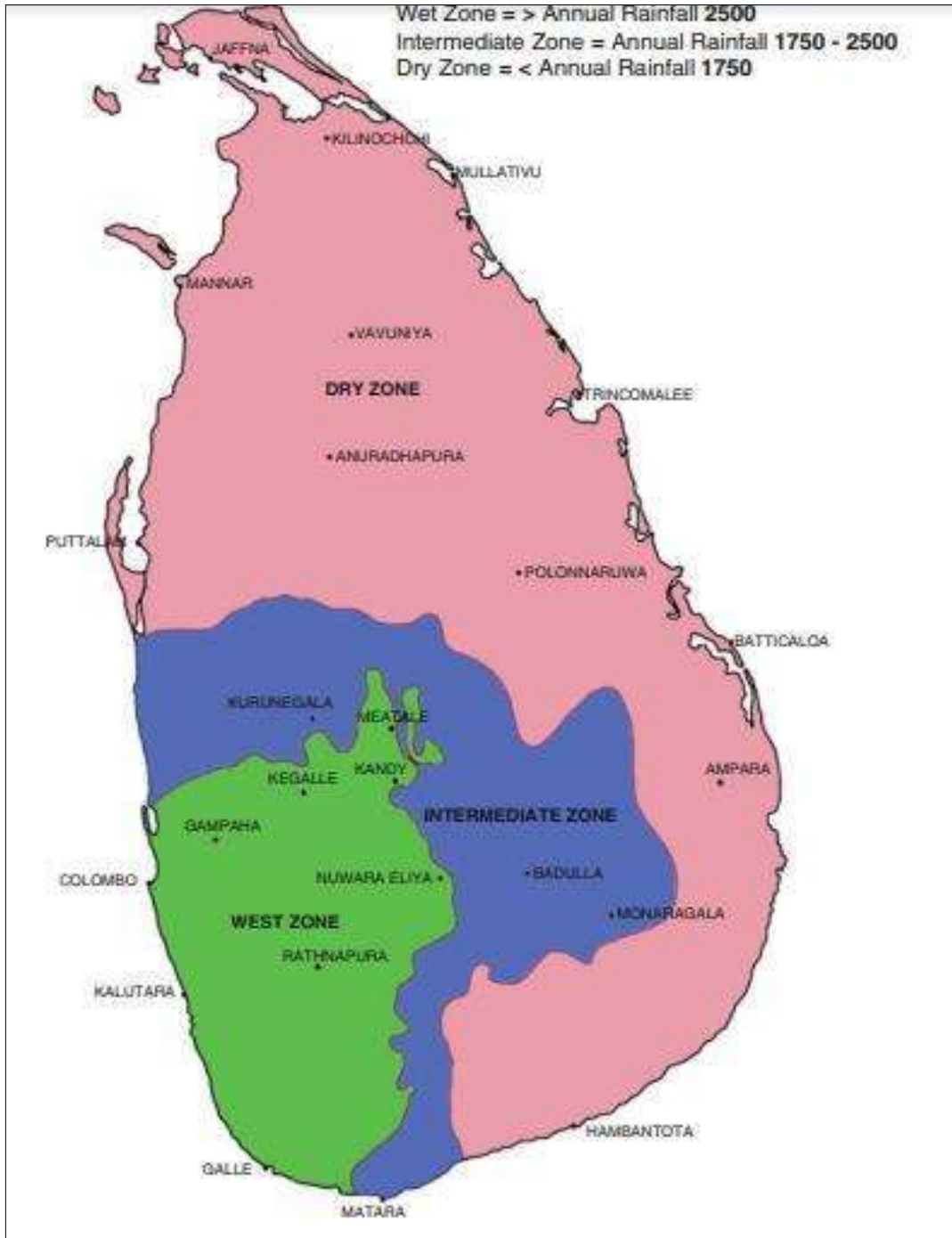


Chart 1-1 Trend of increase in global temperature from 1880 to 2020

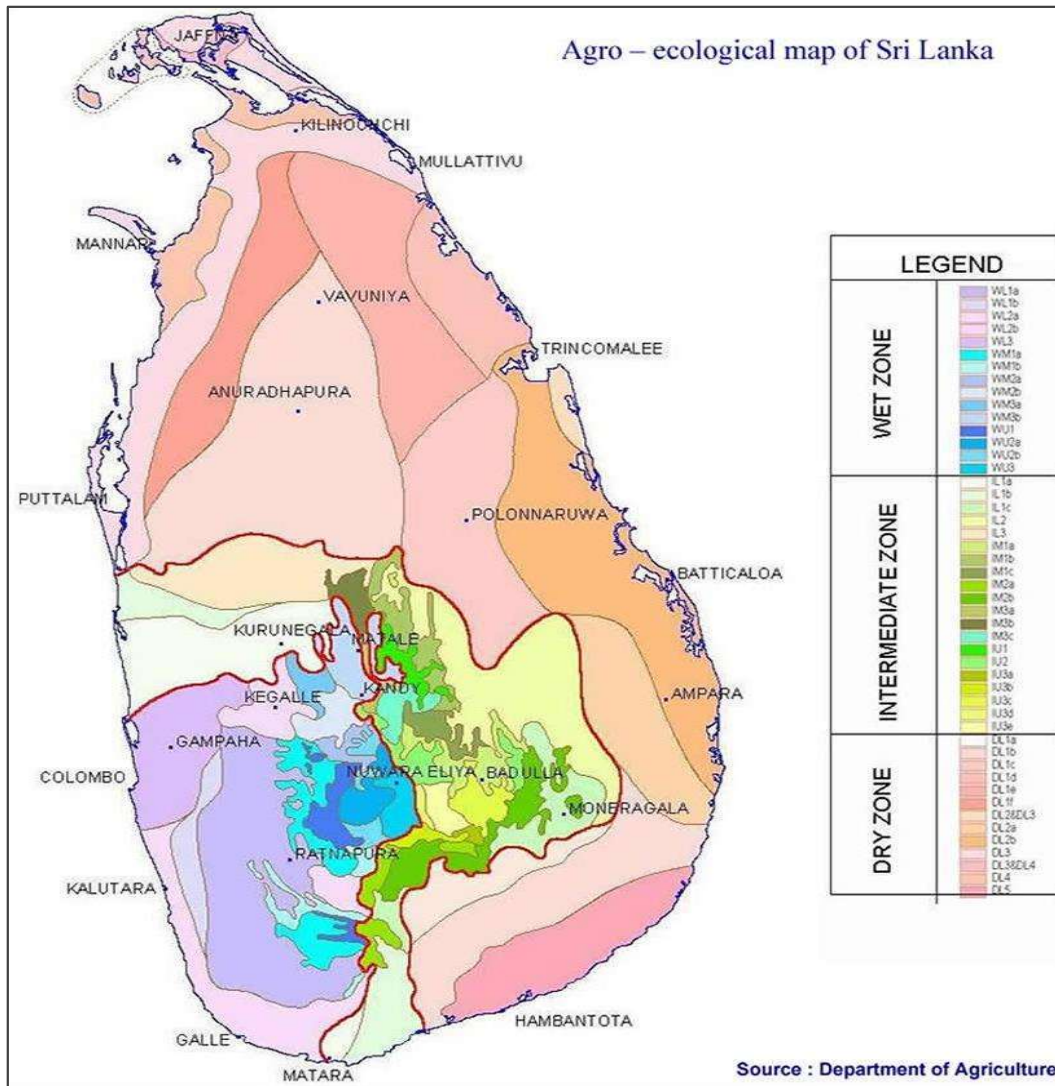
Source: <https://climate.nasa.gov/causes/> (Global Climate Change, NASA 2008).

Sri Lanka is a small island located within the tropical region between 5° 55' to 9° 55' North latitude and between 79° 42' to 81° 53' East longitude in the Indian Ocean, so Sri Lanka's climate belongs to the tropical characteristics. Sri Lanka is traditionally divided into three climatic zones based on precipitation as Wet Zone, Dry Zone, and Intermediate Zones. Wet Zone receives a mean annual rainfall higher than 2500mm, while The Dry Zone receives a mean annual rainfall less than 1750 mm. The Intermediate Zone receives a mean annual rainfall between 1750mm to 2500mm (CCMMDE 2016). Map 1-2 shows the traditional climate zones map of Sri Lanka. According to Punyawardena (2007), Sri Lanka's climate has been further divided into 46 agro-ecological zones based on monthly rainfall distribution. Map 1-3 shows the agro-ecological zones of Sri Lanka.



Map 1-2 Climatic Zones of Sri Lanka

Source: Marambe B, et al., 2015



Map 1-3 Forest cover changes in the DZ of Sri Lanka

Source: <https://www.google.com/search?q=climate+zone+map+of+sri+lanka>

Sri Lanka receives rainfall due to three sources as monsoonal, convectional, and digressional. Sri Lanka climate is divided into four seasons as First inter-monsoon season (FIM) from March to April, Southwest monsoon season (SWM) from May to September, Second inter-monsoon (SIM) from October to November, and Northeast monsoon season (NEM) from December to February. The highest amount of rainfall is received to Sri Lanka during the southwest monsoon session (30%) and the lowest rainfall is received during the first inter-monsoon season (14%). The next highest rainfall during the Second inter-monsoon season (30%) Northeast monsoon season receives around 26% of the rain. Sri Lanka’s temperature varies from lowland to upland, particularly mean annual temperate in lowlands ranging from 26.5°C to 28.5°C but fall around 15.9°C in upcountry when altitude increases

but sometimes temperature exceeds 34 °C some areas of Sri Lanka (Department of Meteorology, Sri Lanka 2016) . Many scientists have pointed out that Sri Lanka’s climate is also rapidly changing, increasing temperature, changing rainfall patterns, and increasing extreme weather events. Sri Lanka was ranked second among the countries most affected by severe weather events in 2017.

However, the Palipothna excavation site is situated in Kahatagasdigilya Divisional Secretariat in Anuradhapura, North Central Province of Sri Lanka. Hence, the Climate of the Dry Zone is characterized in this area. Normally this area is hot most of the months and the driest month is June with 12mm or 0.5 inches of rainfall. The greatest amount of rain is received in November with an average of 249mm or 9.8 inches of rainfall. Temperature is also changing through the year lowest average temperature exceeds 24.7°C and Maximum temperature exceeds 33.3°C and the variation in temperatures throughout the years is 4.0°C or 39.2°F. Chart 1-2 and Table 1-1 show further details of rainfall and temperature variation in the Anuradhapura area.

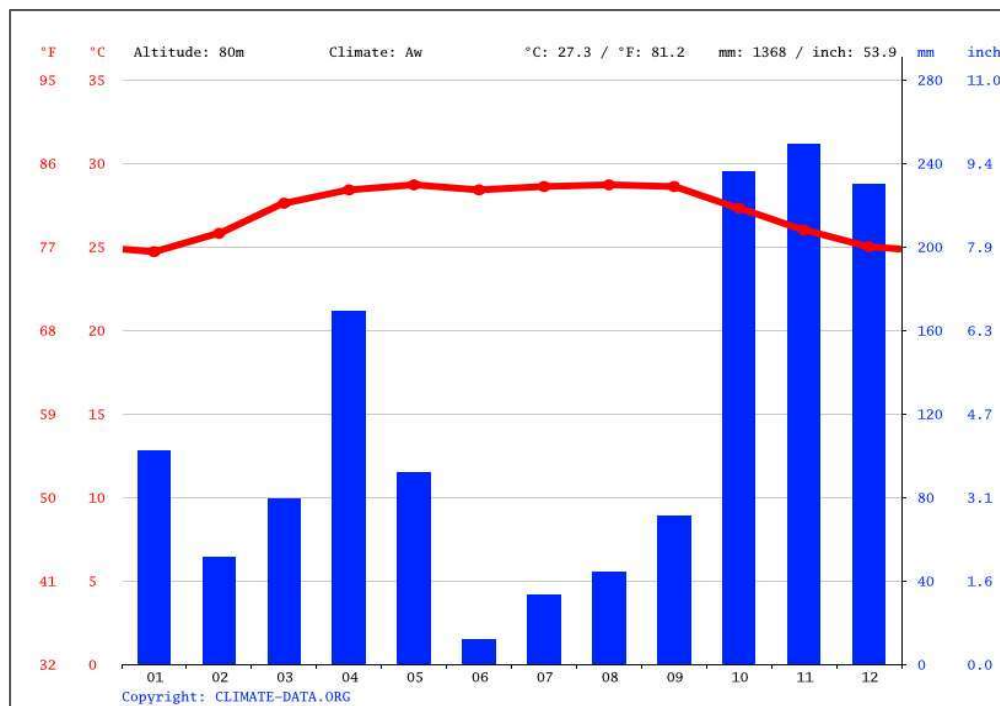


Chart 1-2 Temperature and rainfall variation in Anuradhapura
Source: (Climate Data.Org 2012)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temperature (°C)	24.7	25.8	27.6	28.4	28.7	28.4	28.6	28.7	28.6	27.3	26	25
Min. Temperature (°C)	20.7	20.9	22.3	23.6	24.9	24.6	24.8	24.7	24.5	23.5	22.3	21.6
Max. Temperature (°C)	28.8	30.7	33	33.3	32.6	32.3	32.4	32.7	32.8	31.2	29.7	28.5
Avg. Temperature (°F)	76.5	78.4	81.7	83.1	83.7	83.1	83.5	83.7	83.5	81.1	78.8	77.0
Min. Temperature (°F)	69.3	69.6	72.1	74.5	76.8	76.3	76.6	76.5	76.1	74.3	72.1	70.9
Max. Temperature (°F)	83.8	87.3	91.4	91.9	90.7	90.1	90.3	90.9	91.0	88.2	85.5	83.3
Precipitation / Rainfall (mm)	102	51	79	169	92	12	33	44	71	236	249	230

Table 1-1 Temperature and rainfall distribution in Anuradhapura

Source: (Climate Data.Org 2012)

Soil Type

Soils provide many essential services in both natural and human-made ecosystems. According to the soil map of Rajarata, Panabokke, (1999), the study area is located in the soil region of *Reddish Brown Earths (RBE) & Low Humic Gley (LHG) Soils*. This layer's Permeability is very low, and water holding capacity on the surface is higher than the latosol soil layer in the western part of the north-central region. Therefore, this soil is very productive for agriculture and human settlements. Similarly, narrow alluvial soil belts and some parts of clayey soil in this area are compatible for constructing the tanks and water holding. Before investigating the soil in the Kokbe area, it is useful to identify how Sri Lanka's soil has spread. In this regard, the soil classification proposed by Moverman and Panabokke in the year 1961 is very important. The main soil types found in this area are Reddish Brown Earths (*RBE —rhodustalf*), Low Humic Gley (*LHG — tropaqualf*), and alluvial soils (*tropaquents*) of variable texture. The common soil site is described as RBE and LHG undulating topography. The RBE occupies the crest and the upper and mid-slopes of the landscape. The LHG occupies the lower parts of the slope and upper parts of the bottom of the valley. A narrow strip of alluvial soils occurs along with the natural drainage system. In the modal form, the RBE occupies approximately 60% of the land surface, while the LHG occupies around 30%, and the remaining 10% is made up of alluvial soils and rock knob

plains. The most common types found in the Project area (dry zone) are described briefly below.

- Reddish Brown Earths (RBE)

RBE is the most common soil type in Sri Lanka, occupying nearly a quarter of the land area. They are mainly found in the dry zone and occupy the crest and the landscape's upper and mid-slopes. As their name suggests, RBE is reddish-brown when dry, darkening with moisture (Panabokke, 1996). These soils are 'extremely hard when dry, friable to the firm when moist, and sticky when wet' (Panabokke, 1996).

- Low Humic Gley Soils (LHG)

Low Humic Gley Soils group is the second most common in Sri Lanka. The LHG occupies the lower parts of the slopes and upper parts of the bottom of the valleys. These soils 'are wet or have gleying throughout their profile or below the surface' (Panabokke, 1996).

Geomorphology

Geomorphology in Sri Lanka

Sri Lanka is a small tropical island at the southern tip of the Indian subcontinent. The island is a small area of the ancient Gondwana Supercontinent. Subsequently, the island was separated from the Indian subcontinent by the late Miocene. The total land area is about 65,610 square kilometers. It is a small land area, but Sri Lanka characterizes by various geological and geomorphological features (Chandrajith 2020). Sri Lanka consists of three main topography: lowlands, uplands, and highlands depending on altitude.

Geomorphology in Anuradhapura

Anuradhapura District has a flat nature with slight slopes and a few mountains (Ritigala, Mihintale, Cock Abbey, Isin Bassa Gala, Thanthirimale, Labunorowa). Ritigala Mountain is ecologically and biologically a unique site and claims unique habitats and high biodiversity. The Anuradhapura district is situated in the Vijayan Complex, which is about 100 meters above sea level. Also, there are several major geological zones around the area, namely the Miocene deposit to the west, the Jurassic deposit to the southwest, and the Highland group to the east. Extensive mountain ranges cannot be seen, and there are small mountain ranges. Kokkebe is the highest place in the Kahatagasdigiliya Divisional Secretariat Division.

Water Resources

The surface drainage of Sri Lanka is made up of about 103 “rivers,” most of which are simple wet-season rivulets. Twelve major rivers account for about 75 percent of the mean annual river discharge of the country, with those that flow totally through the Wet Zone. The amount of rainfall received during the maha (wet) season has significantly played a major role in the hydrological processes of the study area. The major source of rainfall for this area is called the north-east monsoon. The annual average rainfall for this area is about 1500 mm and streamflow is taking place along the first order or ephemeral rivulets in the undulating landscape.

Area	River basins
North Central	<ul style="list-style-type: none"> • Malwathu Oya, • Mahaweli Ganga, • Yan Oya, • Ma Oya • Kanadara Oya

Table 1-2 River basins in Anuradhapura

Source: (Department of Agrarian Development, 2007)

The main rivers that stream across the district are *Malwathu Oya*, *Yan Oya* and *Kanadara Oya*. In a watershed, the drainage system is blocked by earth bunds in appropriate locations to store water, making a series of tank lengthways of the drainage system. The drainage pattern formed in the undulating topographic development of the Dry Zone landscape can be classified as a dendritic drainage pattern. This dividing nature of the drainage system has led to the formation of clusters of small tanks found in series, connected to form a system known as a tank cascade. This archeological site is located close to the town of Rathmalgahawewa in the Anuradhapura District of the North Central Province of Sri Lanka. It is hydrologically very important that this excavation site is located near the Malwathu Oya and Ma Oya watershed boundary area. This place is located at the boundary between the Palippothana watershed and the Ratmalgahawewa small tank watershed. There are 293 small and medium scale tanks in the area.

(https://en.wikipedia.org/wiki/Kahatagasdigiliya_Divisional_Secretariat).

Forest Cover

Forest in Sri Lanka

Sri Lanka is a tropical country in the Indian ocean between longitudes E 79°39' and 81°53' and latitudes N 5°54' and 9°52' and with an area of 65,610 km². Therefore, there are several types of forest in Sri Lanka, such as tropical rain forest, mountain forest, dry mixed evergreen forest, Rivering forest, the intermediate forest. Sri Lanka's natural vegetation covers about one-third of the total land area. In the Wet Zone, tropical wet evergreen forest dominates in the lowlands, and submontane and montane evergreen forests prevail in the highlands. The Dry Zone has the vegetation of dry evergreen forest and moist deciduous forest, shrubby, xerophytic (drought-tolerant) vegetation.

Dry mixed evergreen forests

The dry zone forest covers are 3/5 of the country's land area (CEA, 1995). Therefore, these forests are among the most extensive forest types on the island (17.1%). Thus, the Anuradhapura district's primary forest type is also considered the dry mixed evergreen forest. May to August of the year in the Anuradhapura District has a dry condition. The temperature is around 32 C^o and the rainfall is about 1000-1500 mm. Therefore, some of the species of these forests shed their leaves during a particular season (deciduous condition) to reduce water evaporation during the dry season (CEA, 1995), e.g., *Chloroxylon Swietenia*, *vitex altissimo*, *Berry cordifolia*, *Cassia fistula* (Manamandraarachchi and Adikari (2014). evergreen species also can be found in this area, e.g., *Manilkara hexandra*, *Diospyros ebenu*, *D. ovalifolia*, *Alseodaphne semecarpifolia*, *Drypetes sepiaria* (Manamandraarachchi and Adikari (2014). The forest cover of dry mixed evergreen is less dense, and dominant trees are less high (20m). Biodiversity is lower compared with tropical rain forest. Many scholars have stated that it is evident that this forest does not have a transparent canopy layer. But Ashton (1997) revealed several canopy layers such as Canopy 20-25m, Sub canopy 10-15m, Undergrowth with bush, herbs, and vines. It is challenging to identify these forests' original condition due to the Chena cultivation Map 1-4.

In the dry zone, areas that get regularly flooded are called Villu grassland. These wetlands are more prosperous with nutrients and fill with many species of fauna. Villus is found mainly in the Wilpaththu National Park in Anuradhapura.

Name	Extent (ha.)	Date of Declaration
Ritigala	1528.2	1983.02.25
National Parks		
Wilpaththuwa	131,693	1938.02.25
Wildlife Sanctuaries		
Mihintale	999.6	1938.05.27
Anuradhapura	3500.7	1938.05.28
Maha Kanadarawa T.	400 Yards around the T.	1966.12.09
Padaviya Tank	6475	1963.06.21

Table 1-3 Strict nature reserves; national parks and wildlife reserves in the Anuradhapura district

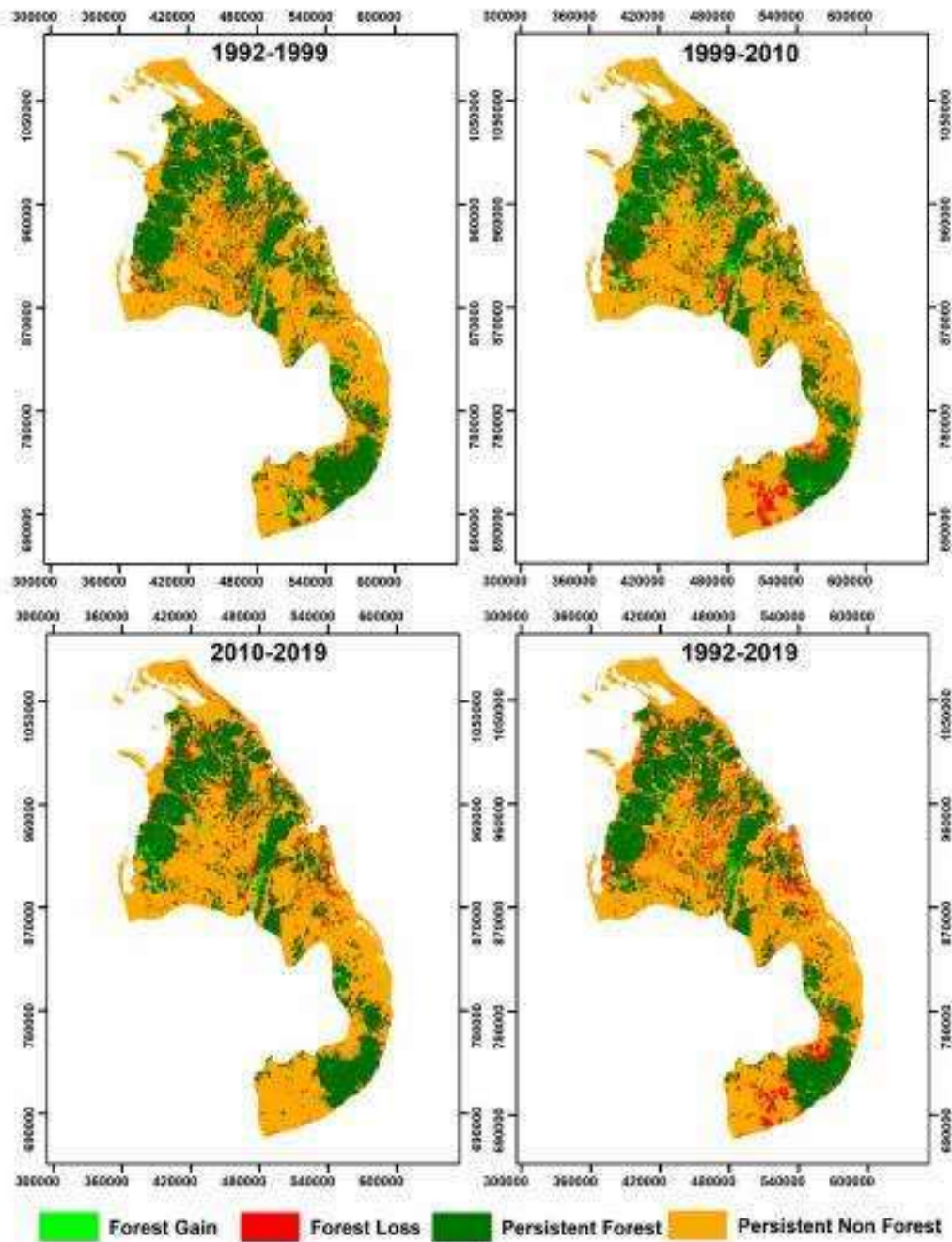
Source: Sumithraarachchi, D. B. (2008) North Central Province: Biodiversity Profile and Conservation Action Plan
Biodiversity Secretariat, Ministry of Environment and Natural Resources, Sri Lanka.

Name of the Forest	Status	Size (ha.)
Alutha banda Wewa	Proposed Reserve	384
Anoalundewa	Proposed Reserve	28,957.10
Andara Wewa	Other State Forests	400
Anuradhapura	Sanctuary	3500.7
Aru Wewa	Other State Forests	150
Demata Wewa	Other State Forests	800
Eta Kaduwa	Proposed Reserve	7689
Galkulama Thirappane	Other State Forests	450
Galmaduwa	Other State Forests	250
Geta langama kanda	Other State Forests	700
Hinna	Proposed Reserve	1021.8
Hurulu	Forest Reserve	25,217.70
Issen Bessa wewa	Forest Reserve	441.9
Kahaila	Proposed Reserve	34
Kahalla	Forest Reserve	3292.5
Kahaila-Pailekale	Sanctuary	2 1,690.00
Katu potha kanda	Other State Forests	175

Labunoruwa	Other State Forests	300
Li.kola wewa	Forest Reserve	325.7
Lunu Oya	Forest Reserve	3647.4
Manawakanda	Other State Forests	325
Marasinghagama	Other State Forests	100
Medalessa Korale	Other State Forests	175
Medawachchiya	Proposed Reserve	2878.4
Mihintale	Forest Reservoir	2462.9
Mihintale	Sanctuary	999.6
Nuwaragam	Forest Reservoir	2314.6
Padaviya Tank	Sanctuary	6475
Padawiya	Proposed Reserve	97,664.30
Pahala mawatha wewa	Other State Forests	325
Puliyam Kulama	Other State Forests	125
Puliyam Kulama	Other State Forests	150
Raria we kanda	Other State Forests	575
Ratmale Kanda	Other State Forests	700
Ritigala kanda	Strict Natural Reserve	1528.2
Thambaragala Wewa	Other State Forests	350
Weda kanda	Proposed Reserve	5180
Wilpattu Block I	National Parks	54,953.20
Wilpattu Block 3	National Parks	22,981.40
Wilpattu Block 4	National Parks	25,252.90
YodhaEla	Forest Reserve	1585.6

Table 1-4 List of forest reserves of Anuradhapura

*Source: Sumithraarachchi, D. B. (2008) North Central Province: Biodiversity Profile and Conservation Action Plan
Biodiversity Secretariat, Ministry of Environment and Natural Resources, Sri Lanka.*



Map 1-4 Forest cover changes in the DZ of Sri Lanka

Source: Ranagalage et al., *Multi-Decadal Forest-Cover Dynamics in the Tropical Realm: Past Trends and Policy Insights for Forest Conservation in Dry Zone of Sri Lanka*.

Wetlands

According to Keddy, P.A. (2010), a wetland is a distinct ecosystem flooded by water, either permanently or seasonally, where oxygen-free processes prevail. Ramsar international wetland conservation, wetlands have defined as “wetlands are areas of marsh, fen, peatland or

water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters”. Wetlands are essential in terms of hydrology, plant and animal productivity (MFE, 2000). Wetlands are also valuable as gene pools for wild varieties.

Rivers and River Basins

In Anuradhapura district, the main river is Ma Oya and Malwathu Oya. The second-largest catchment in our country (3284km²) flowing across the NCP used water for mainly irrigation purposes in this area. It feeds several reservoirs like the Kala Oya basin from the Kala wewa reservoir via Yoda Ela (canal) to provide Nachchaduwa, Thissa wewa Basawakkulama reservoirs.

Tanks and Reservoirs

In ancient times, the dry zone was named “Vavu Bendi Rajya” because there are many water tanks and reservoirs. For example, the north-central province has 13 large tanks, 94 medium-sized tanks, and 2508 small tanks (Sumithraarachchi,2008).

Land use

Sri Lanka has a total land of 65610 Km² with a 21 million population, and North Central Province (NCP) is the largest province of Sri Lanka with a total land area of 10472 Km² (16%). On the other hand, Anuradhapura is the largest administrative district of Sri Lanka located in NCP, which covers total land of 7179Km² composed of 6626.59 km² land area 552.41Km² internal reservoirs. The entire inner reservoir land of Sri Lanka is 2905Km²; among them, the largest internal reservoir land belongs to the Anuradhapura district with more than 2600 tanks. Anuradhapura district’s total population is 937179 by 2019, among them 882080(94%) population living in rural areas. Anuradhapura district is divided into 22 Divisional Secretariat (DS) and 694 Grama Niladari Divisions (GND). This excavation site is situated in Palipothana GND in the Kahatagasdigilya DS area. Kahatagasdigilya belongs to about 352Km² (4.90%) of the land area in the Anuradhapura district. Table 1-5 shows the land use pattern in the Anuradhapura district, where 29.89 percentage of land still covers the forest, which is the largest portion of land. The second-largest type of land used is paddy cultivation, 22.53 % and 21.59 % of the land is still existing as Chena and scrubs, which is the third type of land use by 2019 (Department of Census and Statistics 2010).

People living in Kahatagasdigilya in the Anuradhapura district depend on agriculture, particularly paddy and Chena cultivations. Normally people in this area practice two cropping

seasons as Yala and Maha according to the rainfall pattern. Specially, this area receives rainfall mainly in the Northeast monsoon season than the Southwest monsoon season. Hence, though both Yala and Maha seasons grow paddy, Maha season paddy cultivation is successful than the Yala season in this area. People in this area have been struggling to adapt to changing climate impacts; hence various on-farm and off-farm adaptation strategies are being used by the farmers, particularly for frequent droughts (Gunawardhana 2015). Lack of water for agriculture is the major issue in this area, but people practice three types of cultivation: major irrigation, minor irrigation and rain-fed agriculture.

Furthermore, Palipothana in Kahatagasdigiya practices rain-fed apiculture due to a lack of irrigated water source near the area. Therefore, the Kekulam method of paddy growing is utilized by the farmers in this area. In addition to paddy, they are growing other seasonal crops such as maize, chilly, green gram, black gram, sesame, groundnut, Finger millet, big onion, soybean, etc hope of earning money. But most of the time, their crops are damaged by droughts and wild animals, especially elephants. Human elephant conflict can be observed in this area seriously because people have encroached reservation forest for agriculture ever before in this area. Therefore, farmers use both traditional and modern crop protecting methods from elephants using bio fences, crop growing strategically, electrical fence, etc.

Nature of Land	Area(Hec)	Percentage (%)
Forest	214590.00	29.89
Home gardens	88859.00	12.38
Paddy lands	161752.00	22.53
Perennial crops	11440.00	1.59
Major crops (Tea,Rubber,Coconut)	2155.00	0.30
Other field crops(Seasonal Crops)	14116.00	1.97
Large inland waters	66770.00	9.30
Abandoned land	207.00	0.03
Built up land	2003.00	0.28
Scrub/Chena	155004.00	21.59
Other	1004.00	0.14
Total	717900.00	100.00

Table 1-5 Land used pattern in Anuradhapura district-2019

Source: District Land Use Planning Office, 2019

Environmental Change of the Study Area

According to Google maps 2020, a large portion of the study area's forest cover has been reduced from 2002 to 2020. This forest cover is particularly associated with several small tank catchments and some settlements (*Palipbothana, Meegaskada, Rathmalgahawewa, Gewal 10 and the new housing scheme*). The archeological site is located in between the tank beds of *Ratmalgahawewa kudawewa* and *Palipbothana wewa*.

Examining the google image in 2020, the forest cover of this area is almost over. Around 20% is remaining and the removal process is taking place now also. Chena cultivation, highland cultivation for paddy and mix crops, and new settlements are the main reasons for the above matter. Chena cultivation areas are becoming permanent owners of croplands. Maize cultivation is mostly found in this area as an upland crop. Although a considerable portion of forest cover in the Palipbothana tank catchment area remains, the *kudawewa* has almost no forest cover. Three forest areas reserved for the cemetery can be identified as *Rathmalgahawewa, Palipbothana and Meegaskada*. But, the *Rathmalgahawewa* cemetery area has been almost completely removed (According to Map 1-4). Some rudimentary Teak plantation plots can be seen in various places. As a result of deforestation, this area has become an open area.

Raindrop impact, streamflow velocity, evaporation rate, dryness of the soil layer, soil erosion rate, and siltation rates have increased since 2010. As a result, both surface storage (Tank water storage) and groundwater storage (dug well and tube well capacity) have been reduced. For example, the groundwater table of dug wells in the vicinity of settlements runs deep up to 25feets to 35feets from the surface level. Therefore, both government and non-governmental organizations have introduced water supply schemes in *Rathmalgahawewa, Meegaskada and Palipbothana* areas. These small tanks have dried up totally in dry seasons at present, but in around, 2000 it had remained some amount of water in the *Madakaluwa* area, even during a dry spell. As a solution for this matter, an irrigation canal was constructed from *Mahakumbukwewa* to *Rathmalgahawewa kudawewa* in 2008.

In the recent past, around 2010, the number of home gardens has increased (for example- a housing scheme in 2017 close to *Gewal 10*). Most people are farmers who have been engaging in agricultural activities in these areas. Animal husbandry has reduced considerably. Sometimes it could be the result of the removal of forest cover. The elephants

are a serious threat to the area it also could be the reason for the removal of the forest. For example, a considerable number of home gardens have been protected by elephant fences.

The infrastructure facilities have developed in the recent past. Particularly, Rathmalgahawewa township and its facilities such as road system, roundabout, drainage system. In addition to that, by routes from the main road to the newly constructed housing scheme and other homes, there is a route from Palipbothana to Rathmalgahawewa through the excavation site.

The North Central Irrigation Canal from Moragahakanda to North Region is ready to be constructed through this study area. Since the water divide of Ma Oya and Malwathu Oya is located near the study area, there will be many changes in physical environmental and socio-economic aspects.

Conclusion

The chapter examined the environmental background of the *Rathmalgahawewa Palipbothana* area. This archeological site is located close to the town of *Rathmalgahawewa* in the Anuradhapura District of the North Central Province of Sri Lanka. The area belongs to *Palipbothana Grama Niladhari* Division (GND) in *Kahatagasdigiliya* Divisional Secretariat (DS). The study briefly described the geographical location, climate, soil conditions, topography, water resources, forest cover, land use, biodiversity, and Environmental Change of the study area.

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Appendix I

List of Plants in Anuradapura

Plant Family Name	Type of Nu.	Plant Family Name	Type of Nu.
Amaranthaceae	15	Moraceae	01
Bombacaceae	1	Pandanaceae	01
Clusiaceae	1	Pedaliaceae	01
Compositae	16	Scrophulariaceae	8
Connaraceae	2	Umbelliferae	1
Convolvulaceae	16	Anacardiaceae	4
Dipterocarpaceae	1	Apocynaceae	11
Elatinaceae	2	Asclepiadaceae	16
Fabaceae (Faboideae)	2	Begoniaceae	01
Fabaceae (Mimosoideae)	8	Lobeliaceae	01
Orchidaceae	33	Periplocaceae	02
Bignoniaceae	1	Verbenaceae	14
Lemnaceae	2	Zingiberaceae	02
Myrtaceae	4	Annonaceae	15
Rhizoporaceae	2	Balsaminaceae	02
Ebenaceae	8	Cochlospermaceae	1
Gentianaceae	5	Cyperaceae	61
Lamiaceae	18	Rutaceae	15
Lecythidaceae	3	Aponogetaceae	01
Martyniaceae	1	Araceae	06
Menyanthaceae	2	Datisceae	01
Droseraceae	1	Dioscoreaceae	07
Hernandiaceae	1	Hydrocharitaceae	01
Loranthaceae	7	Lauraceae	03
Melastomataceae	9	Lentibulariaceae	06
Ochnaceae	3	Lythraceae	03
Oleaceae	5	Meliaceae	09
Piperaceae	4	Menispermaceae	03
Polygalaceae	2	Molluginaceae	05
Rubiaceae	2	Onagraceae	04
Solanaceae	6	Sapotaceae	05
Zygophyllaceae	1	Sterculiaceae	10
Boraginaceae	8	Vitaceae	09
Fabaceae (Leguminosae) S/family Caesalpinioideae	20	Araliaceae	1
Fabaceae (Leguminosae) S/family Faboideae (papilionoideae)	63	Capparaceae	16
Hydrophyllaceae	1	Caryophyllaceae	03
Leeaceae	1	Celastraceae	04

Plant Family Name	Type of Nu.	Plant Family Name	Type of Nu.
Malpighiaceae	1	Ceratophyllaceae	01
Salvadoraceae	1	Dilleniaceae	01
Tiliaceae	10	Elaeagnaceae	01
Poaceae	99	Erythroxylaceae	03
Combretaceae	2	Fabaceae (Leguminosae)	05
Flacourtiaceae	5	Euphorbiaceae	07
Hippocrateaceae	4	Haloragaceae	01
Icacinaceae	1	Linaceae	01
Loganiaceae	7	Moringaceae	01
Nelumbonaceae	1	Myrsinaceae	01
Nymphaeaceae	2	Nyctanthaceae	05
Olacaceae	4	Opiliaceae	02
Passifloraceae	3	Oxalidaceae	01
Phytolaccaceae	1	Santalaceae	01
Portulacaceae	1	Staphyleaceae	01
Ranunculaceae	1	Trapaceae	01
Rhamnaceae	8	Turneraceae	02
Tiliaceae	1	Uhnaceae	04
Violaceae	2	Urticaceae	05
Acanthaceae	32	Amaryllidaceae	04
Rubiaceae	29	Anthericaceae	01
Sapindaceae	10	Arecaceae	07
Alangiaceae	1	Asparagaceae	03
Aristolochiaceae	1	Cannaceae	01
Burseraceae	1	Colchicaceae	01
Cactaceae	2	Commelinaceae	19
Dracaenaceae	1		
Hyacinthaceae	1		
Hypoxidaceae	2		
Najadaceae	2		
Pontederiaceae	2		
Potamogetonaceae	1		
Taccaceae	1		
Trichopodaceae	1		
Typhaceae	1		
Xyridaceae	1		
Cycadaceae	1		

Table 1-6 List of Plants in Anuradapura

Source: Sumithraarachchi, D. B. (2008) North Central Province: Biodiversity Profile and Conservation Action Plan
Biodiversity Secretariat, Ministry of Environment and Natural Resources, Sri Lanka.