



Climate Technology Centre and Network (CTCN) Technical Assistance
for the Development of an Urban Adaptation Plan for Kurunegala

Literature Review Report

“Report on literature review, data and information”

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The Climate Technology Centre & Network (CTCN) has provided Technical Assistance (TA) to Kurunegala Municipal Council (KMC) and Ministry of Mahaweli Development and Environment (MMDE) in Sri Lanka through pro-bono support from Korea Environment Institute (KEI) Korea Adaptation Center for Climate Change (KACCC) and Green Technology Center (GTC) in Republic of Korea.

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1 Introduction

In 2018 Climate Technology Centre and Network initiated a Technical Assistance (TA) titled “Development of a Climate Smart City in Kurunegala” in response to a request from Municipal Council Kurunegala through the Ministry of Mahaweli Development and Environment of Democratic Socialist Republic of Sri Lanka. Korea Adaptation Center for Climate Change (KACCC) through Korea Environment Institute was identified as the implementer of this TA.

The TA is expected to: i) identify the current effects of climate change in Kurunegala City; ii) assess climate change vulnerability and risk to prioritized issues (heat stress and water management); iii) propose an adaptation action plan for addressing heat wave and water management and; iv) build the capacity of city planners and policy makers in order to transform Kurunegala City into a climate-smart city.

This report entails review of literature and relevant information – plans, policies strategies in Sri Lanka and most importantly Kurunegala City that will facilitate a better understanding when delivering on this TA.

2 Literature Review

2.1 National Level Strategies and Plans

2.1.a Climate Change

Sri Lanka has taken several positive steps by introducing national policies, strategies and actions in order to address climate change. Amongst which are;

2.1.a.1 National Climate Change Policy of Sri Lanka, 2011

The National Climate Change Policy of Sri Lanka was developed to provide guidance and directions for all the stakeholders to address the adverse impacts of climate change efficiently and effectively. The National Climate Change Policy contains a vision, mission, goal and a set of guiding principles followed by broad policy statements under Vulnerability, Adaptation, Mitigation, Sustainable Consumption and Production, Knowledge Management and General

Statements. It emphasizes on collaborative action at all levels as this is necessary to transform the policy into meaningful set of actions to meet the challenges of climate change.

2.1.a.2 National Climate Change Adaptation Strategy for Sri Lanka, 2011-2016

This strategy - NCCAS laid out a prioritized framework for action and investment for the 2011-2016 period aimed at systematically moving Sri Lanka and its people towards a climate change resilient future. It mirrored and supported Sri Lanka's national development strategy as articulated in the Mahinda Chintana and aimed at ensuring its success and sustainability.

Accordingly, key findings of sector-based analysis were synthesized into an integrated framework, and structured into the following 5 Strategic Thrusts;

- i. Mainstream Climate Change Adaptation into National Planning and Development
- ii. Enable Climate Resilient and Healthy Human Settlements
- iii. Minimize Climate Change Impacts on Food Security
- iv. Improve Climate Resilience of Key Economic Drivers
- v. Safeguard Natural Resources and Biodiversity from Climate Change Impacts

Under each of the Strategic Thrusts, key Thematic Areas for action, along with priority Adaptation Measures, were identified. An estimated 47.7 billion rupees in incremental additional financing was required to implement the NCCAS over its 6 year duration. Hundreds of stakeholders representing a cross section of government institutions, national NGOs, professionals, and academia covering a wide range of sectors were engaged in the process of developing this strategy.

2.1.a.3 Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation and Mitigation, 2014

Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation was the outcome of the project on Technology Needs Assessment (TNA) on Climate Change Adaptation and Mitigation for Sri Lanka conducted by the Climate Change Division of the Ministry of Environment and Renewable Energy from June 2011 to April 2013.

The main objective of the Climate Change Technology Needs Assessment is to identify and assess environmentally sound technologies that have synergy between reducing the impact of climate change and the rate of GHG emissions in Sri Lanka within national development

objectives. The TNA represents a set of country driven activities that identify and determine the most appropriate mitigation and adaptation priority technologies for Sri Lanka. By adopting a consultative process, it identifies the barriers to technology transfer and measures to address these barriers through a sectoral analysis.

As the initial step of the TNA process, the priority sectors for adaptation and mitigation were identified in consultation with the National TNA Committee. The priority sectors thus identified for adaptation were Food, Health, Water, Coastal and Biodiversity. This prioritization was followed by preparation of a list of potential technologies for each sector in consultation with sectoral stakeholder working groups and other sector experts. Thereafter this list was prioritized by using the Multi Criteria Decision Analysis (MCDA) process at stakeholder consultation workshops for each sector. The process was involved in; a) selecting basic criteria for evaluation, b) deciding on sub-criteria associated with each basic criterion and c) weighting the criteria and sub-criteria. Then the Performance Matrix was constructed based on the criteria and weighted scores followed by Benefit/Cost analysis which helped determining the most preferred, prioritized technologies.

2.1.a.4 National Action Plan for Haritha Lanka Programme in 2009

This Action Plan was developed in pursuance of a decision taken at a meeting convened by the Presidential Secretariat on 16th October 2008. Short-, medium-, and long-term solutions to meet current and emerging economic and environmental challenges were explored when preparing the Plan. A preliminary draft was initially developed by the Ministry of Environment and Natural Resources taking into consideration the five-year national environmental action plan titled “Caring for Environment 2009 – 2013”, and the National Strategy for Sustainable Development, both of which were developed through extensive deliberations with the relevant ministries and other related key stakeholder institutions. Using the draft prepared by the Ministry of Environment and Natural Resources and incorporating the outcome of deliberations and conclusions reached during four meetings of secretaries of the relevant ministries, the final draft of the Action Plan for the Haritha Lanka Programme was prepared.

A National Council for Sustainable Development (NCSD) was established by the government under the Haritha Lanka Programme to function as a national platform to launch and promote the process of achieving sustainable development. The ten broad missions/thrust areas covered by the programme are: *Clean Air - Everywhere, Saving the Fauna, Flora and Ecosystems,*

Meeting the Challenges of Climate Change, Wise Use of the Coastal Belt and the Sea Around, Responsible Use of the Land Resources, Doing Away with the Dumps, Water for All and Always, Green Cities for Health and Prosperity, Greening the Industries, Knowledge for Right Choices. The programme includes short-, medium- and long- term targets spanning the period 2009 – 2016 and performance indicators.

2.1.a.5 National Adaptation Plan on Climate Change (NAP) 2016-2025

This plan was prepared in line with the broad set of guidelines set forth by UNFCCC for development of national adaptation plans (NAPs) (UNCCS 2012). The NAP covers adaptation needs at two levels, namely; adaptation needs of key vulnerable sectors and cross-cutting national needs of adaptation. Nine vulnerable sectors were identified in the consultation process and they include; food security, water, coastal sector, health, human settlements, bio-diversity, tourism and recreation, export development and industry- energy-transportation. The consultation process adopted in the preparation of the plan helped to identify adaptation needs of each vulnerable sector based on logical criteria involving projections, vulnerabilities, impacts and socioeconomic outcomes. The plan identifies adaptation options that can fulfil the needs and actions necessary to achieve these options with responsible agencies and key performance indicators. They together constitute the sectoral action plans for each vulnerable sector. The NAP also include interventions necessary for fulfilling cross-cutting national needs of adaptation identified on the basis of analyzing common sectoral needs and opinions of key stakeholders. The plan also proposes an institutional and coordination mechanism along with implementation and resource mobilization strategies for successful implementation on a realistic timeframe.

2.1.a.6 Nationally Determined Contributions (NDCs) of Sri Lanka

As per the outcome of the 19th Conference of Parties (COP19) in Warsaw in 2013, all Parties were invited to prepare INDCs. This is as part of the work of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) that was established at COP 17 in Durban to “Develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties”. The Paris Agreement was reached and the NDCs shall make it possible to track progress and achieve a collective ambition level sufficient to limit global warming to well below 2°C relative to pre-industrial levels and pursue to limit the temperature increase to 1.5°C above pre-industrial level.

Sri Lanka submitted its Intended Nationally Determined Contributions (INDCs) in October 2015, and improved version of INDCs in April 2015, at the time of signing the Paris Agreement. NDCs of Sri Lanka submitted in September 2016 were prepared based on the *Readiness Plan for the Implementation of the Intended Nationally Determined Contributions (INDCs) 2017-2019* (previously submitted INDCs following the principle of common but differentiated responsibilities and respective capabilities).¹

The Nationally Determined Contributions comprise of the following areas Mitigation, Adaptation, Loss and Damage and Means of Implementation. The sectors discussed under mitigation are energy (electricity generation), transportation, industry, waste and forestry. Under Adaptation, the focused sectors are human health, food security (agriculture, livestock and fisheries), water and irrigation, coastal and marine, biodiversity, urban infrastructure and human settlement, tourism and recreation.

2.1.a.7 Readiness Plan for the Implementation of the Intended Nationally Determined Contributions (INDCs) 2017-2019

The readiness phase till 2020 was for allowing the country to prepare for the full-scale implementation of chosen NDCs. Adequate preparations were required to ensure successful implementation of NDCs to achieve the set GHG emission reduction targets by 2030.

A Readiness Plan for the Implementation of the INDCs of Sri Lanka was developed in consultation with relevant stakeholders, led by line ministries that cover the 14 sectors identified in the NDCs of Sri Lanka. The sector specific line Ministries and other stakeholders provided information and recommendations on the implementation of the NDCs, need of identifying policy gaps, institutional gaps, need for improvements in human and technical capacity, as well as financial and technical support to implement the NDCs by 2020.¹

2.1.b Water Management

Sri Lanka can be considered as a country with sufficient amount of available water. Sri Lanka is prosperous in water resources with 103 rivers, more than 20 major wetlands, exceptionally designed minor and major irrigation systems and significant groundwater resources.²

¹ Nationally Determined Contributions Ministry of Mahaweli Development and Environment Sri Lanka, September 2016

² Ministry of Environment and Natural Resources. (2008). Caring for the Environment 2008- 2012. Towards sustainable development. Ministry of Environment and Natural Resources, Battaramulla, Sri Lanka.

The total cultivated area in Sri Lanka had been estimated as 1.8 million ha. The area cultivated with paddy is about 848,691 ha of which 644,478 ha is irrigated, whilst the balance is rain-fed. Out of the irrigated lands in Sri Lanka 90% is cultivated with paddy and hence the irrigated areas for Other Field Crops (OFCs) are estimated at 71,608 ha. Irrigation systems with a command area of more than 80 ha are classified as major irrigation schemes and are managed by the Irrigation Department (ID) and the Mahaweli Authority of Sri Lanka (MASL). The minor irrigation systems are usually associated with a village and are managed by the local community. Department of Agrarian Development and Provincial Councils play a major role in providing the necessary services to the farmers in minor irrigation schemes.

The drinking water is provided by the National Water Supply and Drainage Board and covers 31.5% of the population whilst the small rural water supply schemes using natural streams and wells provide water to about 18% of the population. The overall access to safe water is about 81% in 2010. The NWSDB is also responsible for providing water to industrial and livestock sectors. The overall water demand as of 2010 is estimated as follows;³

Sri Lanka has more than 50 institutions and over 40 legislations dealing with water. The following are some of these institutions and legislations;

2.1.b.1 Water Sector Institutional Setup

- **The Department of Irrigation (DI)**, established in 1900, is primarily responsible for water resources planning, project formulation, construction, maintenance and informally responsible allocations of water for irrigation.
- **The Mahaweli Authority of Sri Lanka (MASL)**, established in 1979, is responsible for water resources development in many large river basins in the country.
- **The Water Resources Board (WRB)** was established in 1968. It coordinates governmental water resources functions and formulates national policies relating to the control and use of waterresources.
- **The National Water Supply and Drainage Board (NWSDB)** established in 1974 is the main agency for domestic and industrial water supply, sewage, and surface drainage.
- **The Ceylon Electricity Board (CEB)** is responsible for the generation, transmission, and distribution of electric power, including hydropower.

³ Gunawardena, E.R.N. (2013). Sustainable Water Resources Management in Sri Lanka: Status at Present and Strategies for Future.

- **The Department of Meteorology (DM)** is responsible for gathering information needed for estimating available water supplies nationwide.

2.1.b.2 National Water Resources Management Policy

The Water Resources Management Policy and the Water Resources Act attempts deals with integrated water resources management (IWRM) allocation on an equitable and efficient basis; decentralised decision-making; and a new holistic institutional structure.

2.1.b.3 National Policy on Water Supply and Sanitation

This policy was formulated in 2002 by the Ministry of Housing and Plantation Infrastructure and provides a framework for the supply of safe drinking water and access to sanitation services. It involves a programme for sector reforms, including the establishment of a regulatory commission for water supply and sanitation services, and the contracting of private operators in selected areas to improve operational efficiency and to provide private sector operational finance. A division for rural water supply and sanitation will be set up under the Ministry. The policy covers provision of drinking water from bulk water supply to consumers through piped networks and other means, such as tankers, tube and dug wells and other community distribution systems.⁴

2.1.b.4 National Policy on Rural Water Supply and Sanitation

This policy recognizes that the demand for water resources is increasing, with competition from users for water for domestic use, agriculture, and industry. As a result, there is the need for an institutional arrangement for the efficient allocation and management of facilities, with stakeholder participation. Basic principles of the policy are the same as that of the National Water Supply and Sanitation Policy, but with a few additional principles strengthening it with respect to community participation. Some of the key principles are that: Provision of water supply and sanitation services be people-centered and demand-driven; the role of the government, provincial councils and local government authorities be to regulate and facilitate sector activities. CBOs, NGOs and the private sector (small-scale private operators) should be the services providers; Women play a central role in the decision-making process.

⁴ Ministry of Housing and Plantation Infrastructure, 2002

2.1.b.5 Mines and Minerals Act (No 33 of 1992)

Empowers an owner or occupier of any land or a licensee authorized in terms of the act to produce and consume mineral water in or from such land for his or her personal use.

2.1.b.6 National Physical Planning Policy and Plan (2011-2030)

Addresses ‘water resources development’ including the protection of catchments, water resources and tanks. The policy specifies in details certain principles and strategies to achieve these objectives.

2.1.c Heat wave/Heat stress

There is no clear definition for heat wave and heat stress. But, heat wave is considered as a long term temperature anomaly characterized by each locations unique climatology of heat and heat stress can be considered as the short term temperature anomaly measuring recent thermal acclimatization.⁵ Further, the World Meteorological Organization defines a heat wave as five or more consecutive days during which the daily maximum temperature surpasses the average maximum temperature by 5°C (9°F) or more. The Indian Meteorological Department has adopted their own definition which requires a temperature increase of 5-6°C (9-10.8°F) or more above the normal temperature. Those affected by heat stress are mainly children under four years of age and the elderly.

A briefing paper titled the Global Climate Risk Index 2019 published by “Germanwatch” looks at the impacts of weather-related loss events such as storms, floods and heat waves from 1998 to 2017. It ranked Sri Lanka as the second most impacted territory in 2017.⁶

Similarly, The challenge before Sri Lanka, and the island’s north in particular, is well documented in a September 2018 World Bank Group study that looked into South Asia’s climate profiles, analyzing how temperatures have risen considerably and will continue to rise, with precipitation patterns becoming less predictable.

⁵ Nairn, J. and Fawcett, R.(2013) Defining heatwaves: heatwave defined as a heat-impact event servicing all community and business sectors in Australia. CSIRO and the Bureau of Meteorology, Australia.

⁶ 'Extreme weather puts traditional livelihoods in peril in Sri Lanka, studies warn', MONGABAY, 19.05.2019, <https://news.mongabay.com/2019/05/extreme-weather-puts-traditional-livelihoods-in-peril-in-sri-lanka-studies-warn/>

“Sri Lanka’s proximity to the ocean makes it vulnerable to increase in extreme tropical storms and sea level rise,” the study says. It says the country also contains “hidden hotspots,” areas that are economically at risk from climate change that are not often discussed. It adds that by 2050, annual average temperatures on the island are projected to increase by about 1 to 1.5 degrees Celsius (1.8 to 2.7 degrees Fahrenheit) under a climate-sensitive scenario, and 1 to 2 degrees Celsius (1.8 to 3.6 degrees Fahrenheit) under a carbon-intensive scenario.

The study says Sri Lanka has 19 million people living in locations that would become “moderate or severe hotspots” by 2050 under the carbon-intensive scenario, or more than 90 percent of the total population. And if the projection holds true, Sri Lanka’s Northern and North Western provinces will emerge as the top hotspots.⁷

The National Climate Change Policy of Sri Lanka (as published by the Ministry of Environment-Sri Lanka in 2012; Annex 1), declares a vision, mission, goal and a set of guiding principles followed by broad policy statements under Vulnerability, Adaptation, Mitigation, Sustainable Consumption and Production, Knowledge Management and General Statements, emphasizing the need of urgently adopting “collaborative action at all levels is necessary to transform this policy into meaningful set of actions to meet the challenges of climate change”.

Nonetheless, no specific mitigation or adaptation strategies are defined under the “National Physical Planning Policy and Plan (2011-2030)” to minimize or withstand the predicted “Heat Wave” conditions at national level.

2.2 Local Level Strategies and Plans

Sri Lanka consists of Nine Provinces (see Figure 1) with ‘geographically well-defined boundaries’ as well as “constitutionally designated political and administrative factions”. The 13th amendment to the Constitution of Sri Lanka,⁸ introduced “Provincial Council”, which consist of ‘Provincial Chief Minister with three other Ministers’ and council members ‘elected’ through public votes.

⁷ Mani, Muthukumara S.; Bandyopadhyay, Sushenjit; Chonabayashi, Shun; Markandya, Anil; Mosier, Thomas Michael Rowe. 2018. South Asia’s hotspots : the impact of temperature and precipitation changes on living standards (English). Washington, D.C. : World Bank Group.
<http://documents.worldbank.org/curated/en/201031531468051189/South-Asia-s-hotspots-the-impact-of-temperature-and-precipitation-changes-on-living-standards>

⁸ THIRTEENTH AMENDMENT TO THE CONSTITUTION, Ministry of Justice,
<https://www.lawnet.gov.lk/1947/12/31/thirteenth-amendment-to-the-constitution-2/>

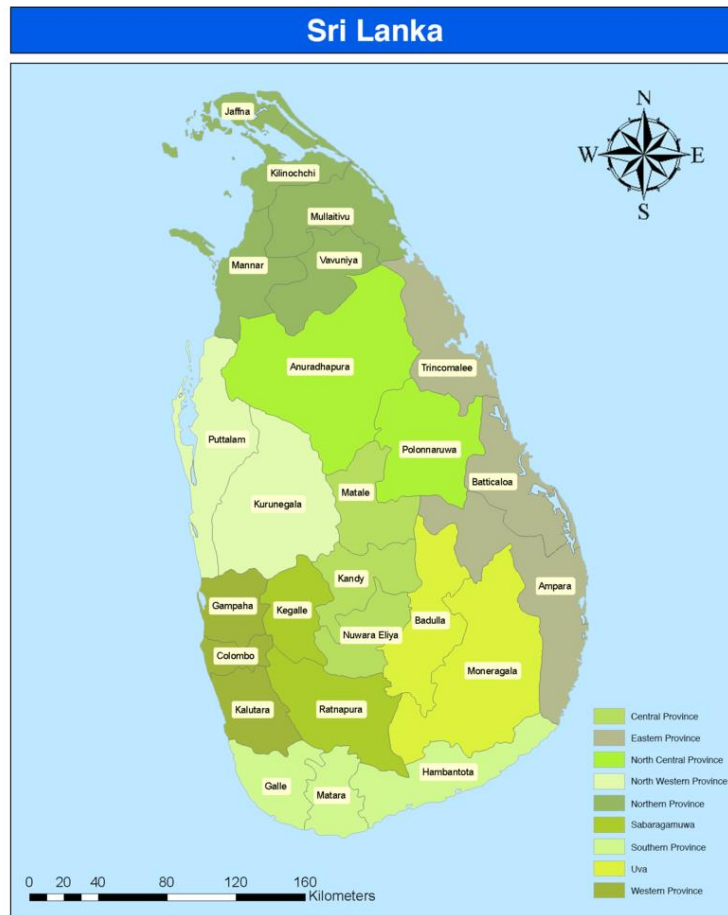


Figure 1 Map of Sri Lanka

The Provincial Council is empowered to make ‘policy decisions’, ‘implementing strategies’ and ‘administrative practices’ within the provisions of the Constitution. Similarly, each “Province” has “local authorities” with well defined “geographical boundaries” as well as “political and administrative factions” as per the “Local Authority (Amendment) Act No 20 and 24 of 1987 and the “Municipal Council Ordinance No 19 of 1987. Three types of local authorities are defined as “Municipal Councils”, “Urban Councils” and “Pradeshiya Sabha (regional council)”. The local authority, which is being the “smallest political entity” of the governance system in Sri Lanka is empowered to “elect” a leader (i.e. Chairman or Mayor) and councillors through public votes. The local authority is vested with the responsibility of making “policy”, “strategy” and “administrative procedures” to manage common amenities for the benefit of population occupy within its boundary.

The project being “Climate Smart City Development of Kurunegala”; the following chapters focus on the information related to the “North Western Province” and “Kurunegala City” within the “Municipal Council of Kurunegala”.

2.2.a Climate Change

Despite a dearth of information related to climate change at a local level, the ‘Climate Change Vulnerability Data Book’⁹ addresses the climate vulnerability of five sectors (urban development, human settlements and economic infrastructure; water; agriculture and fisheries; health and biodiversity and ecosystem services) which are considered critical for national development. This contains a vulnerability mapping for all districts.

The preparation of “Provincial Climate Change Action Plan of North Western Province (PCCAP-NWP)” was initiated in 2018 by the “Chief Ministry of the North Western Province of Sri Lanka” with the technical guidance from the “Climate Change Secretariat” under the Ministry of Environment-Sri Lanka.

The project on “Development of a Climate Smart City in Kurunegala” was launched in 2018 by the “Municipal Council of Kurunegala” with The Climate Technology Centre & Network (CTCN) which has provided Technical Assistance through pro-bono support from Korea Environment Institute (KEI) Korea Adaptation Center for Climate Change (KACCC) and Green Technology Center (GTC) to prepare an Adaptation Plan and to assess climate change vulnerability and risk of the Kurunegala city in collaboration with the Climate Change Secretariat, Ministry of Environment-Sri Lanka which is the focal point for the UNFCCC.

2.2.b Water Management

The provincial level and thus the municipal level strategies and plans on water management so far have been generally within the national framework.

Nevertheless, the “development plan of NWP in year 2018” (refer to Mr. Jayathissa, Director of NWP.) indicates that the accelerated maintenance of “small irrigation tanks” and the “initiatives for improvement of cascade water management system” are some of the provincial level responsive actions adopted by provincial irrigation department and provincial agrarian development department.

Similarly, the strategy of introducing “community cluster based water supply schemes” in rural level rather than individually depending on water sources by the National Community Water Supply Department (NCWSD) within the NWP is also recognised as an action to reduce

⁹ MoE, 2011. Climate Change Vulnerability Data Book. Ministry of Environment.

vulnerability of local community to depletion of ground water table with drought hit climate conditions in NWP (refer to Mr. Jayathilaka Herath, Director General of NCWSD).

2.2.c Heat Wave

The annual report of the “Meteorological Department of Sri Lanka” indicates that the North Western Province is a “hot spot” in terms of vulnerability to temperature rise leading to the heat wave scenario. Nonetheless, no previous actions are reported except the initiatives being planned under this proposal.

2.3 Other Plans and Projects

2.3.a Current Projects by International Organizations

Here are current climate change-related projects in Sri Lanka, in particular, organized by international organizations such as World Bank, UNDP, UNFCCC etc. This section is to analyse possibility of duplicate redundant overlap projects. If some areas are overlapped, then we will analyse and strengthen the focus area of the project to have differentiation from the existed projects.

2.3.a.1 The Megapolis - Western Region Master Plan - 2030

The Western Megapolis is envisioned and conceptualized as the prudent Grand Strategy for achieving two decisive interdependent transformations required in Sri Lanka’s forward march to achieve the status of “A High Income Developed Country”. The spatial transformation of urban agglomerations in the Western Region is to be achieved through structural transformation of the National Economy as a whole, while comprehensively addressing the burning issues brought about by past trends of spontaneous urbanization.

Western Megapolis has three broad national goals:

- To address the issues resulting from the congestion pressures being exerted on the urban physical infrastructure, urban services amenities, and the environment.
- To create the enabling environment for propelling the nation to the status of a high income developed country tunneling through the middle income trap, by way of leveraging the economies of agglomeration, through development and transformation of the physical and institutional infrastructure and the national economic structure.

- To optimally harness the benefits of knowledge-based innovation-driven global economic environment characterized by such developments as the new industrial revolution and emergence of smart cities.

The total land area of the Western Region is 3684 km² and consists of several districts including: Gampaha in the north, Colombo in the middle and Kalutara in the south and some parts of Rathnapura, Kegalle and Galle. Western region is the most densely populated in the country and is home to the legislative capital of Sri Jayawardenepura Kotte.

2.3.a.2 Moragahakanda-Kaluganga Development Project

Funded by: Sino Hydro Corporation China

The project takes place in the Matale District in the Central Province. This project is envisaged to resolve the issue of inadequacy of water for irrigation and generation of 25MW. It will reduce emissions of 90,200 tCO₂eq from this project. The Eastern Province, Northern Province, North Central Province and North Western Province will benefit by securing water and food security as it is envisaged that agricultural production will increase by 123,000 tons annually. Water will be diverted to the Kurunegala District up to Polpithigama, Ehetuwewa, Galagamuwa, Ambalanpola and Mahawa by building canals.

2.3.a.3 Uma Oya Multipurpose Development Project

This project is located in the Badulla District. It will add 123MW of electricity to the national grid while reducing 273,800tCO₂eq of emissions. The purpose of this project is to divert 145million cubic meters of excess water in the Uma Oya basin to the Kirindi Oya basin contributing to diminish the waters scarcity in the south-eastern dry-zone.

2.3.a.4 Climate Resilient Integrated Water Management Project (CRIWMP)

This is a seven-year project (2017-2024) aimed at strengthening the resilience of Smallholder Farmers in Sri Lanka's Dry Zone to climate variability and extreme events. The project targets poor and vulnerable households in three river basins -the Malwathu, Mi, and Yan (rivers)- which flow through the northern part of the Dry Zone. These river basins are among the most vulnerable to the vagaries of the climate, have a high presence of village irrigation systems and cascade systems on which poor and vulnerable farming populations depend for their

livelihoods, and are in areas that significantly lack safe drinking water, which pose a high risk of kidney disease.

The total cost of the Project is USD 52.08 Million of which USD 38.08 Mn will be financed through a grant received from Green Climate Fund (GCF). Government of Sri Lanka has committed an additional USD 14 Mn to co-finance the activities identified under the Project. Ministry of Mahaweli Development and Environment, which is also the implementing partner to the project, will implement the project with technical assistance of the United Nations Development Programme (UNDP) and with the support of Department of Agriculture, Department of Agrarian Development, National Water Supply and Drainage Board, Department of National Community Water Supply and Ministry of Disaster Management.

2.3.a.5 Addressing Climate Change Impacts on Marginalized Agricultural Communities Living in the Mahaweli River Basin of Sri Lanka.

Funded by World Food Programme

Objective is to mitigate effects of climate change induced rainfall variability and its impacts on livelihood and food security of farm households in three vulnerable divisions of the Mahaweli River Basin.

2.3.a.6 Strengthening the Resilience of Post-conflict Recovery and Development to Climate Change Risks in Sri Lanka

Funded by UNDP

The project's key objective is increase the resilience of communities to climate change-induced hazards through integration of climate-smart policies and actions into development planning and budgeting, including in the reconstruction and rehabilitation programmes in the Northern Province and Eastern Province.

2.3.b Current Projects lead by Government

Here are current climate change-related projects in Sri Lanka, in particular, organized by government of Sri Lanka.

2.3.b.1 Climate Resilient Irrigation Infrastructure Project (CRIIP) by Irrigation Dept./MASL

Combined climate resilience planning with development benefits to reduce vulnerability of exposed people. Flood and Drought hazard modelling is being carried out for 9 river basins considering the erratic rainfall pattern and water vulnerability.

2.3.b.2 2. North Western Canal Project

North Western Canal Project under the Mahaweli Water Security Program implemented by the MMDE through DOI under ADB funds to convey 130 MCM/ Year of excess waters from the water rich Mahaweli River Basin in to cascade system in Deduru Oya and Mee Oya river basins to enhance cultivation of 12500 Ha in dry weather hit areas of NWP (Polpithigama, Maho, Ambanpola and Galgamuwa DS zones).

2.3.b.3 Greater Kurunegala Water Supply and Sanitation Project of NWD&DB (2011)

This project is purposed to supply drinking water to an estimated 600,000 people living in Kurunegala and manage its sewerage system more effectively.

2.3.b.4 ‘Community Cluster Based Water Supply Schemes’ by the National Community Water Supply Department (NCWSD),

2.3.b.5 Components of the National Solid Waste Management – Pilisaru Project

This is implemented by the CEA under MMDE, including “Solid Waste Segregation & Composting Facility” in main solid waste disposal site in Kurunegala, the Sundirapola,

2.3.b.6 Road Sector development Projects by the Provincial RDA (NWP)

The rural roads and RDA the main road with Road Network of Kurunegala City (including introducing color lights, pedestrian under passes & improved side drainages etc.),

2.3.b.7 Reforestation/ Forest cover improvement Projects undertaken by the Forest and Wildlife Departments.

2.3.b.8 8. Wastewater Agriculture and Sanitation for Poverty Alleviation (2006)

It is funded by the European Commission. 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 in producing the wastewater or consuming the agricultural produce.

3 Basic Information of Kurunegala

Kurunegala is the capital city of the North Western Province. It has gained importance not only for its social and economic resource base, but also for its historical past. The ancient kingdoms of Kurunegala, Panduwasnuwara and Yapahuwa are located in the District. Kurunegala is located within the ‘coconut triangle’. Therefore, most of the service roads have been constructed to facilitate its needs. It is the core of politics, economy and culture. Since Kurunegala is the main service centre of the province, the large number of service oriented institutions as well as higher education centers located within the boundaries of Kurunegala serve a floating population. Despite its small population, it takes pride of place for the service functions it provides.

3.1 Physical Characteristics

3.1.a Location and Geography

The Kurunegala City is situated in the Northwestern Province of Sri Lanka and well known for its historically important religious places as well as its location as a gateway to major cities of the country such as Colombo, Kandy, Negombo, Anuradhapura and Trincomalee. It covers an area of 10.53 Km² and its own socio-economic and historical significance. The city is located between 7° 29' 0" N and 80° 22' 0" E coordinates in proximity to the districts of Kandy and Matale in the central highland. The area is situated in the peneplain lying 108 to 120 meters above mean sea level.¹⁰

¹⁰ Development Plan for Urban Development Area of Kurunegala 2006-2015



Figure 1. Location of Kurunegala City in Sri Lanka

3.1.b Climate

The climate of the Kurunegala is characterized by a 'Tropical climate'. The dry season is from February to September and the annual rainfall is around 2,316.1 mm with the highest rainfall occurring in October and November during the North-East monsoon. The coolest average temperatures in the year are in December and January with an average temperature of approximately 26 degrees Celsius, while April to September has the hottest average temperatures in the year at an average of approximately 30 degrees Celsius. The mean annual temperature is approximately 27.4 °C and the annual relative humidity varies from 71-87%.¹¹. The warmest month of the year is April, with an average temperature of 28.5 °C. January has the lowest average temperature of the year. It is 25.6 °C.

3.1.c Land Use

3.1.c.1 Residential Use

¹¹ Department of Meteorology, Colombo, Sri Lanka. <http://www.meteo.gov.lk/>

Residential land use in relation to the extent of developed land, it is 56% and it comprises 36.57% of the total land extent. The highest overall distribution of residential use is in the west and south west of the city, as this is influenced by the availability of more land for development as well as better facilities.¹²

3.1.c.2 Commercial Use

Commercial development has mainly taken place predominantly along the streets and the by-roads. Even though the commercial land use in the city is clearly evident, it is in a concentrated form of ribbon development. There is an increase in the conversion of residential use into commercial use while with the expansion of the town centre the commercial activities are not being centralized due to the existence of government land. On the other hand, suppression of cluster commercial development leads to the building of houses along the main roads.¹²

3.1.c.3 Roads and Transport

Whereas the secondary roads are inadequate, the amount of land used for the main roads conforms to an acceptable level. The road and transport system in Kurunegala is more orderly when compared to other towns.¹⁰

3.1.c.4 Agricultural and other Uses

Agricultural uses as well as rock outcrops restrict development in Kurunegala while at the same time contributing to the improvement of the urban environment. On this basis, the following interpretations can be made when analyzing this land use distribution pattern;

- i. The land available in the town for development being limited to 20%. This situation, with the restrictions imposed in the use of paddy lands for developments are considered, it is reduced to 5%.
- ii. When the overall development process is considered it is observed that in the town centre appreciable development has taken place and much of this development is concentrated to the southwest of the town. As this is inter-related to the provincial development, hence it is not easy to control it. As such, ribbon development is taking place along Colombo road and Ambepussa-Kurunegala road.

¹² Development Plan for Urban Development Area of Kurunegala 2006-2015

- iii. Due to high land values a significant growth in residential land use is not evident.
- iv. Because of the concentrated development in the Town centre, the adjacent lands are used by the Government and semi-Government for their uses. As these are multiplied due to prevailing market forces, the Town centre and adjoining areas have developed in an unplanned manner.
- v. The fact that some uses fall within an acceptable standards, other uses indicate an over utilization of land.

According to a survey done in 1997, land use pattern of the total Kurunegala area (4813 sqkm) is given as

| | Percentage (%) |
|--------------------------|----------------|
| Residential area | 31.86 |
| Commercial | 4.71 |
| Industries | 1.00 |
| Government organizations | 10.64 |
| Roads | 9.63 |
| Entertainment | 0.91 |
| Religious | 1.80 |
| Coconut | 3.34 |
| Agriculture | 0.83 |
| Paddy | 14.08 |
| Irrigation | 5.08 |
| Forest | 1.36 |
| Rock | 13.44 |
| Others | 1.32 |

Source: S.S.Anandan, 2002

3.1.c.5 Water Resources

Some of the water resources in Kurunegala City include Kurunegala Lake which is situated at North Western Province is used as one of the main intakes to supply drinking water to the Kurunegala town area. Kurunegala City is also drained by two streams, the Wan Ela and the

Beu Ela which confluence just before Wilgoda Anicut (weir) and flow on through agricultural land before joining the Maguru Oya (river) at Watawehera estate just outside the western boundary of Kurunegala City. The Beu Ela originates from the Wennaru Wewa (irrigation tank) and was originally an irrigation canal but now acts as a city drain, although it is still used for irrigation.¹³

3.2 Socio-economic Characteristics

3.2.a Population

The Kurunegala consists of twelve Grama Nilathari Divisions (GN divisions) and twelve wards. The current population of Kurunegala is estimated to be 36,500.¹⁴ The following table shows the trend of population of Kurunegala between 2010 and 2015;

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|-------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Population | 27,141 | 27,682 | 26,931 | 27,043 | 26,727 | 26,903 |

3.2.b Language

The common languages of Kurunegala, depending on social classes, social circles, and ethnic backgrounds are Sinhalese, Tamil and English.

3.2.c Economic

It is evident that the economy of the town is built upon primary, secondary and tertiary economic activities. Due to the fact that the town is located in an agricultural region, and the availability of agricultural and other service facilities as well as the growth of industrial activities in the town and its vicinity, have invariably contributed to its economy. On the other hand, since manufacturing activities are restricted within the local authority area, it is home to only two garment factories¹³.

¹³ Report on Water Quality Survey and Pollution in Kurunegala, Sri Lanka (Wastewater Agriculture and Sanitation for Poverty Alleviation in Asia (WASPA Asia) Project, 2007

¹⁴ <http://www.kurunegala.mc.gov.lk/explore-kurunegala/life-in-kurunegala/>

¹⁵ Data Collection Survey on Solid Waste Management in Democratic Socialist Republic of Sri Lanka Final Report, February 2016

The Kurunegala district environment is conducive to the cultivation of agricultural crops and has thereby attained popularity for paddy and coconut cultivation as well as other minor crops such as cinnamon, pepper, cocoa, coffee and nutmeg.

3.2.d Poverty

In Sri Lanka, poverty figures refer to the share of individuals whose household per capita consumption falls below the official poverty line. This poverty headcount index is the standard measure of the incidence of poverty. Kurunegala is home to 7.7 percent of the country's poor people even though only 6.5 percent of its population lives under the official poverty line. Sri Lanka's current poverty line is moderate by regional standards, but below what one might expect from a country at Sri Lanka's level of development. This is partly because the poverty line was developed using 2002 data and is therefore based on consumption patterns in 2002. The country's context has changed dramatically in the years in between, and we believe it is good practice to update the benchmark used to judge poverty about once per decade. This makes updating the current poverty line a priority for Sri Lanka.¹⁶

The headcount index is calculated by taking into account all the food and non-food expenditures collected in the Household Income and Expenditure Survey (HIES). Differences in the cost of living across different districts, and the number of people in the household are also considered. This per capita household consumption is then compared to the national poverty line. This line was defined as the expenditure for a person to meet the daily calorie intake of 2,030 kcal based on the Cost of Basic Needs approach, and was set at 1,423 rupees in 2002. To keep the national poverty line constant, this line has been inflated in subsequent years using the Colombo Consumer Price Index (CCPI).

3.2.e Education

Kurunegala is the education hub of the North Western province with many leading public and private schools and auxiliary education institutions. It also serves as the academic centre for students from other neighboring provinces due to the city's facilities and the location. The city is home for 12 national schools and 5 private and international schools making it a city well

¹⁶ Understanding Poverty in Sri Lanka, 2017 <http://www.worldbank.org/en/news/feature/2017/03/02/part1-understanding-poverty-sri-lanka>

suitable for studies. In addition to that, Kurunegala attracts more than 60,000 students a week for tuition and auxiliary classes.¹⁴

3.2.f Religion

Buddhism is the main and the most widely practised religion in Kurunegala. The city is also home to a wide range of other religious faiths such as Hinduism, Christianity and Islam. The prominent Buddhist temples in Kurunegala include Athkanda Raja Maha Viharaya, Ibbagala Raja Maha Viharaya, Angangala cave temple, Wilbawa Purana Viharaya and Baudhaloka Viharaya. Churches, Mosques and Hindu temples are also found in the city. The Roman Catholic Diocese of Kurunegala's bishop is headquartered in the city. The Church of Ceylon, which is the Anglican Church in Sri Lanka, operates a diocese in Kurunegala covering the North-Central province and Kurunegala, Kandy, Matale and Kegalle, Anuradapura, Polonnaruwa districts.¹⁷

3.3 Infrastructure

3.3.a Water Supply System and Sewage Treatment

Safe drinking water coverage in Sri Lanka is around 86% of the population while the population having pipe borne water supply facilities is around 46%. Currently, around 35.2 percent of the population has been connected to the national pipe borne water distribution network of the National Water Supply & Drainage Board (NWSDB) and 10.8% of population served pipe borne water facilities through the CBOs, Local Authorities. In the context of sanitation, there are around 97,000 sewer connections connected to pipe sewerage system in the country covering around 2.4 percent of population and rest of the population uses individual onsite sanitation systems. Kurunegala is one of the cities with safe water coverage less than the national average.¹⁸

Kurunegala Lake which is situated at North Western Province is used as one of the main intakes to supply drinking water to the Kurunegala town area. This lake has been identified as a regional water body which has been subjected to occasional eutrophication during recent past. According to the National Water Supply and Drainage Board (NWSDB), Kurunegala, Sri Lanka, this Lake had been cleaned two times from 2003 and 2010 due to the algae growth.

¹⁷ <https://en.wikipedia.org/wiki/Kurunegala>

¹⁸ Public Investment Programme 2017 - 2020

About 78% of Kurunegala town area is drained by two streams, the Wan Ela and the Beu Ela which confluence just before Wilgoda Anicut (weir) and flow on through agricultural land before joining the Maguru Oya (river) at Watawehera estate just outside the western boundary of Kurunegala Municipality.¹³ The National Water Supply and Drainage Board (NWSDB) carry out routine water quality monitoring for drinking water sources and supplies in Kurunegala.¹⁹

There is inadequate sewerage system in Kurunegala and the majority of people living in the area dispose of their waste using on-site sanitation methods. Urban runoff, untreated grey water and sewage are discharged into the urban drainage canals and streams. Surface waters are extremely polluted and do not even comply with the discharge standards for industrial effluents¹³. The wastewater generated in Kurunegala city is estimated to be 4,620 m³/day.¹⁹

In August 2018, the Greater Kurunegala Water Supply and Sewerage Project was inaugurated. This project will provide clean water for households, government and private sector offices, schools, hospitals, tourist hotels, daily floating population of over 70,000. It will also provide disposal of wastewater for 3,500 domestic and commercial institutions through its well-organized sewerage network.²⁰ Greater Kurunegala Water Supply and Sewerage Project is seen as a boost to the quality of life and protection of the environment in Kurunegala, and the underground water and lake water quality will also be improved through the waste water treatment of this project.

3.3.b Solid Waste Management

In Kurunegala City, solid waste management is carried out by the Municipal Health Department (MHD) headed by the MOH who is responsible for overall SWM activities. With regard to organization, the experienced MOH (Medical officer of health) and PHI (Public health inspector) have taken the actual command of waste management and are working in close collaboration with the PHI and the SV.¹⁵

Total waste generation unit in Kurunegala is 1.84kg/person/day where organic waste comprise of kitchen waste and grass & wood occupies less than 70%, on the other hand, the ratio of

¹⁹ National Water Supply and Drainage Board (NWSDB). 2005. Initial Environmental Examination Report: In Respect of Greater Kurunegala Sewerage Project. Sri Lanka: Ministry of Urban Development and Water Supply.

²⁰ http://www.xinhuanet.com/english/2018-08/14/c_137389078.htm

recyclable waste comprising of paper, textiles, plastic, metal and glass & bottles occupies close to 30%, which is the urbanized waste composition.²¹

However, the absence rate of disposal site workers for the compost and recycling facility is high and it often causes a malfunction of the facility. The kerbside collection is conducted by Kurunegala and the residences have to store their mixed waste in a plastic barrel or a polythene sack and discharge them in front of their houses on the collection day. The owners of restaurants and shops also store their waste in plastic barrels of 100 or 200 litres, which are collected by door to door collection. Even though, Kurunegala residents complain about the low frequency for waste collection due to the low attendance of collection workers.¹⁵

Collection and transportation of solid waste is conducted by Kurunegala. The waste collection covers 100 % of Kurunegala area and no collection fee is charged either for residents or large scale waste generators. The solid waste collected in Kurunegala is transferred to the Sundarapola final disposal site located in Kurunegala. This facility was established and has been in operation since 2012. In Sundarapola, only 2tons/day of solid waste can be accepted at the compost yard due to shortage of workers.¹⁵

3.3.c Critical Infrastructure

3.3.c.1 Roads and Railway

Kurunegala plays an important role as a linkage between the commercial capital Colombo and the central, eastern and northern cities of Sri Lanka. Five major roads intersect in Kurunegala. Kurunegala is also one of the main stops along Sri Lanka's main railway line running connecting Colombo and Jaffna. The Railway station is situated in a suburb called Gettuwana, a few kilometres away from the city centre. The Bus Stand is situated in the city centre within a sprawling shopping complex.²²

A characteristic feature in the city is the road network with national and regional linkages with a major railway connecting Colombo and Anuradhapura as indicated below. This makes it a main intersection linking different parts of Sri Lanka;¹⁰

- Colombo - Kurunegala - Trincomalee Road

²¹Solid Waste Management Action Plan (2008) by National Solid Waste Management Support Center (NSWMSC)

²² <http://www.kurunegala.mc.gov.lk/explore-kurunegala/>

- Colombo - Kurunegala - Anuradhapura Road
- Kurunegala - Puttalam Road
- Kurunegala - Negomob Road
- Kurunegala - Kandy Road
- Colombo, Kurunegala, Anuradhapura Railway

3.3.c.2 Hospitals

Sri Lanka has a well-developed network of government hospitals which provide treatment at no cost to patients. In the districts, there are a number of small primary hospitals supported by at least one referral hospital. It is estimated that no citizen is more than 30 minutes from a primary hospitals.

In Kurunegala, there are 44 Primary Hospitals and a tertiary/referral hospital, Teaching Hospital Kurunegala (THK). The Primary Hospitals includes the Base Hospitals and the Divisional Hospitals. The Base Hospitals provide healthcare in relation to four main specialized care only. The Divisional Hospitals are hospitals with very low facilities and they do not provide any specialized care.²³

3.3.c.3 Sporting Venues

Major sporting venues in Kurunegala include Welagedara Stadium which is the top sporting venue in Kurunegala and also a multi-use stadium with a capacity of 10,000 people.²⁴ It regularly hosts domestic cricket matches. Another one is Maliga Pitiya Stadium with a capacity of 3000 people and is located along Colombo Road.¹⁷

3.3.c.4 Archaeological Sites

Being an ancient city, Kurunegala has many historical places of visit. Ridi Viharaya (Silver temple), Munneswaram temple, Yapahuwa, Panduwasnuwara, Arankele monastery, Dadagamuwa Viharaya, Padeniya Rajamaha Viharaya, Elephant rock are few of the places that travellers visit along their travel route.

3.4 Current Condition and Outlook of Climate Change

²³ Shahmy S, Kularatne SAM, Rathnayake SS, Dawson AH (2017). A prospective cohort study of the effectiveness of the primary hospital management of all snakebites in Kurunegala district of Sri Lanka.

²⁴ https://en.wikipedia.org/wiki/Welagedara_Stadium

3.4.a Current Conditions

Sri Lanka being a small tropical island there is no significant annual variation in temperature due to latitude. However, significant regional variation in temperature could be observed due to altitude. In lowland areas, average annual temperature usually vary around 26.5 – 28.5 °C and it falls quickly as altitude increases (e.g. Nuwara Eliya – 15.9 °C at 1800 mean sea level). In the absence of high seasonal variation in temperature, the average pattern of climate in a given local area is determined mainly by the variations in precipitation. Sri Lanka's mean annual rainfall is around 1850 mm (range from 900 mm to 5000 mm). There are three major sources of rainfall in the country, namely; monsoonal, convectional and depressional. Based on the variation in precipitation, Sri Lanka's climate is generally divided into four seasons:²⁵

- a) First inter-monsoon season (FIM): March –April (268 mm, 14%)
- b) Southwest monsoon season (SWM): May –September (556 mm, 30%)
- c) Second inter-monsoon season (SIM): October-November (558 mm, 30%)
- d) Northeast monsoon season (NEM): December- February (479 mm, 26%)

The first inter-monsoon (FIM) rains are usually experienced around March-April period. During the FIM, southwestern quarter and certain parts of central highlands receive over 250 mm rainfall. Most other parts get rainfall around 100 -250 mm. Hazardous lightning associated with thunderstorms is a frequent incident and sometimes intensive rainfall may give rise to flash floods.²⁵

The country experiences Southwestern monsoon (SWM) around May-September. During the SWM season, mid-elevation western slopes of central highlands receive over 3000 mm rainfall and southwestern coastal belt around 1000-1600 mm. Higher elevations in central highlands get rainfall around 800 mm. Long lasting monsoon rains may result in floods in low-lying areas and landslides in hilly areas. Rains can be experienced at any time during the day and night. Second inter-monsoon season (SIM) brings rainfall around October-November period. Unlike FIM, the influence of depressions is common during SIM, whole country experiencing strong winds with widespread rains, sometime leading to floods and landslides. It is the season with most evenly distributed rainfall in Sri Lanka. Many areas receive over 400 mm. Slopes in southwestern quarter receive 750 -1200 mm. Usual period of northeast monsoon season (NEM) is December-February. During this season moist wind blowing from northeast Asian landmass

²⁵National Climate Change Adaptation Plan of Sri Lanka 2015-2024

produces seasonal rainfall in northern, north central and eastern parts of the country. Highest rainfall figures are recorded in north-eastern slopes of the hill country and eastern slopes of the Knuckles/Rangala range.²⁵

This general pattern of annual rainfall results in an overall mean annual rainfall around 1850 mm that range from 900 mm to 5000 mm. Southwestern quarter of the country, especially western slopes of central highlands receive the highest rainfall (e.g. Yatiyantota, Ginigathena, Watawala > 5000 mm). On the other hand, southeastern (Yala, Palatupana < 1000 mm) and northwestern (Mannar < 1000 mm) coastal areas receive the lowest amount of rainfall. Based on the variation in mean annual rainfall the country it has been divided in to three major climatic zones.²⁵

- Wet zone (mean annual rainfall > 2500 mm)
- Intermediate zone (mean annual rainfall 1750-2500 mm)
- Dry zone (mean annual rainfall <1750 mm)

These climatic zones have further been subdivided into three elevation categories (low-country - <300 m; mid-country – 300-900 m; up-country - >900 m) to cover the associated temperature variations. These divisions have given rise to 46 agro-ecological zones, a classification that provides the basis for various decisions and recommendations concerning agriculture and other sectors²⁵.

3.4.b Damage of Disaster

Cummulatively, more than 36 million Sri Lankans have been affected by natural hazards such as floods, landslides, cyclones and droughts over a period of 40 years to 2016, with an average of over 900,000 people, an equivalent of 4.1% of the entire population affected annually.²⁶ According to the table below, Kurunegala was documented as one of the 9 Sri Lanka’s Provincial Capitals exposed to these climate risks between 1974 to 2017 where floods and drought caused several incidents.²⁷

Climate Risk Exposure 1974-2017

| | Flood | | Landslide | | Drought | | Cyclone | |
|----------------|----------|--------|-----------|--------|----------|--------|----------|--------|
| | Affected | Deaths | Affected | Deaths | Affected | Deaths | Affected | Deaths |
| Badulla | 2,251 | - | 6,424 | 41 | - | - | - | - |
| Galle | 27,206 | - | 2 | 4 | - | - | - | - |

²⁶ GoSL (Government of Sri Lanka) 2016a. Impacts of Disasters in Sri Lanka

²⁷ Disaster Management Centre (DMC) Database

| | | | | | | | | |
|-------------------------|------------------|------------|---------------|------------|----------------|----------|---------------|----------|
| Ratnapura | 113,260 | 9 | 6,969 | 47 | 4,313 | - | - | - |
| Jaffna | 40,268 | | - | - | 2,150 | - | - | - |
| Kurunegala | 2,774 | 2 | - | - | 141,074 | - | - | - |
| Anuradhapura | 4,030 | - | - | - | 19,645 | - | - | - |
| Trincomalee | 33,535 | - | - | - | 18,187 | | 75,000 | |
| Kandy | 505 | - | 2,615 | 7 | - | - | - | - |
| WRM²⁸ | 3,807,394 | 223 | 2,084 | 36 | 530,763 | - | 9,355 | 3 |
| Total | 4,031,223 | 234 | 18,115 | 135 | 716,132 | 0 | 84,355 | 3 |

3.4.c Outlook of Climate Change

Observed and projected changes suggests that the climate of Sri Lanka is undergoing three major types of changes.

- Gradual increase in ambient air temperature
- Changes in distribution pattern of rainfall
- Increase in frequency and severity of extreme weather events

In addition to the above changes in atmosphere, there are associated changes in oceanic environment too, especially sea level rise, that seem to create significant impacts over Sri Lanka. Another recent projection has predicted that climate pattern in Sri Lanka is getting more polarized where the Dry zone becomes drier and Wet zone becomes wetter in years to come.²⁹

4 Current Problems of Kurunegala City

The problems currently occur in Kurunegala are below:

- a) Increasing trend in Flash Floods and Water Scarcity in the City due to long dry spell and short term, high intensity rain falls
- b) Continual rise of Heat index (being at extreme caution level in the 1st quarter of the year of last 3 years)
- c) Regular occurrence of spontaneous Fires in the old solid waste dumpsite (due to temperature rise and methane emission)

²⁸ Western Region Megapolis (WRM)

²⁹ Punyawardena, B.V.R., S. Mehmood, A.K., Hettiarachchi, M, Iqbal, S.H.S.A Silva, and A. Goheer (2013a) Future Climate of Sri Lanka: An approach through dynamic downscaling of ECHAM4 General Circulation Model (GCM).

- d) Increasing trend of Heat stress conditions experienced by occupants in the City
- e) Increasing air pollutants (particulate matter, dust and smoke-noxious gases) levels in the City
- f) Limiting factors affecting efficiency in proper solid waste management such as:
 - Absence of “Safe Temporary Storage and Final Disposal of Clinical Wastes” generated within the City,
 - Lack of support due to poor awareness/ attitudes for “generator segregation of wastes” by bulk solid waste generators like Government office complexes, Hospital etc..
 - Poor drainage system that causes difficulties in removal, accumulation of wastes and stagnation
- g) Extreme weather bound health impacts like “Dengue epidemic condition”.
- h) Climate sensitive diseases
- i) Lack of storm water drainage for city limits
- j) Heavy traffic congestion in town area increasing the daytime heat stress
- k) Inadequate space within city limits to design shady tree areas

5 Discussion and Result

The literature review indicates that there is a dearth of baseline data related to water management and heat stress. Data is available only from periodically conducted surveys or data collections made for specific purposes. Therefore, there is no continuity of data. Further, quantitative information which leads to the development of indicators for exposure, sensitivity and coping capacity are not easily available. Basic data such as land-use planning and water capacity needs to be updated.

Heat stress is experienced by the communities but there is no published information related specifically to health hazards due to heat stress. Nor are there records available with the Medical Officer of Health to indicate the relationship of heat stress and health.

Water scarcity which arises due to prolonged drought which may be exacerbated by anthropological interventions is also not documented.

It is needed a data collection and storage system (a comprehensive data base and accompanying GIS maps) to understand the status and impact of climate change. This allows Kurunegala to establish suitable climate change action plans through an accurate analysis of the status.

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