



Climate Technology Centre Network (CTCN) Technical Assistance
for the Development of Climate Smart City in Kurunegala, Sri Lanka

Current GHG Emissions State Analysis Report

“Report on current state and baseline GHG emissions analysis of Kurunegala City”

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Contributing Researchers

Mr. Soon-chul Jung, General Manager, Econetwork (Inc.)

Ms. Jeong-lyoung, Ryu, CEO, Econetwork (Inc.)

Dr. Lizzy Seo, Senior Researcher, Econetwork (Inc.)

Mr. Whi-lim, Son, Senior Researcher, Econetwork (Inc.)

Mr. Yunho Choi, Senior Researcher, Econetwork (Inc.)

Mr. Gi-hun Kim, Researcher, Econetwork (Inc.)

Mr. Hwansu Kim, Researcher, Econetwork (Inc.)

Ms. Jung Nahyun Seo, Researcher, Econetwork (Inc.)

Ms. Jisun Lee, Researcher, Econetwork (Inc.)

Eng. Samantha Kumarasena, CEO, National Cleaner Production Centre Sri Lanka

Eng. Ruwan Wijemanne, Energy Expert, National Cleaner Production Centre Sri Lanka

Ms. Nisansala Ranundeniya, RECP Expert, National Cleaner Production Centre Sri Lanka

Eng. M. M. Munsif, RECP Engineer, National Cleaner Production Centre Sri Lanka

Ms. Harshini Rananjali, RECP Technologist, National Cleaner Production Centre Sri Lanka

Report Reviewers and Coordinators

Mr. Pradeep Thillekeratne, Commissioner, Kurunegala Municipal Council

Dr. Priyantha Muthunayake, Chief Medical Officer of health, Kurunegala Municipal

Ms. Kumudini Vidyalankara, Director, Climate Change Secretariat, Ministry of Environment

Ms. Hasula Wickremasinghe, Program Assistant, Climate Change Secretariat, Ministry of Environment



The Climate Technology Centre & Network (CTCN) has provided Technical Assistance (TA) to Kurunegala Municipal Council (KMC) and Ministry of Environment (MoE) in Sri Lanka through pro-bono support from Econetwork and Green Technology Center (GTC) in Republic of Korea.

LIST OF ABBREVIATIONS

BRT	Bus Rapid Transit
CEB	Ceylon Electricity Board
COP	Conference of Parties
CTCN	Climate Technology Centre & Network
GHG	Greenhouse Gas
GTC	Green Technology Center
IFI	International Financial Institutions
INDCs	Intended Nationally Determined Contributions
KMC	Kurunegala Municipal Council
LA	Local Authorities
MEWR	Ministry of Environment and Wildlife Resources
MMDE	Ministry of Mahaweli Development and Environment of Sri Lanka
NAMAs	Nationally Appropriate Mitigation Actions
NCCAS	National Climate Change Adaptation Strategy
NCER	Non-Conventional Energy Resources
NCSD	National Council for Sustainable Development
NDC	Nationally Determined Contributions
TA	Technical Assistance
TNA	Technology Needs Assessment

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1. Introduction

Kurunegala City, located in the North-Western Province of Sri Lanka, is one of the most intensively developing economic and administrative capitals. The growth rate of the population of Kurunegala City is approximately 4%, and the growth rate per residential area is relatively higher than other cities with similar conditions. The main highways pass through the center of the City and it is linked to main cities adjacent to Kurunegala City. The geographical characteristic of the City and the condition of the roads cause severe traffic congestion and the growing population leads to the increase of energy consumption and waste generations.

To cope with these arising issues, Kurunegala City requested technical assistance to CTCN, which develop a roadmap to convert Kurunegala City into Climate Smart City in order to mitigate greenhouse gases in energy, transport, and waste sectors.

Climate Technology Centre and Network (CTCN) initiated a Technical Assistance (TA) entitled “Technical Assistance for the Development of a Climate Smart City in Kurunegala, Sri Lanka” in response to a request from Municipal Council of Kurunegala through the Ministry of Environment and Wildlife Resources (MEWR) of Democratic Socialist, Republic of Sri Lanka. Republic of Korea NDE (Ministry of Science and ICT) decided to accept and support the TA as Pro bono project. It was assigned to Econetwork(Inc.) which is a key implementer of this TA Project.

The Technical Assistance has the aim to : i) analyze current state and baseline GHG emissions of Kurunegala City in energy, transport and waste sectors (hereinafter the sectors on consideration are specified in energy, transport and waste area) ii) identify list of low emission technologies for three sectors, iii) develop the roadmap including low emission technologies for each sector, and iv) build the capacity of City planners and policy makers in order to guide on how to transform Kurunegala City into a low emission City.

In order to comprehend and identify the overall circumstances and characteristics of greenhouse gases (hereinafter, GHG) emissions of the City, the implementer has collected the data and information accounting for the City’s features and issues in energy, transport and waste sectors. Subsequently, the analysis for current state and GHG emissions of the City is carried out on the criteria such as contribution to GHG emissions by each sector, existing standards or policies affecting to the City governing, mandate of the municipal government and GHG emission potentials with consideration of expected cost.

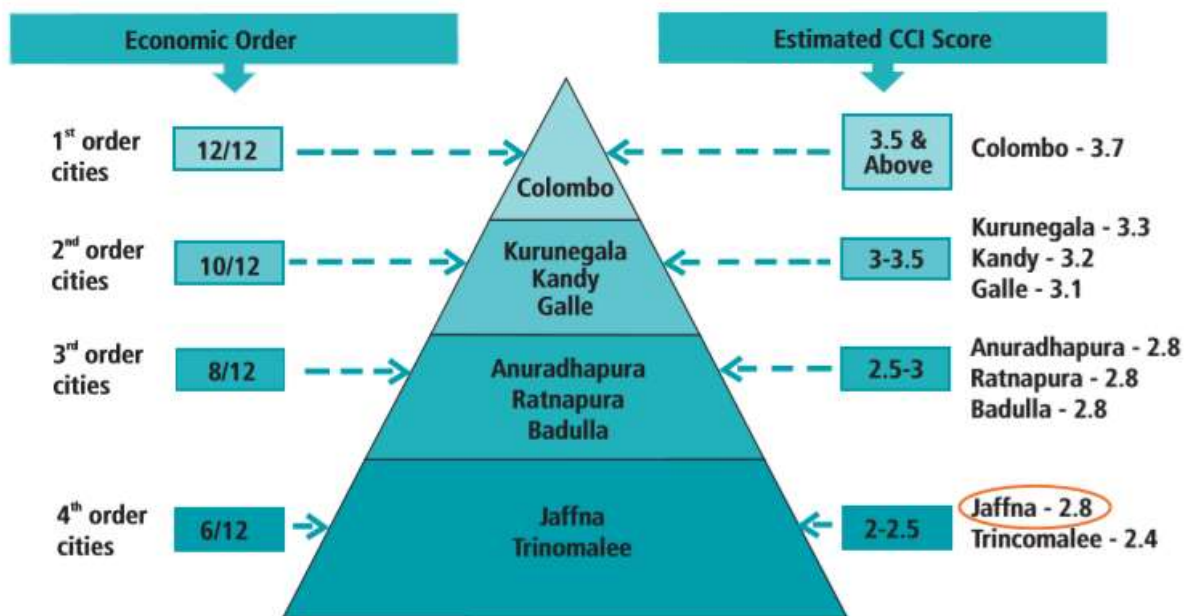
To provide more valuable information for identifying feasible climate technologies in future steps, the

analysis in this stage will consider factors inter alia the vision and objective of existing policies and plans, the level of infrastructure established in energy, transport and waste sectors, the possibility of a connectivity the climate technologies towards international financial institutions (IFI), given financing options. Consequently, the roadmap will be drawn up, which leads to mitigation of GHG emissions in energy, transport and waste sectors by introducing climate technologies. Furthermore, a concept note will be drawn in consideration of the possibility of connectivity with international financial institutions in order to implement the finally selected climate technology through consultation with stakeholders.

This report provides the analysis results of the current state and GHG emissions of the City in order to understand the circumstances and the issues the City encounters. And it will be used as basic data to identify the feasible climate technologies in future steps.

2. General Information of Kurunegala City

Kurunegala City, as one of the major cities in Sri Lanka, is the developing capital of the North-Western Province of Sri Lanka. Since Kurunegala City is located at the junction to link several main roads with high connectivity to the main towns in Sri Lanka, it has contributed to Kurunegala City to achieve relatively high "City Competitiveness Index(CCI)," ranked as the second-highest among the countries, primarily through the aspects of Infrastructure, Human Resources and Training, and Dynamic of Local Economy¹," [Figure 1]. The Government of Sri Lanka also established the urban policy priority actions to promote the western region as an economic hub of the southern part of the Indian subcontinent and to promote strategic City development to secondary urban spaces as a provincial economic hub, which implies Kurunegala City has potential in future economic development. However, due to the uprising risk and vulnerability towards climate change, the Kurunegala Municipality Council considers the resilience aspect of a City in parallel to make sustainable urban development.



[Figure 1. An 'Economic Order' of Sri Lankan Cities in 2018]

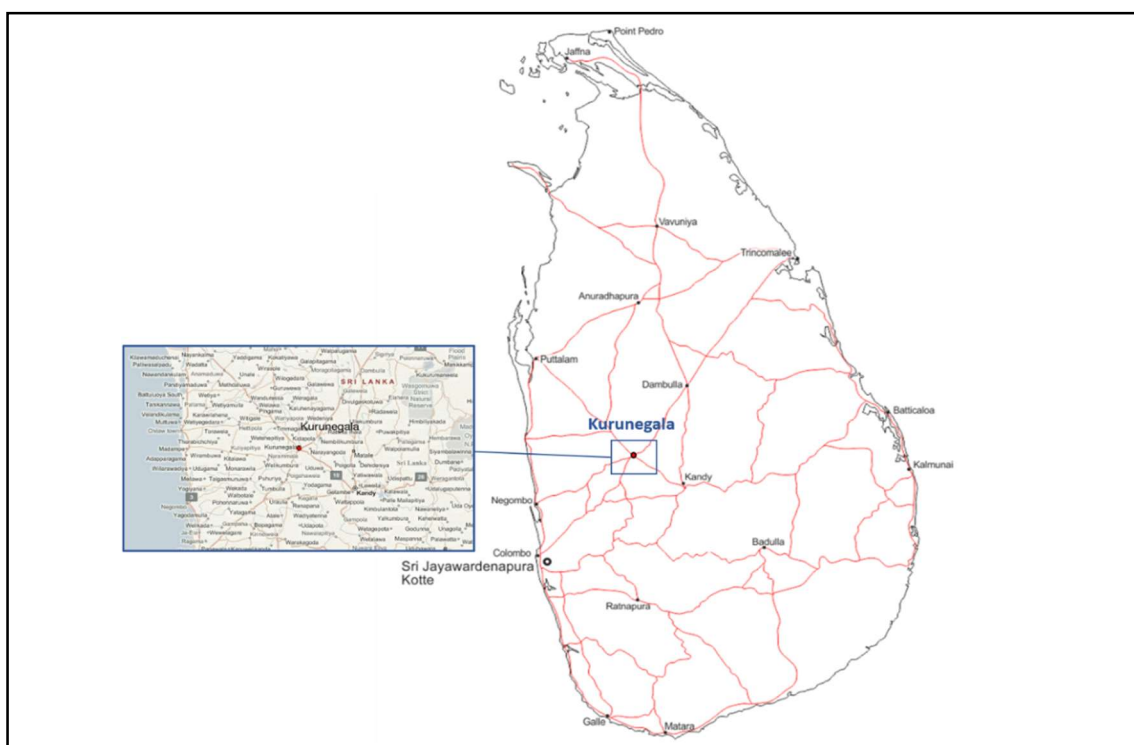
¹ SoSLC(State of Sri Lankan Cities), Kurunegala Municipal Council

2.1 Physical Characteristics

2.1.a Geography and Climate

Kurunegala district is situated between 7° 29' 0" N and 80° 22' 0" E. Kurunegala City is 116km from Colombo and 42km from Kandy. The significance of Kurunegala City not only resides with its historical background but also with its high potential in socio-economic development due to the accessibility to major cities in Sri Lanka [Figure 1]. Kurunegala City links 6 major towns; Colombo, Puttalam, Anuradhapura, Trincomalee, Negombo and Dambulla. The administrative coverage area of the City is 10.53 Km² and it is based on a plain area which is 108 to 120 meters well above the mean sea level.

The climatic feature of the Kurunegala is categorized as a tropical rainforest climate. The average temperature throughout the year is from 27°C to 30°C due to the heat retainment of surrounding rocks. The coolest temperatures are shown in December to January and the hottest temperatures is expected to be found in the month of April to September. Since the geographical characteristics impact on the change of season is not mainly with the temperature variation but with precipitation variation, it is essential to examine the pattern of precipitation and rainfall in Kurunegala City. It is expected to have the annual average rainfall around 1,750mm to 2,500mm and the highest rainfall occurs mostly from two monsoons, the North-East monsoon from December to February(479 mm, 26%) and the South-West monsoon from May to September(556 mm, 30%). The past decade has shown prolonged droughts in Kurunegala.



[Figure 2. Location of Kurunegala City]

During the South-West monsoon 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. For the North-East monsoon period, moist wind blowing from northeast Asian landmass 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.

This general pattern of annual rainfall results in highest rainfall in South-West quarter of the country, especially western slopes of central highlands. On the other hand, southeastern and northwestern coastal areas receive the lowest amount of rainfall. ²

Through the overview of the current climate situation, three types of climate changes are observed and expected to occur in Sri Lanka which can cause the problematic environmental changes as well in Kurunegala City: 1) Gradual increase in ambient air temperature; 2) Changes in distribution pattern of rainfall; 3) Increase in frequency and severity of extreme weather events. ³

2.1.b Land Use

Kurunegala City is a hub converging the main road network, with commercial development along major roads. In the process of studying the land use changes from 2001 to 2017 in Kurunegala City limit it was observed that there was a considerable increase in the commercial use while a few are seen in residential development. However, due to the fact of narrow roads in the interior area and non-connectivity of dead ends, there is no commercial development even within the CBD (Central Business District).

To generally acquire the land use status of residential sector, though there is residential development within the Town limit and the adjacent area on small lots ranging for 6 to 15 perches the same residential development could be seen in the interior of the Pradeshiya Sabha in home gardens in an

² National Climate Change Adaptation Plan of Sri Lanka 2015-2024

³ 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).

extent of 2 to 3 acres. It also has been allocated as high as 10% of the land for education and government etc.

In terms of land use plan related to area of planning authority though 18% and 21.6% of land are set apart for paddy and coconut cultivations respectively, 16.6% of the paddy land are abandoned due to non-availability of water facilities. There is a problem of converting coconut lands all though it is 21.6% of the total lands, into residential development due to its under productivity. Accordingly, all though there is higher share of agriculture land use the contribution made to the economy by them is not up to a considerable level.

The data explain that there are 3,694 industries and 11,618 employees ranging from large scale industries to cottage industries within the Pradeshiya Sabha Area whereas in Kurunegala Town area there is a tendency of decreasing in the Industrial land use. Moreover there is a possibility of expansion of Industrial sector within Pradesiya Sabha Area because of the facts that there are Industrial Parks such as Heraliyawala and Dangaspitiya manage by the Provincial Council, the location of coir based Industries within those parks and further demand being made by the Industrialists. Though there is a fairly a higher percentage of land use amounting nearly to a 10% of the total set apart for roads within Kurunegala Town since there is convergence of five main roads and the location of Railway Station, this situation in comparison to total area (Planning Area) of the land use as few as 2% of the land is reserved for the same purpose. At the same time in studying road expansion, connection of main roads directly to narrow residential roads, ending of roads with dead ends, non-availability of bypasses etc. could be identified. A considerable amount of vehicles into the Town is in flow daily by reason of convergence of the five major roads in the Town, since there is a non-availability of alternative roads, large number of vehicles not meant to be coming to the Town are observed. ⁴

Use	1985 (%)	1997 (%)	2002 (%)	2017 (%)
Residential	29.80	34.13	36.57	38.50
Commercial	1.46	4.65	4.97	7.30
Industries	0.78	1.00	1.18	0.15
Recreational	0.71	0.89	0.98	1.04
Road and Transport	4.23	6.94	7.64	8.69
Public and Semi Public	5.96	10.53	10.78	11.78
Religious	1.67	1.70	1.95	2.00

⁴ Urban Development Authority North Western Provincial Office, 2019.6, Kurunegala Town Development Plan 2019-2030

Paddy Cultivation	15.77	13.94	13.19	11.00
Coconut Cultivation	18.51	6.17	4.35	1.49
Vacant Land	1.93	0.76	1.73	2.50
Cemetery	0.60	0.69	0.69	0.55
Rock and Forest	13.50	13.20	10.90	10.14
Water Body	5.00	5.00	5.01	4.30
Total	100.00	100.00	100.00	100.00

Source: Urban Development Authority North Western Provincial Office, 2019. 6, Kurunegala Town Development Plan 2019-2030

[Table 1. The changes in the land use pattern – 1985/2017]

2.2 Socio-economic Characteristics

2.2.a Population and Diversity

The population of Kurunegala Town in 2017 was 26,205⁵. The proportion of the total population divided by age is 22.9% for children under 15, 24.1% for those aged 15 - 29, 39.8% for those aged 30 - 59 and 13.2% for the elderly population over 60year⁶. The population density is also high due to the factor of quick accessibility to the adjacent areas such as Malkaduwawa, North Malkaduwawa, South Malkaduwawa and South Wilgoda.⁷

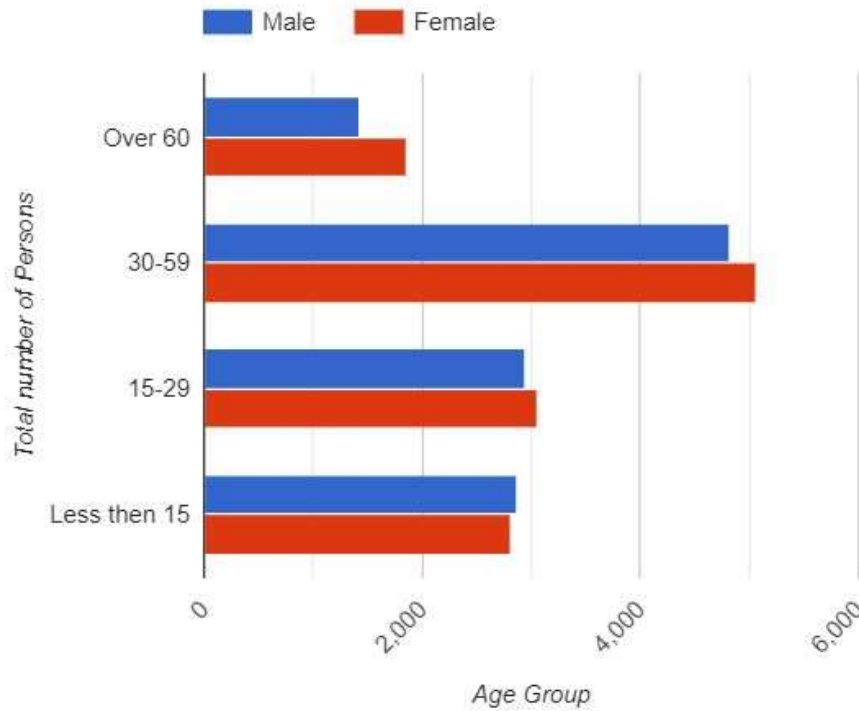
Sex ratio of Kurunegala was 94.3 males for every 100 females in the 2012 census. 48.5% of the total population is male and 51.5% is female. Kurunegala also registered as a high proportion of working-age men compared to working-age women, backing their overall trend of women-weighted populations. Ratio of labor force based on gender in Kurunegala district is divided into male 60.3% and women 39.7%. Elderly population over age of 60 in Kurunegala is 11.8% for men and 14.5% for women. Migration population in Kurunegala is 20.5% in 2012.⁸

⁵ Urban Development Authority North Western Provincial Office, 2019. 6, Kurunegala Town Development Plan 2019 – 2030

⁶ Department of Census and Statistics

⁷ Urban Development Authority North Western Provincial Office, 2019. 6, Kurunegala Town Development Plan 2019-2030

⁸ Data from DCS in SoSLC report



Source: Department of Census and Statistics

[Figure 3. Gender distribution by age]

The residents of Kurunegala City mostly use the language of Sinhalese, Tamil, and English depending on social boundaries and ethnic backgrounds.

Religious variety co-exists in Kurunegala City such as Hinduism, Christianity, and Islam, but Buddhism is the most prevailing religion in Kurunegala City. 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 districts⁹

2.2.b Education

Kurunegala can be depicted as the one of the education centers in the North-Western province with facilities such as leading public and private schools and other kinds of education institutions. It also serves as the academic center for students from other neighboring provinces due to the City's facilities

⁹ https://en.wikipedia.org/wiki/Kurunegala_District#Religion

and the location. The City is home for 12 national schools and 5 private and international schools making it a City well suited for studies. In addition to that, Kurunegala attracts more than 60,000 students a week for tuition and auxiliary classes. The level of higher educational attainment is the highest in Kurunegala compared to the other provincial capital cities. Kurunegala City is also ranked 3rd in the proportion of people in the over 25 age with degrees among the Municipalities in 2012. ¹⁰

2.2.c Economic

Over the past 50 years, Sri Lanka's economy has become increasingly urban centered. The North-Western Province gains 3rd place in terms of provincial contribution to Gross Domestic Product of Sri Lanka and Kurunegala district contributes 7%, since Kurunegala Town is the Administrative and Commercial Town of the Province and the District as well. Being the Administrative and Commercial center of the province the daily floating population to Kurunegala Town is nearly 300,000. A considerable share of population from 25km radius of adjacent area arrives for service needs such as employment, school, education and commercial services etc. and commutes daily whereas population from 50km radius of the adjacent area, it is observed is commuting for health (Hospitals and Medical Consultation services), foreign employment, tuition classes and administrative service needs. Since the government of Sri Lanka also investing in developing transport and logistics infrastructure along a Central Corridor, linking Colombo to Trincomlaee via Kurunegala and Kandy, this will drive the further development potential which will reduce travel times and widen access to markets, and increases in labor productivity.

2.2.d Poverty

Sri Lanka has faced several incidents which inhibit the country to develop to its full potential. Sustainable development is now one of the key priorities in Sri Lanka, but poverty is still a critical issue in the country. 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. The 7.7% of poorest citizens in Sri Lanka is located in Kurunegala even though only 6.5% 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

¹⁰ <https://soslc.lk/en/cities/kurunegala-municipal-council>

to judge poverty about once per decade. This makes updating the current poverty line a priority for Sri Lanka.

The headcount index is calculated by considering 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).¹¹

2.3 Infrastructure

2.3.a Transport Facilities

As discussed earlier, Kurunegala has its own significance in the country with the aspect of transportation hub to link major cities as commercial capital Colombo and the central, eastern, and northern cities of Sri Lanka. Five major roads intersect in Kurunegala. The railway to connect Colombo and Jaffna also crosses Kurunegala as one of the main stops. The railway station is situated in a suburb called Gettuwana, a few kilometres away from the City centre. The bus stand is located at the City center within a shopping complex. The major transport facilities which play the linkage role between cities are as below.

- Colombo - Kurunegala - Trincomalee Road
- Colombo - Kurunegala - Anuradhapura Road
- Kurunegala - Puttalam Road
- Kurunegala – Negombo Road
- Kurunegala - Kandy Road
- Colombo, Kurunegala, Anuradhapura Railway

¹¹ Sri Lanka – Poverty and Welfare: Recent Progress and Remaining challenges, World Bank

Regarding the major highway construction according to the National Plan during 2007-2017, the construction has already commenced on January 16th, 2017 with the following phases as below.

- Phase 1: Kadawatha(0.0km) – Meerigama(37.1km)
- Phase 2: Meerigama(37.1km) – Kurunegala(76.8km)
- Phase 3: Pothuhara(0.0km) – Galagedra – Kandy(76.8km)
- Phase 4: Kurunegala(76.8km) – Dambulla(137.1km)

* Towns covering the Kurunegala district include, Meerigama, Nakulugamuwa, Pothuhara, Danbokka, Kurunegala and Melsiripura.

Main roads are vigorously developed through national and sub-national authorities, however, compared to the road development, lack of parking spaces for cars are also observed with only 1,310 parking lots proposed for private vehicles by the Urban Development Authority.

Therefore, this causes vehicles to park on the either side of the main roads rather than to park in the public parking lots.

For the traffic system in the city, Kurunegala has traffic lights signals and road signs for control systems. And highest traffic congestion normally occurs at 7am due to school and office transport as predicted by the SOSLC project.

2.3.b Water Supply System and Sewage Treatment

To view the country-wide aspect of safe drinking water coverage in Sri Lanka, it is around 86% of the population while 46% of the population having pipe borne water supply facilities. 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 are served pipe borne water facilities through the CBOs, and 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.¹²

¹² Public Investment Programme 2017 – 2020, Department of National Planning, Ministry of National Policies and Economic Affairs, Sri Lanka

The National Water Supply and Drainage Board (NWSDB) of the North Western Province and the KMC jointly secure the supply of safe drinking water to its community. The NWSDB is responsible for the abstraction and treatment of raw drinking water, and the KMC is responsible for water distribution and revenue collection. The current water demand in the city is about 8,000m³ per day. Currently, the total length of the water distribution is about 82 km. The Kurunegala Municipal Area obtains water from the Deduru Oya, Wendaru Wewa and during periods of droughts from the Kurunegala Wewa. These are the main sources of water for the Kurunegala City. The KMC uses a small reservoir called Tampana which originates from a catchment, but which dries up during the drought. The water supply capacity of the NWSDB is 7,200 m³ per day from the Deduru Oya and 1,000 m³ per day from the Wendaru Wewa. This raw water is pumped into the Water Treatment Facility that sells the water in bulk to the KMC. The KMC supplies the pipe borne water to the city. Gas chlorination is used in the treatment of raw drinking water. In the case of the Tampana's water supply, the water quality is good as it is from the catchment. Therefore, pressure filter and disinfection are the only treatment needed to be given. The Kurunegala Wewa has a water storage capacity of 1,750m³ per day. But, this lake is used only in periods of drought. It has a channel linked to the Deduru Oya and can store water for up to 21 days requirement. It is estimated that the water demand will be 19,000m³ per day by 2030. Under the Greater Kurunegala Water Supply and Sewerage Project (inaugurated in 2018), the present water treatment facility is expected to be upgraded to approximately 14,000m³ per day. However, only one phase of the project is complete.

Currently, most commercial institutions, government offices, the hospital and several residences are connected to the sewerage treatment plant. Most of the residences and institutes have on-site septic tanks for treatment of sewage.

The residual treated wastewater of 24,000m³ is used for irrigation. The filtrate is used as a fertilizer for coconut plantations¹³.

2.3.c Solid Waste Management

The current population of Sri Lanka is approximately 21 million, with an annual population growth rate of 1.1%. Present Municipal Solid Waste (MSW) Generation in Sri Lanka is around 6500 to 7000 Mt/Day (Mannapperuma, 2017) while present MSW collection is around 3500 Mt/Day (50% of

¹³ <https://www.ctc-n.org/technical-assistance/projects/development-kurunegala-climate-smart-city>

generation). Western Province contributes 60% to the National MSW generation and other eight provinces contribute for 40 % to the total waste generation.

Solid Waste Management (SWM) of Kurunegala City is carried out by the Municipal Health Department (MHD) headed by the MOH who is responsible for overall collection of waste and keeping the city clean. The SWM Division in the KMC manages the composting and disposal treatment of solid waste and wastewater at the Sundarapola Waste Management Site. These waste management programmes are held in close collaboration with the Public Health Inspectors.

The solid waste collected by the Kurunegala MC (Municipality Council) and the Kurunegala PS (Pradeshiya Sabha) is transferred to the Sundarapola final disposal site located in the Kurunegala PS. The Sundarapola final disposal site was established and has been in operation since 1920. The total extent of Sundarapola site is 12.5 acres while around 4 acres of area is covered by the open dump. The discharged solid waste amount is approximately 38 ton/day from the Kurunegala MC, approximately 10 ton/day from the Kurunegala PS and is estimated at approximately 48 ton/day in total. The screw type composting machine was installed in Sundarapola waste disposal site with the capacity of 50 Mt/day on 18th August 2019. Major raw materials to make the compost is organic domestic garbage collected by separate collection which was introduced to households in 2010. However, the plant is not running at its full capacity due to technical operational issues. The plant process 3 – 7 Mt of wastes daily. . In Sundarapola, only 2tons/day of solid waste can be accepted at the compost yard due to shortage of workers.¹⁴ Further, there is a mixed waste dumping hill at the Sundarapola site. Various recommendations have been made in order to manage this mixed waste hill, however it is still in the same condition.

The KMC carries out an extensive programme to promote segregation of waste at source. However, with the floating population it is very difficult to manage this and there are many instances of mixed waste gathering.

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

¹⁴ Data Collection Survey on Solid Waste Management in Democratic Socialist Republic of Sri Lanka Final Report, February 2016

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 curbside collection is conducted by Kurunegala and the residences have to store their segregated waste in plastic barrels or a polythene sacks and keep 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. Kurunegala residents complain about the low frequency for waste collection due to the low attendance of collection workers.

Collection and transportation of solid waste is conducted by Kurunegala MC trucks. The waste collection covers 100 % of Kurunegala area and no specific collection fee is charged either from residents or large-scale waste generators.

3. Relevant Policy and Planning

3.1 National Level Policy and Plan

3.1.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;

1) 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.

Especially, Sri Lanka set the several strategies below with regard to mitigation of GHG emissions in order to meet the Challenges of Climate Change.

- Establish country-specific policies and action plans to counter adverse Climate Change impacts.
- Promote the use of economically viable, environment-friendly, renewable energy resources,

with emphasis on Non-Conventional Energy Resources (NCER).

- Optimize energy consumption through energy efficiency in enterprises and promoting substitution of fossil fuels by renewable energies in economic and production sectors.
- Promote supply-side and end-use energy efficiency.
- Promote carbon sequestration.
- Promote Integrated waste management.

This report is currently being upgraded by the Ministry of Environment as the National Environment Action Plan.

2) National Climate Change Policy of Sri Lanka in 2012

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.

Especially in the mitigation area, the National Climate Change Policy of Sri Lanka laid out the strategic policies in energy, transport, and waste sectors, referred to in **[Table 2]**.

Sector	Policy Statement
Energy	<ul style="list-style-type: none"> - Explore the potential of clean and renewable energy sources of the country and enhance their production, accessibility and affordability. - Encourage the utilization of clean and renewable energy sources taking into account the local absorption capacity and long-term sustainability. - Take action to improve demand and supply side management to maximize the efficiency of energy utilization. - Introduce economic incentives for less carbon intensive fuels and energy efficient technologies while imposing appropriate fiscal policy to combat detrimental practices.

Transport	- Take action to promote integrated transport systems, low emission fuels and improved fuel efficiency taking into consideration the long-term sustainability of the existing resources.
Waste Management	- Adopt integrated waste management systems for all types of waste assigning priority for prevention of waste generation with nationally appropriate low greenhouse gas emission technologies.

Source: MMDE, National Climate Change Policy of Sri Lanka in 2012

[Table 2. Policy statement of each sector in National Climate Change Policy of Sri Lanka]

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

- Mainstream Climate Change Adaptation into National Planning and Development
- Enable Climate Resilient and Healthy Human Settlements
- Minimize Climate Change Impacts on Food Security
- Improve Climate Resilience of Key Economic Drivers
- 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 years 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.

4) 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 mitigation were Energy, Transport and Industry. 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 to determine the most preferred, prioritized technologies.

5) Nationally Determined Contributions (NDCs) of Sri Lanka in 2016

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). Sri Lanka NDC accounts for concrete mitigation strategies in energy, transport and waste sectors [Table 3].

Sector	Mitigation Strategy
Energy	<ul style="list-style-type: none"> - Establishment of large-scale wind power plants of 514 MW - Establishment of 115 MW of solar power plants - Establishment of 105 MW of biomass power plants - Establishment of 176 MW of mini hydro power plants - Introduction of Demand Side Management (DSM) activities - Strengthening sustainable energy related policies with a view to increasing the share of renewable energy from the existing 50%, to 60% in 2020. (The level of 60% expected to be reached in 2020 will be maintained at the same level, until further developments in renewable energy technology allow for increased share of electricity generation from the renewable energy sources.) - Converting existing fuel oil-based power plants to LNG (newly proposed INDC)
Transport	<ul style="list-style-type: none"> - Establishment of energy efficient and environmentally sustainable transport systems by 2030 - Upgrade of Fuel Quality Standards (FQS) to reduce harmful emissions that cause environmental pollution and health hazards - Reduce unproductive transport systems from current usage - Shift passengers from private to public transport modes - Enhance the efficiency and quality of public transport modes - Reduction of GHG emissions in the maritime sector - Gazette new emission standards to reduce GHG emissions - Encourage and introduce low emission vehicles such as electric and hybrid - Reduce traffic congestion in order to reduce GHG emissions - Reduction of GHG emissions in the aviation sector - Establishment of a database management system for monitoring NDCs of transport sector
Waste Management	<ul style="list-style-type: none"> - Introducing a source separation system at the household level and a proper collection mechanism - Improving the compost preparation system for each local authority and increasing the supply of organic fertilizer to agricultural purposes by providing facilities to control quality of compost and introduce a market for the compost fertilizer production - Introducing energy generation by waste (waste to energy programmes) - Improving the waste collection mechanism

	<ul style="list-style-type: none"> - Designing and implementing comprehensive solid waste management strategies for 40% to 60% of LAs before 2030 - Monitoring of waste management activities - Systematic management of industrial/hazardous and clinical waste management
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Source: MMDE, Nationally Determined Contributions (NDCs) of Sri Lanka in 2016

[Table 3. Mitigation Strategies in Sri Lanka NDC]

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

6) 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 the 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, biodiversity, tourism and recreation, export development and industry- energy-transport. 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 fulfill 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 includes interventions necessary for fulfilling cross-cutting national needs of adaptation identified based on 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.

7) ‘Vistas of Prosperity and Splendour’ on President Pledges

President, Gotabaya Rajapaksa had pledged the thrust below for the development and prosperity of Sri Lanka.

- Priority to National Security
- Friendly, Non-aligned, Foreign Policy
- An Administration Free from Corruption
- New Constitution that fulfills the people's wishes
- Productive Citizenry and a vibrant Human resource
- People-Centric Economic Development
- Technology-Based Society
- Development of Physical Resources
- Sustainable Environmental Management
- Disciplined, Law Abiding and values-based society

Especially regarding Sustainable Environmental Management, the government has established stringent aims to make the country environmentally sustainable. Primary policies in waste sector are; 1) mandatory of waste sorting and separation, 2) proper waste collection and disposal in designated locations, 3) introduction of modern techniques and improved incinerators.

3.1.b Sector Specific Policy and Plan

3.1.b.1 Cross-Sectoral

1) National Physical Planning Policy & The plan 2017-2050

The main objective of the National Physical Planning Policy is to provide all development agencies in Sri Lanka with a broad national level guiding framework for the planning and execution of development activities, which will directly impact upon the physical environment of the island and its territorial waters, and to establish facilities, amenities and service-related infrastructure incidental to the development of the physical environment.

It is commonly accepted that the state of the health, wealth and power of a nation is sensed in its physical environment. This implies that a well ordered, efficiently managed and effectively used physical environment is a manifestation and in turn, a vehicle towards the increased livability, economic prosperity and political stability of a nation. Therefore, planned physical development is

more a necessity, rather than an option in Sri Lanka’s journey towards becoming a developed nation by 2030.

In this comprehensive plan, it encompasses the projects to build facilities or infrastructure in physical, social and agricultural areas. Especially the plan includes the projects to extend the railway and build the expressway passing through Kurunegala City. Furthermore, the project for building sewage treatment facilities is described in the plan.

3.1.b.2 Energy Sector

1) Sri Lanka Long Term Generation Expansion Plan 2018-2037

This Plan presents the Generation Expansion Planning Studies carried out by the Transmission and Generation Planning Branch of the Ceylon Electricity Board for the time span 2018-2037. The Plan also includes information on the existing generation system, generation planning methodology, system demand forecast and investment and implementation plans for the proposed projects and recommends the adoption of the least cost plant sequence derived for the base case and also emphasizes the need to implement the plan to avoid energy shortfalls.

To be aligned with the Intended Nationally Determined Contributions (INDC), Sri Lanka has been struggling to strengthen the global efforts in mitigation area by introducing renewable energies to replace the existing power plants.

Referring to Sri Lanka Long Term Generation Expansion Plan, the renewable energy generation accounted for 13% of the entire electricity generation in 2018, but it is planned to increase to 21.5% of the entire generation capacity in 2037. Particularly, the generation expansion plan shows drastic an expansion of renewable energy on the given ratio of total generation, 8.5% increase from 2018 to 2037[Table 4].

Year	2018	2023	2028	2033	2037
Cumulative Mini hydro Capacity (MW)	344	404	454	504	544
Cumulative Wind Capacity (MW)	144	599	799	1,044	1,349
Cumulative Biomass Capacity (MW)	39	64	89	109	119
Cumulative Solar Capacity (MW)	210	526	900	1,173	1,442

Cumulative Total Renewable Energy Capacity (MW)	737	1,592	2,242	2,830	3,454
Share in Total Generation (%)	13.0	20.3	21.3	21.1	21.5

Source: CBD, Sri Lanka Long Term Generation Expansion Plan 2018-2037, p5-12

[Table 4. Renewable Energy Development Plan]

2) National Drinking Water Policy (2009)

The National Rainwater Policy and Strategy (NRPS) was adopted in 2005, to bring legal, institutional, and programmatic arrangements to optimize the management of rainwater. RWH (Rainwater Harvesting) was made mandatory in 2007 by amending the Urban Development Act. The objective of Rainwater Harvesting is saving energy by not using a pump for water supply.

3.1.b.3 Transport Sector

1) Nationally Appropriate Mitigation Actions (NAMAs) Design Document for Transport Sector of Sri Lanka (Draft version)

NAMAs are voluntary, non-binding policy instruments that provide a framework for pursuing a country's socio-economic and development goals, while contributing towards global GHG mitigation efforts. NAMAs can be seen as one of the most promising voluntary instruments for reducing GHG emissions in developing countries while offering flexibility as to the interventions that can be employed.

In this Design Document, Bus Rapid Transit (BRT) system with electric buses is primarily suggested to mitigate GHG emissions in transport sector. BRT system integrated with electric buses is expected to reduce fossil fuel consumption by on-road vehicles and travel time compared to regular buses. Modal integration at stations, rapid boarding and alighting, real-time tracking information displays are also common features of the BRT system.

3.1.b.4 Waste Sector

1) National Solid Waste Management Program in Sri Lanka

Waste generation in Sri Lanka amounts to 7500 MT per day. However, the waste is collected as only 3500 MT per day. Almost half of the entire waste is not collected and disposed. The main objective of

the national solid waste management program, which is referred to Pilisaru Project, is to increase the share of collected solid waste and dispose or treat the waste in appropriate manners. The other objectives of the program are 1) Preparation of national policy on Solid Waste management.; 2) Preparation of strategies for solid waste management. 3) Provision of training on effective solid waste management including education and awareness for relevant officers. 4) Provision of necessary facilities for implementation of solid waste management projects and programs. 5) Strengthening the legal framework for solid waste management.

The main activities to accomplish the goals of the program are the followings. 1) Provision of proper waste management facilities for local authorities. 2) Installments of biogas plants for hospitals and other government institutions. 3) Provision of necessary instruments or equipment for local authorities where compost sites are being operated. 4) Provision of compost bins at low cost for local authorities. 5) Conduct education and awareness programs. 6) Awareness program on waste segregation at local authority level.; 7) Project Coordination, Monitoring and Evaluation.

2) National Policy on Waste Management 2019

Ministry of Environment and Wildlife Resources provide specifications for liquid wastes management; general wastes, sewage, Municipal solid waste, Industrial waste, Chemical waste, Leachate and Service Station effluent, Contamination of runoff with petroleum residues, healthcare waste effluent, agrochemicals and other emerging contaminants, Food handling establishments and Kitchen waste (grey water) and Liquid Radioactive waste.

The policy statements for sewage are;

- a. All the generators including households shall be held responsible to manage sewage in consultation with relevant LAs and NWSDB, MOH/PHIs/Ministry of Health as appropriate to prevent health and environmental problems.
- b. Local Authorities and MOH/PHIs/Ministry of Health shall be held responsible to ensure sufficient toilet facilities to the community and prevent contamination of land and water with sewage as non-point sources.
- c. Standards for sewage effluent discharge and waste water management guidelines shall be developed for different sectors by CEA in collaboration with the NWSDB to prevent pollution of water bodies, lands and other sensitive ecosystems causing public health and environmental problems.

- d. Sludge generated from treatment plants shall be finally dispose of in an environmentally sound manner.

Policy statements for Industrial waste, Chemical waste, Leachate and Service Station effluent are;

- a. All the generators shall be held responsible to develop their own management plans and implement in consultation with relevant authorities with annual performance monitoring and reporting mechanisms.
- b. Common waste treatment facilities both onsite or outside shall be encouraged wherever possible while onsite treatment facilities are mandatory when common treatment is not feasible.
- c. Appropriate mechanisms shall be introduced for Chemical tolerable limit management through supplier and supply chain of the hazardous liquid chemical waste

Policy statements for Municipal solid waste are;

- a. A market mechanism shall be developed by the M/PC&LG and M/Environment to promote use of compost produced from municipal waste with proper quality control systems and guidelines in collaboration with the Ministry of Agriculture and other stakeholders
- b. Landfilling shall be limited to non-recyclable, non-compostable and inert material generated through waste treatment processes.

3) National Environmental (protection and quality) Regulation (EPL) (1990)

Gazette Notification Number 595/16 in 1990 and its amendment of Gazette Notification Number 1534/18 in 2008 provide the “General Standards for discharge effluents into inland surface waters”. The EPL is applied for the following projects related to SWM for municipal solid waste and other solid waste composting plants with a capacity of 10 or more metric tons per day.

3.2 Local Level Policy and Plan

3.2.a Sectoral Specific Policy and Plan

3.2.a.1 Cross-Sectoral

1) Kurunegala Town Development Plan 2019 - 2030

Under the Amendment Act No 4 of 1982; (Part II section 8A [1]) the Urban Development Authority has been mandated to prepare Development Plans for the Urban Development Areas, declared by the Minister-in-charge. Kurunegla City recognized as a main economic center in the Eastern – Western economic corridor has locational advantage. There are two highway interchange points and railway expansion projects also going to implement with focusing Kurunegala town. Consequently, the Kurunegala town is going to be developed as a center of Transit Oriented Development.

The goals and objectives below are set to realize the vision of the town development plan.

Goal	Objective
To become a vibrant economic center at east west economic corridor	<ul style="list-style-type: none"> - To develop as the specialized center of the economy by 2030 - Reduce the travelling time to 15 minutes for passing the town center
The most attractive residential population agglomeration in the region	<ul style="list-style-type: none"> - Increased the residential population up to 250,000 in 2030 by enhancing the social and physical services. - To develop sustainable residential zones by 2030, with preserving critical wet lands.
Preservation of ‘character /identity’ of the Kurunegala	<ul style="list-style-type: none"> - Established view corridors for selected places which will be seen the 1/3 of Ethugala by 2030. - Open up the hidden monuments (Rajapihilla Garden, Rajapihilla Rest House, Clock Tower and Ancient Ruins of the Kingdom) to the town center by 2030.

Source: Urban Development Authority, Kurunegala Town Development Plan 2019 – 2030

[Table 5. Goals and Objectives of Kurunegala Town Development Plan]

The plan contains sub-plans in land use, social infrastructure, and economic development areas. Especially in social infrastructure, the plan laid out the strategies to improve the traffic flow and establishing sewerage and solid waste management facilities to accomplish the objectives of each area.

Each proposed strategy in transport and waste sectors with regard to mitigation of GHG is described in [Table 6].

Sector	Strategy
Transport	<ul style="list-style-type: none"> - Development of outer circular road - Construction of Highway - Current railway station land development as Multimodal Transport Hub - Widen the inner regional roads - Construction of flyover in Muththettugala - By providing vehicular parking areas for high dense commercial development, hope to reduce available traffic situations which are occurring due to vehicle parking on either side of the roads. It may lead to efficient functionality of the City.
Wastewater	<ul style="list-style-type: none"> - The construction of sewerage treatment plant in Herealiyavala area and expanding the sewerage network as covers the High Dense Urban Zone and semi urban Zone
Solid Waste	<ul style="list-style-type: none"> - Reduction of the solid waste generation - Separation of the solid waste source - Promotion of composts production using the places, which generate low amount of biodegradable waste. To introduce profitable markets for organic fertilizer (composts) for encourage the community. - Establishment of biogas generation centers in hospitals and government institutions. - Introduction of a program to supply biodegradable food items for pig farms. - Utilization of suitable technical methods for disposal of non-biodegradable (recyclable) solid waste. - Establishment of an institutional structure, to prevention of mixing clinical solid waste (released by hospitals) and municipal solid waste. - Establishment of the efficient system of solid waste collection and transport. - Establishment of sanitary landfilling locations. - Establishment of centers to collect E- waste. - Establishment of monitoring and post-investigation committee.

Source: Urban Development Authority, Kurunegala Town Development Plan 2019 – 2030

[Table 6. Strategies of transport and waste sector in Kurunegala Town Development Plan]

3.2.a.2 Energy Sector

1) GREEN^{SL}® RATING SYSTEM for Built Environment

There is a Green Environmental Rating System applicable to Sri Lanka has been formulated as a ‘home-grown system’ with all norms acceptable to leading rating systems, after conducting research projects and workshops by an Expert Committee appointed by the Green Building Council of Sri Lanka (GBCSL), with the assistance of national and international experts.

2) Pumped Storage Power Plant Development (2028-2032)

Implementation of 3x200MW Pumped Storage Power Plant has been identified in 2028, 2029 and 2032, respectively. This is considered as the energy storage technology and facilitate variable renewable energy (Wind & Solar) absorption by reducing the curtailments of energy generation.

Category	Year		
	2020	2025	2030
Cumulative mini hydro capacity (MW)	419	519	569
Cumulative Wind capacity (MW)	368	638	823
Cumulative Biomass capacity (MW)	49	74	99
Cumulative Solar capacity (MW)	410	730	1,210
Cumulative total ORE capacity (MW)	1,245	1,960	2,700
Annual total ORE Gen (GWh)	3,403	5,193	6,738
ORE Share to total	18.40%	21.20%	21.80%

[Summary of renewable energy additions]

3) Applicability of Smart Metering Technology in Sri Lanka (2020)

PUCSL (Public Utility Commission of Sri Lanka) has conducted an assessment on Applicability of Smart Metering Technology in Sri Lanka (2020). Following functions are expected from the smart meter.

- Real-time registration of electricity import and export
- Allowing changing of tariff in response to price changes
- Ability to change of payment method (Eg. Prepaid or Post-paid)
- Allowing load limiting/shedding for demand response purposes
- Detecting and notifying tamper alerts

- Receiving service messages (Eg. Power cut notifications)
- Power quality monitoring and communications with other intelligent devices in the home

Automatic Meter Reading (AMR) Facility, Outage Detection Ability, Permitting Prepayment Facility, Reducing theft of energy, Financial benefits through efficient use of energy, Encouraging Micro Generation, Promoting TOU(Time of Use) Tariff, Supporting to reduce the demand growth through DSM and Reducing Carbon foot print are anticipated Benefits from Development of Smart Metering Technology in Sri Lanka.

Utility-Driven Demand Side Management (DSM) Regulations No. of 2016 is also available for specific regulation for Green Home technology.

3.2.a.3 Transport Sector

1) KMC Level By-laws for Transport Sector

- By-law on Maintenance, Regularization, Supervision and Control of Parking of Vehicles and Traffic Control within the area of Authority of Municipal Council, Kurunegala
- By-law on Prevention, Regularize and Control of Damages to Thoroughfares and Obstructions to Road Transport within the area of authority of Municipal Council of Kurunegala

3.2.a.4 Waste Sector

1) Basic legal provisions relating to collection and disposal of solid waste

In Sri Lanka, local authorities are primarily responsible for collection and disposal of solid waste in their areas of administration. Therefore, basic legal provisions relating to collection and disposal of solid waste are established by the Municipal Councils Ordinance (No. 16 of 1947), Urban Councils Ordinance (No. 61 of 1939) and Pradeshiya Sabhas Act (No. 15 of 1987).

Relevant laws and regulations are fully established both by the central and provincial authorities as listed below:

- The National Environment Act
- Provincial Councils Act
- Local Government Ordinances

- Hazardous Waste Regulations

The National Environmental Act No 47 of 1980 (NEA) is an act to protect and manage the environment in Sri Lanka. Under the provisions of Section 23Z of the NEA the EIA (Environmental Impact Assessment) applies only to "Prescribed Projects" which have been specified in Gazette Extraordinary No 772/22 of 24.06.1993 and implemented through designated Project Approving Agencies (PAA).

The National Environmental Act has identified two types of approval procedures in the EIA process based on the magnitude and significance of environmental impacts. The type I – i.e. the Initial Environmental Examination (IEE) is a report where comparatively less significant impacts are considered and the second type is the Environmental Impact Assessment (EIA) Report which is a more comprehensive document whereby alternatives to the proposed project are considered and the option with the least impact on the environment identified and assessed. Mitigation measures for the impacts identified as significant are part of an EIA report. An environmental cost benefit analysis is also undertaken wherever possible.

According to the section 23A (2) of the National Environmental Act, no person shall carry on any Prescribed activity except-

- (a) Under the authority of a license issued by the Authority; and
- (b) In accordance with such standards and other criteria as may be prescribed under this Act.

In this regard necessary standards are specified in the Section 23 C of the NEA and the relevant regulations. The environmental standards are already gazetted in respect of:

- Water Quality
- Atmospheric Emissions; (Ambient air quality standards and stationery sources)
- Noise

By the 13th amendment to the constitution of the GOSL, a relevant law came into effect in 1987 by which, the authority for waste management was transferred from the central government to provincial administrations, and the 42nd Law of 1987 stipulates provincial responsibility for waste management. Clause 12 of the NEA allows the CEA to give necessary instructions and guidelines to provincial authorities. In provinces, the responsibility for waste control and management was included in the

ordinance pursuant to the 15th law (1987). It also empowers provincial authorities to enact regulations regarding industrial waste and punitive measures against violators.

2) Technical Guidelines on Solid Waste Management in Sri Lanka

The set of guidelines is aimed to cover only the municipal solid wastes. Various components of Solid Waste Management such as waste collection, waste transfer, recovery of useful components of solid wastes, waste incineration, composting, bio gas generation and land filling are covered in this guideline giving a technical guidance to do these operations with minimal impacts to the environment. A guidance has been given at the beginning on general requirements, legal requirements and operational requirements which are common to all components of solid waste management. The guidelines incorporate design considerations for aerobic composting process and specifications for compost from Municipal Solid Waste and Agricultural Waste.

3) Sri Lanka Standard 1246:2003 – Specifications for Compost from Municipal Solid Waste and Agricultural waste

This specification prescribes the requirements for compost from municipal solid waste and agricultural waste. This is intended to promote the conversion of plant/animal or biodegradable municipal solid waste/agricultural waste into compost which minimizes environmental pollution. Compost shall not contain any materials hazardous to plant, animal and human health. It provides plant nutrients and enhance physical, chemical and biological characteristics of the soil.

4) KMC Level By-laws for Waste Sector

- By-law on Maintenance, Regularization, Supervision and control of Eating Houses, Restaurants and Tea or Coffee Shops within the Area of Authority of Municipal Council, Kurunegala
- By-law on Maintenance, Regularization, Supervision and control of lodging houses within the area of Authority of Municipal Council Kurunegala
- By-laws on Maintenance, Regularization, Supervision and Control of Hotels within the area of Authority of Municipal Council, Kurunegala

5) KMC Level Sub Statute for Waste Sector

- Sub statute on removing, regularizing and controlling of garbage

4. GHG Emissions of the City

4.1 Scope of Data Gathering

In order to gather the valid data for calculating the baseline GHG emissions of Kurunegala City, it is necessary to gather the data by the criteria of period, geological boundary and sectoral boundary below.

4.1.a Data Gathering Period

At least, the data for recent one year is required to carry out a quantitative analysis. Although series of annual data is admirable, if there are not sufficient data or uncollected data for calculating the GHG emissions of the City, the data and information in ‘Kurunegala GHG emission Inventory Report, 2016-2017’ will be applied to calculate and analyze the GHG emissions of the City.

4.1.b Geological Boundary

Kurunegala City is located at the center of Kurunegala District. The scope of data gathering is limited within the administrative area of Kurunegala City. Even though the activities take place out of City boundary, if it is related to governing of the City, the outcomes of the activities should be included in the consideration of an analysis.

However, the boundary of the transport sector has a different scope of the geological boundary, since the GHG emissions in transport sector come from the fossil fuel consumption by all vehicles have fueled in the gas stations within the City. Therefore, geological boundary of transport sector should be widened by the range of roads across the City.

4.1.c Sectoral Boundary

The sectoral boundary of data gathering is predetermined as energy, transport, and waste sectors by following the response plan of CTCN TA.

Each sector is subdivided into subsectors considering the existing inventory established in ‘Kurunegala GHG emission Inventory Report’. Furthermore, the other subsectors can be edited or disregarded through the process of scrutinizing the GHG emission status of the City.

4.1.d Target of Data gathering

The ultimate goal of the data gathering is to calculate the GHG emissions of the City. Generally, GHG emissions are produced in two ways by a distribution of where the GHG comes from. One way is direct GHG emissions derived from the consumption of fossil fuels and the process of waste treatment. Another way is indirect GHG emissions derived from the consumption of electricity. Thereby, the

activity data for energy consumption amounts of fossil fuels and electricity and waste treatment amounts in energy, transport and waste sectors is required. The activity data gathering scope is specified in [Table 7].

Sector	Subsector	Activity data
Stationary Energy	Residential buildings	LPG
		Electricity
	Commercial buildings and facilities	LPG
		Diesel
		Petrol
		Electricity
	Institutional buildings and facilities	LPG
		Diesel
		Petrol
		Electricity
	Manufacturing industries and construction (i.e. industrial sector)	LPG
		Diesel
Electricity		
Energy industries (renewable energy)	Electricity generation	
Transport	On-road	Petrol
		Diesel
	Railways	Diesel
Waste	Disposal of solid waste generated in the City	Solid waste generation
		Waste composition
	Biological treatment of waste generated in the City	Waste amounts treated by biological method
	Incineration and open burning of waste generated in the City	Waste amounts treated by incineration
	Wastewater generated in the City	Population (Num.)
BOD by sewage (mg/L)		

[Table 7. The Data Gathering Scope of Activity Data]

4.2 Methodology for Data Gathering

The overall methodology for data gathering is decided by taking into consideration of whether the data is qualitative or quantitative and whether the means of data gathering are by documents or survey questionnaires. In other words, documents and survey questionnaire are the data source to gather the activity data during the last few years as well as one of the recent years. Likewise, documents and survey questionnaires are the basic data source to comprehend the current state and the features of each emission source of the City.

Data	Source	
	Document	Survey questionnaire
Quantitative Data	Historical GHG emissions of the City	Recent GHG emissions of the City
Qualitative Data	General information of the City	Features of emission source in the City

[Table 8. Data source of GHG emissions and general information of the City]

4.2.a Document Review

By document review, followings are investigated and captured from the different types of reports, national and local level statistics, international guidelines and so on.

- The direction of national and local policy strategies of Sri Lanka in mitigation area
- The level of establishing GHG inventory of Kurunegala City
- General information and features of Kurunegala City
- Energy consumption amounts in energy, transport sectors and waste generation amount data in waste sector
- The features of each GHG emission source

The document list reviewed is presented in [Table 9].

Sector	Document Title	Publisher
National policy	National Action Plan for Haritha Lanka Programme in 2009	Ministry of Environment and Natural Resources

	Sri Lanka's Long Term Generation Expansion Plan, 2018-2037	Ceylon Electricity Board
	National Physical Planning Policy & The plan 2017-2050	National Physical Planning Department
General information	Global Protocol for community scale Greenhouse Gas Emission Inventories	World Resources Institute
	Kurunegala Town Development Plan 2019-2030	Urban Development Authority
GHG emissions	Kurunegala GHG emissions Inventory Report, 2016-2017	Kurunegala Municipal Council
	Sri Lanka's Second National Communication on Climate Change	Ministry of Environment

[Table 9. Document Review List]

4.2.b Survey Questionnaire

Survey questionnaire is carried out to investigate the latest current state of the City and gather the activity data for energy consumption amount, waste generation amount and so on in recent years. The set of survey questionnaires consist of several templates on purpose to investigate the general information of the City and gather the activity data in energy, transport and waste sectors. The survey questionnaires for activity data are classified by energy types and waste types. And the energy types are classified into diesel, gasoline, LPG electricity, etc. and waste types are classified into wastewater and solid waste.

Data gathering issues on general information are described in [Table 10].

Sector	Subsector	Data gathering issue
General information	The features of Kurunegala City	<ul style="list-style-type: none"> - A current state of the City and features of each emission source - Mandate of the municipality - Relevant polices for the City governing
	Energy sector project	<ul style="list-style-type: none"> - Main issues in energy sector of the City - Ongoing or undertaking projects in energy sector - Technical needs in energy sector

	Transport project	<ul style="list-style-type: none"> - Main issues in transport sector of the City - Ongoing or undertaking projects in transport sector - Technical Needs of the City in transport sector
	Waste sector project	<ul style="list-style-type: none"> - Main issues in waste sector of the City - Ongoing or undertaking projects in waste sector - Technical Needs of the City in waste sector
Gender Mainstreaming	Gender issues in Kurunegala City	<ul style="list-style-type: none"> - Level of women's social position in the City - Level of women's education in the City - Level of women's opportunity in the City

[Table 10. Data Gathering Issues in General Information of the City]

Data gathering issues on activity data are described in [Table 11].

Sector	Subsector	Primary Data Gathering Issue
Stationary Energy	Residential buildings	<ul style="list-style-type: none"> - Activity data source - Whether the use of other types of fuel - Prediction of energy consumption in the future
	Commercial buildings and facilities	<ul style="list-style-type: none"> - Activity data source - Identification of facilities using diesel - Identification of facilities using petrol - Whether the use of other types of fuel - Methodology of data gathering
	Institutional buildings and facilities	<ul style="list-style-type: none"> - Identification of facilities using LPG - Identification of facilities using diesel - Identification of facilities using petrol - Whether the use of other types of fuel - Subdivision of institutional facilities
	Manufacturing industries and construction (i.e. industrial sector)	<ul style="list-style-type: none"> - Division of activity data between industrial data and construction sector

	Energy industries + renewable energy	<ul style="list-style-type: none"> - Existence of renewable energy plant in the City boundary
Transport	On-road	<ul style="list-style-type: none"> - The scope of data collection - Transport control system (signal, sign, etc.) - Subdivision of vehicle types - The number of vehicles passing through the City - Existence of electric vehicles
	Railways	<ul style="list-style-type: none"> - Collecting energy consumption of railway transport - Existence of electric vehicles
	Waterborne navigation	<ul style="list-style-type: none"> - Existence of vehicles for waterborne navigation
Waste	Disposal of solid waste generated in the City	<ul style="list-style-type: none"> - The amounts of waste generation and treatment - The City's waste composition - The condition of landfill - Treatment or utilization of landfill gas
	Biological treatment of waste generated in the City	<ul style="list-style-type: none"> - Existence of waste treated by biological way
	Incineration and open burning of waste generated in the City	<ul style="list-style-type: none"> - Existence of waste treated by incineration
	Wastewater generated in the City	<ul style="list-style-type: none"> - The amounts of wastewater generation and treatment - Treatment Methodology of wastewater (aerobic, anaerobic) - Treatment of uncollected or untreated wastewater - Treatment of manure wastewater - Treatment of industrial wastewater - Data for capita protein consumption per annum

[Table 11. Data Gathering Issues in Activity Data]

4.2.c Constraints of Data Gathering

The results of data collection by documents and survey questionnaire become raw materials in order to comprehend current state and analyze the features of the GHG emissions of the City. Accordingly, the degree of accuracy and reliability of the collected data depends on how specific the level that respondents recognize the current state and issues for the City is and how accurate the documents published by institutions are.

The data collected by the questionnaire containing the latest data of the City is preferentially used as the activity data for analysis on priority. If the data collected by the questionnaire is not possible or valid, the activity data from 'Kurunegala GHG emission Inventory Report, 2016-2017' is applied.

However, since the most recent data in the inventory report is collected up to 2017, there may be constraints to reflecting the current features of GHG emissions in Kurunegala City, and it may be incomplete in terms of the completeness of the inventory scope as it is not verifiable.

Especially in the transport sector, the existing Kurunegala inventory report specifies the data collection range as fuel consumption by all vehicles that have fueled in gas stations located within Kurunegala City, so the actual fuel consumption by Kurunegala residents may differ from the amounts of fuel consumption in the inventory report.

4.3 Result of Data gathering

4.3.a Energy Consumption and Waste Generation

The activity data is collected from 'Kurunegala City Inventory Report', which is written by the guideline of 'Global Protocol for Community-Scale GHG Inventories'.

The data gathering period of activity data is specified from 2012-2013 to 2016-2017. Direct GHG emissions by fossil fuel consumption and an indirect GHG emissions by electricity consumption are considered in the analysis.

A GHG emissions analysis is based on the latest data to reflect the features of GHG emissions of Kurunegala City.

Sectors	Energy Source/Activity	Activity Data					
		Unit	2012-13	2013-14	2014-15	2015-16	2016-17
Residential Buildings	Electricity	GWh	8.32	8.41	8.61	9.01	9.28
	LPG	kL	637.00	652.00	674.50	685.60	701.44
Commercial and Institutional Buildings/ Facilities	Electricity	GWh	21.96	22.54	24.18	26.93	34.87
	LPG	kL	300.00	330.00	360.00	380.00	422.41
	Petrol	kL	430.47	401.18	417.20	433.86	451.18
	Diesel	kL	182.40	207.94	237.05	270.23	308.07
Manufacturing Industry and Construction (i.e. Industrial sector)	Electricity	GWh	1.22	1.25	1.31	1.48	2.00
	Diesel	kL	1,203.32	1,344.49	1,502.22	1,768.00	1,975.42
	LPG	kL	50.00	60.00	85.00	100.00	144.83
Waste	Solid Waste to Landfill	ton	16,104.04	16,271.12	16,444.17	16,623.19	16,808.25
	Wastewater Treatment	kL	3,356.77	3,390.69	3,425.87	3,462.31	3,500.00
Transport	Petrol	kL	8,178.84	7,622.47	7,926.81	8,243.29	8,572.41
	Diesel	kL	3,465.60	3,950.78	4,503.89	5,134.44	5,853.26

Source: KMC, Kurunegala GHG Sheet_10.09.2019

[Table 12. Energy consumption and waste generation]

4.3.b Population

The population of Kurunegala City is estimated by the average for calculating population by several prediction methodologies, based on the demographics collected every 10 years from 1971 to 2010.

Year	Arithmetic	Geometric	Incremental Increase	Average Population
2012-2013	37,297	36,926	37,786	37,336
2013-2014	37,644	37,088	38,439	37,724
2014-2015	37,990	37,251	39,133	38,125
2015-2016	38,337	37,415	39,867	38,540
2016-2017	38,684	37,579	40,643	38,969

Source: KMC, Kurunegala GHG Sheet_10.09.2019

[Table 13. Population Projection from 2012-2013 to 2016-2017]

4.3.c Data Validity in Qualitative and Quantitative Aspects

In order to understand the current state and characteristics of GHG emissions of Kurunegala City, the extensive data gathering is required to conduct a complete analysis.

In quantitative aspect, the scope of data gathering as period, sectoral boundary, geological boundary and so on is aligned with the standards to fulfill the GHG emission analysis of the City. Namely, the activity data of energy consumption per annum in energy and transport sectors and waste generations per annum in waste sector is sufficiently collected.

In qualitative aspect, we collected information such as population, climate characteristics, language, and geographical characteristics of Kurunegala City through the materials such as the latest published reports, statistical data, and survey questionnaires that confirm the characteristics of emission sources such as landfills, wastewater treatment facilities, and transport systems.

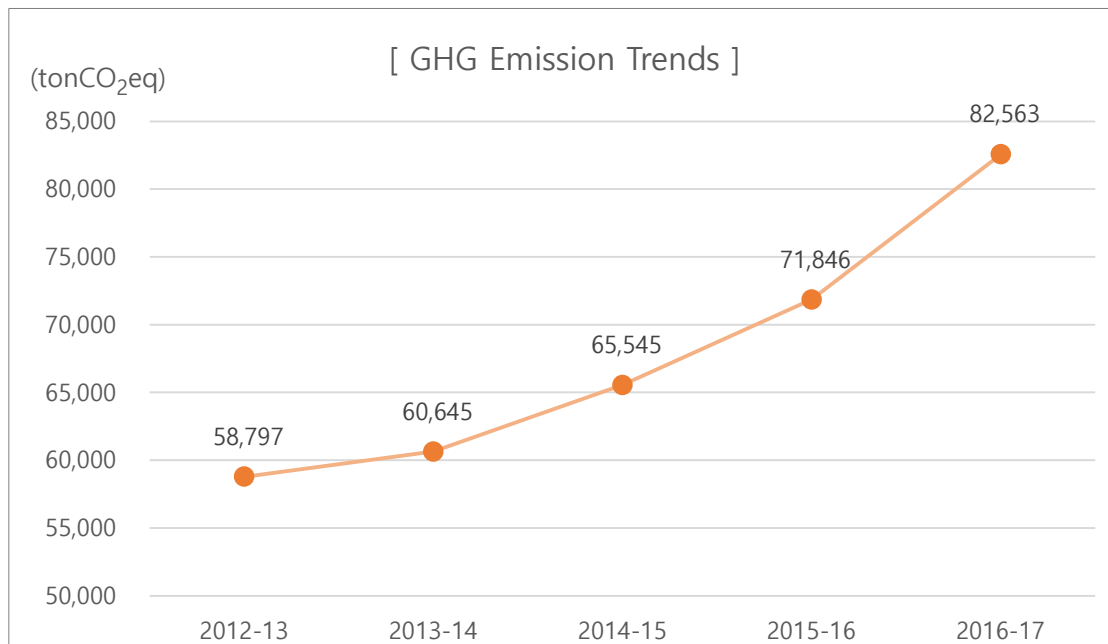
4.4 GHG Emission of the City

4.4.a GHG Emission Trends

The GHG emissions have increased from 58,797tonCO₂eq in 2012-2013 to 82,563tonCO₂eq in 2016-2017. The increase rate between 2013 and 2017 is 40.42%. The GHG emission trends of each year is presented in **[Figure 4]**. Due to the data quality issue stemming from current limitation of travel to the site, this section will be updated once the recent data and information is gathered

Year	2012-13	2013-14	2014-15	2015-16	2016-17
GHG emission (tonCO ₂ eq)	58,797	60,645	65,545	71,846	82,563

[Table 14. GHG Emission Trends of Kurunegala City]



[Figure 4. GHG Emission Trends of Kurunegala City]

4.4.b GHG Emissions of Sector-wise

In [Table 15], the total GHG emissions of the City in 2016-2017 are 82,563tonCO₂eq, stationary energy is the highest emission source, followed by transport sector and waste sector by order.

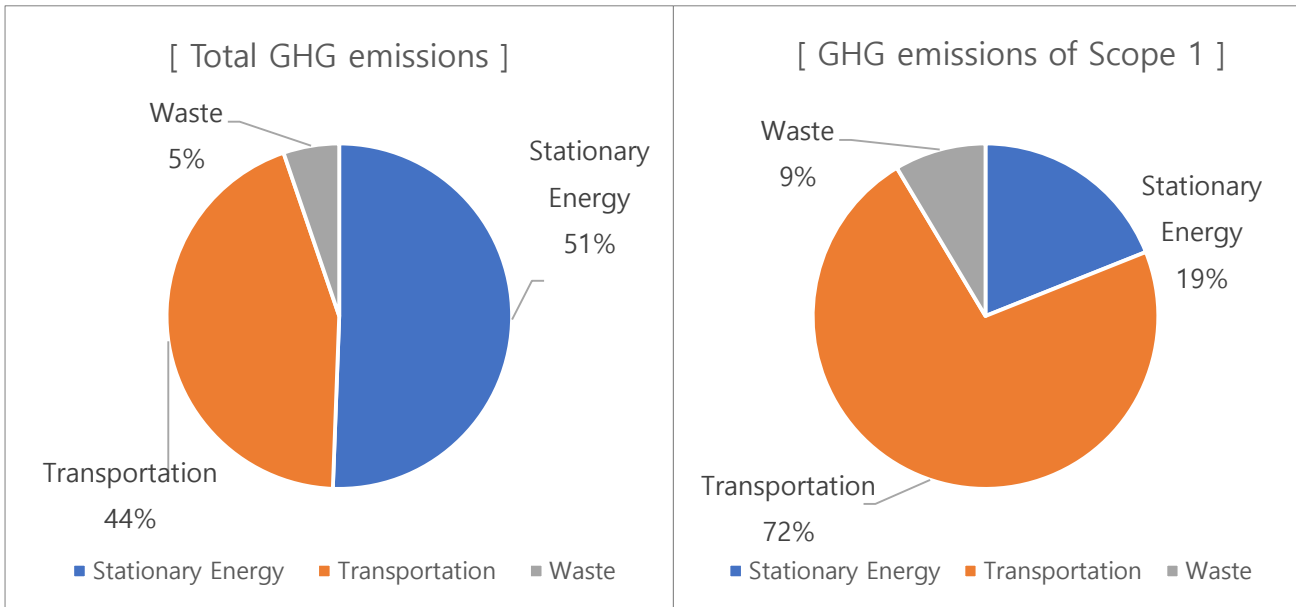
GHG emissions in Scope 1 means direct GHG emissions by fossil fuel consumption or by the process of waste treatment. GHG emissions in Scope 2 means indirect GHG emissions by electricity consumption.

The GHG emissions in Scope 2 by electricity consumption are only produced in stationary energy sector referred as residential, commercial, institutional buildings and facilities and industrial plants or facilities.

Sector	GHG emissions (tonCO ₂ eq)		Total GHG emissions (tonCO ₂ eq)
	Scope 1	Scope 2	
Stationary Energy	9,530	32,244	41,773
Transport	36,480	-	36,480
Waste	4,309	-	4,309
Total			82,563

[Table 15. Emissions of sector-wise in 2016-2017]

In [Figure 5], with consideration of scope 1 and scope 2, the stationary energy is 51% (41,773.35tonCO₂eq) as the largest proportion of total GHG emissions, the second largest source is transport sector of 44% (36,480.25tonCO₂eq) and the waste sector of 5% (4,308.98tonCO₂eq) is the least emission source.



[Figure 5. Total GHG emissions of each sector in 2016-2017] (Left)

[Figure 6. GHG emissions of Scope1 of each sector in 2016-2017] (Right)

In [Figure 6], with considering only Scope 1, the order of emission sources share is changing. The major emission source is the transport sector of 72% (36,480.25tonCO₂eq), and the rest of emissions are the stationary energy sector of 19% (9,529.69tonCO₂eq) and the waste sector of 9% (36,480.25tonCO₂eq).

4.4.c GHG Emissions of Subsector-wise

- Detailed GHG emissions in subsector level

Each sector can be subdivided into subsectors by the criteria of GHG emission sources, and each subsector emits GHG in scope 1 and scope 2.

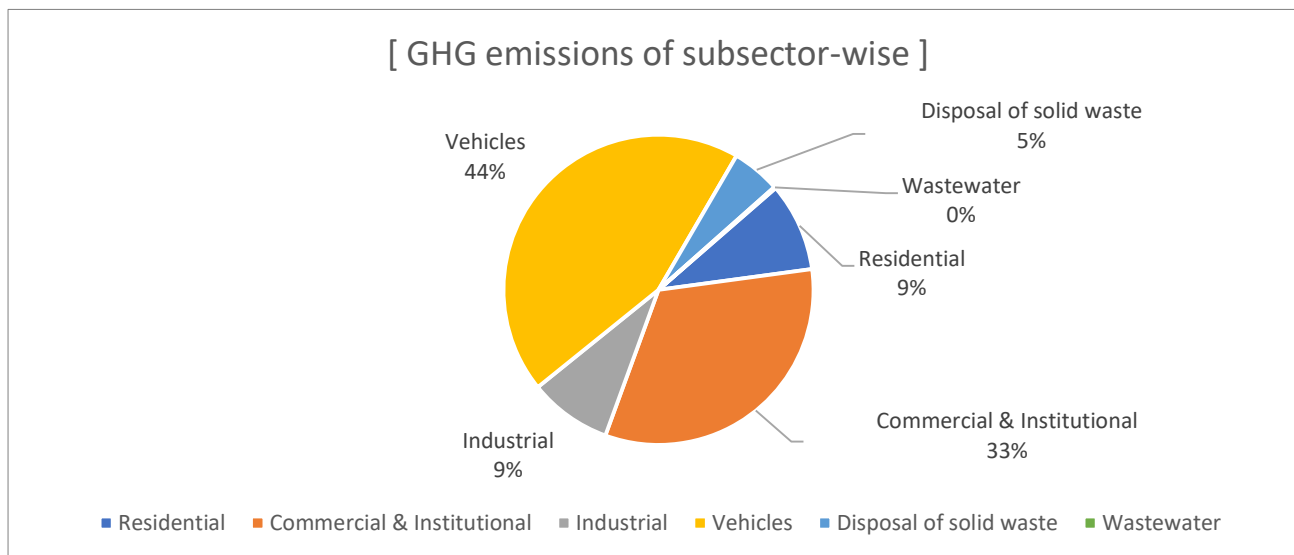
The stationary energy sector distinguished by the purpose of buildings and facilities is classified into residential buildings, commercial & institutional buildings and facilities and Industrial sector. The waste sector distinguished by the method of waste treatment is categorized into subsector of solid

waste disposal and wastewater treatment.

Sector	Subsector	GHG emissions (tonCO ₂ eq)		GHG emissions (tonCO ₂ eq)
		Scope 1	Scope 2	
Stationary Energy	Residential Buildings	1,159.74	6,485.24	7,644.98
	Commercial & Institutional Buildings/Facilities	2,618.42	24,360.38	26,978.80
	Industrial sector	5,751.53	1,398.04	7,149.56
Transport	Vehicles	36,480.25	-	36,480.25
Waste	Disposal of solid waste	4,181.70	-	4,181.70
	Wastewater	127.28	-	127.28
Total				82,562.58

[Table 16. Emissions of subsector-wise in 2016-2017]

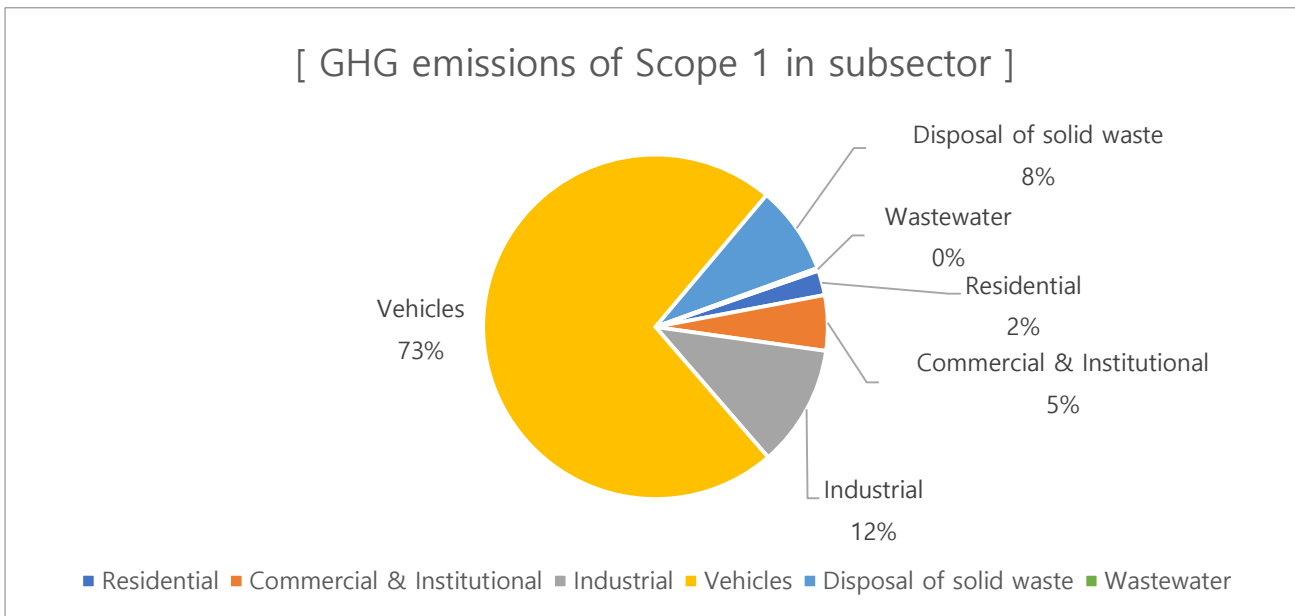
In [Figure 7], as the subsector level, the main emission subsectors are vehicles (44%) as a transport and commercial & institutional buildings and facilities (33%) are following emission source. The other emission sources representing meaningful emission are residential buildings (9%), industrial plants and facilities (9%) and GHG emission from disposal of solid waste (5%).



[Figure 7. Detailed GHG emissions of subsector]

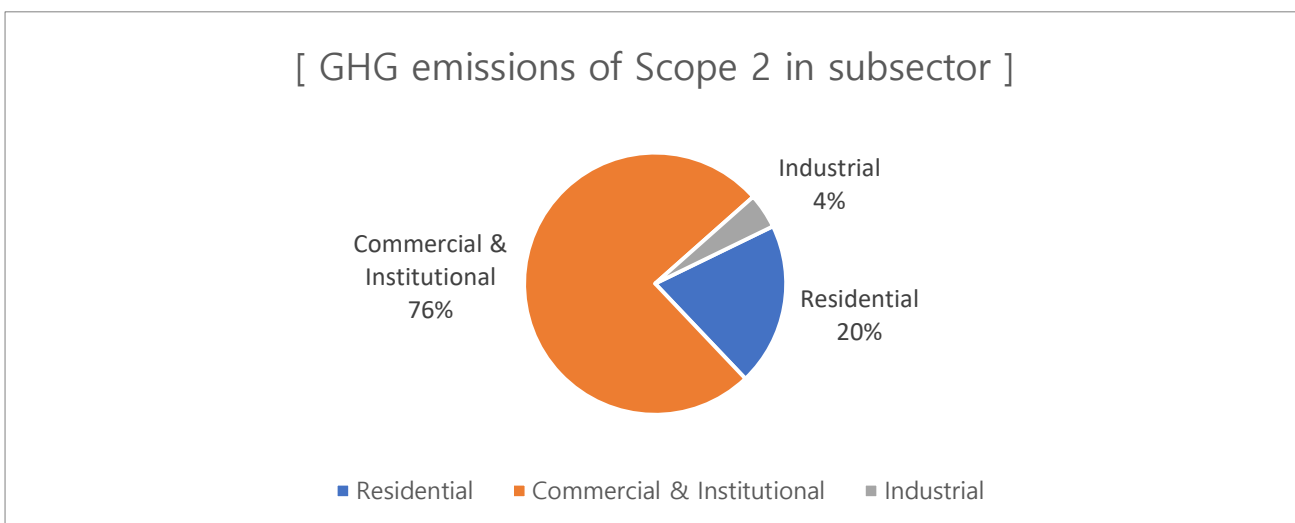
- GHG emissions of each scope in subsector-wise

In **[Figure 8]**, considering only Scope 1 as direct emissions in subsectors, the 90% of GHG emission is produced from transport vehicles, industrial sector and disposal of solid waste. The 90% GHG emissions consist of emissions by transport vehicles (73%), industrial sector (12%) and disposal of solid waste (8%).



[Figure 8. GHG emissions of Scope 1 in subsector]

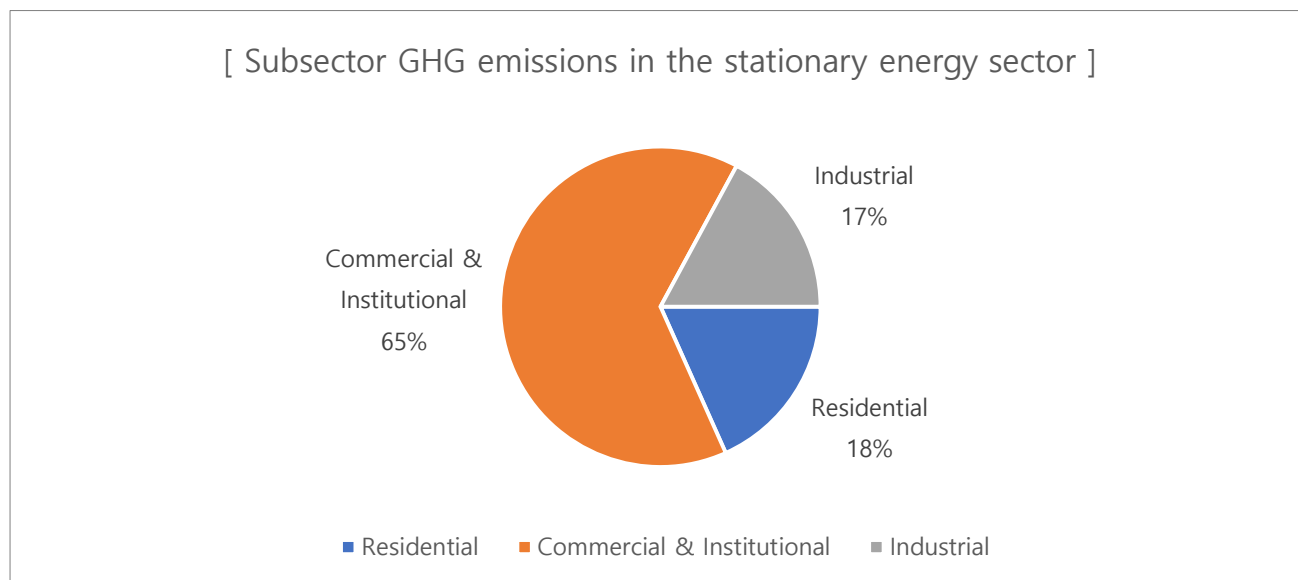
In **[Figure 9]**, the commercial and institutional sector accounts for 76% of GHG emissions, and residential buildings accounts for 20% of the entire amounts in the stationary energy.



[Figure 9. GHG emissions of Scope 2 in subsector]

- Subsector GHG emissions by each sector

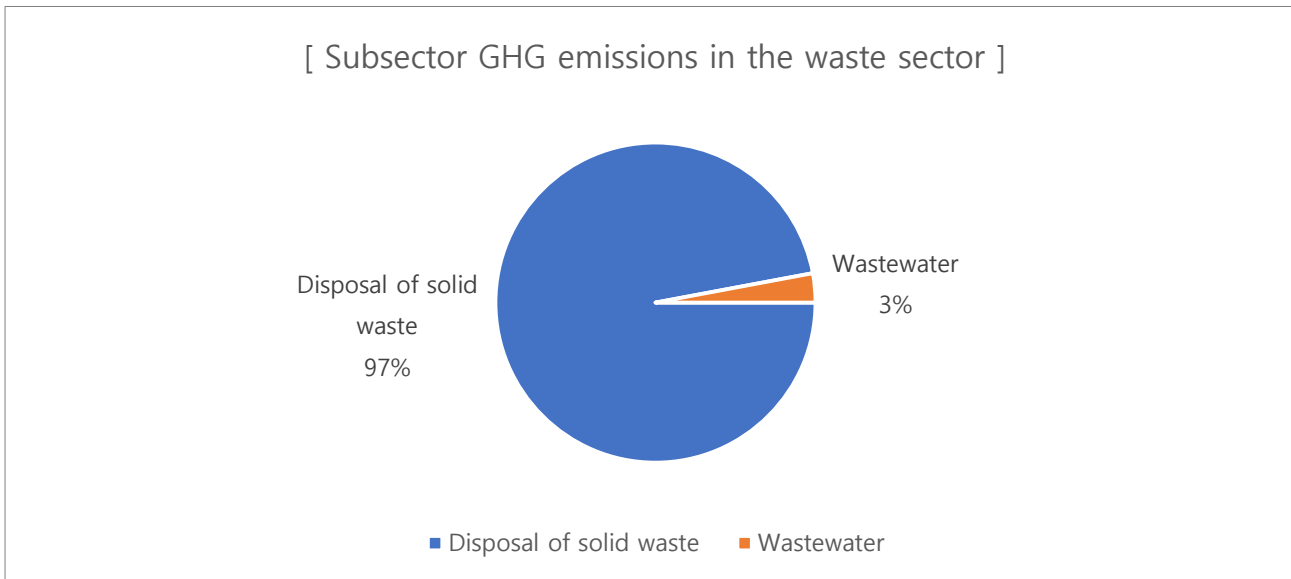
In consideration of GHG emissions from Scope 1 and Scope 2 in the stationary energy sector, GHG emissions of commercial and institutional buildings and facilities are the main emission source (65%), and GHG emissions of residential buildings and industrial sector is 18% and 17% respectively. **[Figure 10]**



[Figure 10. Subsector GHG emissions in the stationary energy sector]

The feature of GHG emissions in waste sector differs from the features of other sectors since the reason of GHG generation is not the consumption of fossil fuel and electricity but the generation of solid waste and wastewater.

The 97% of GHG emissions in waste sector comes from the subsector of disposal of solid waste. Only the 3% of GHG emissions in waste sector is allocated in the treatment of wastewater. **[Figure 11]**



[Figure 11. Subsector GHG emissions in the waste sector]

4.4.d GHG Emissions by Fuel Type

- GHG emissions in division of fossil fuel and electricity

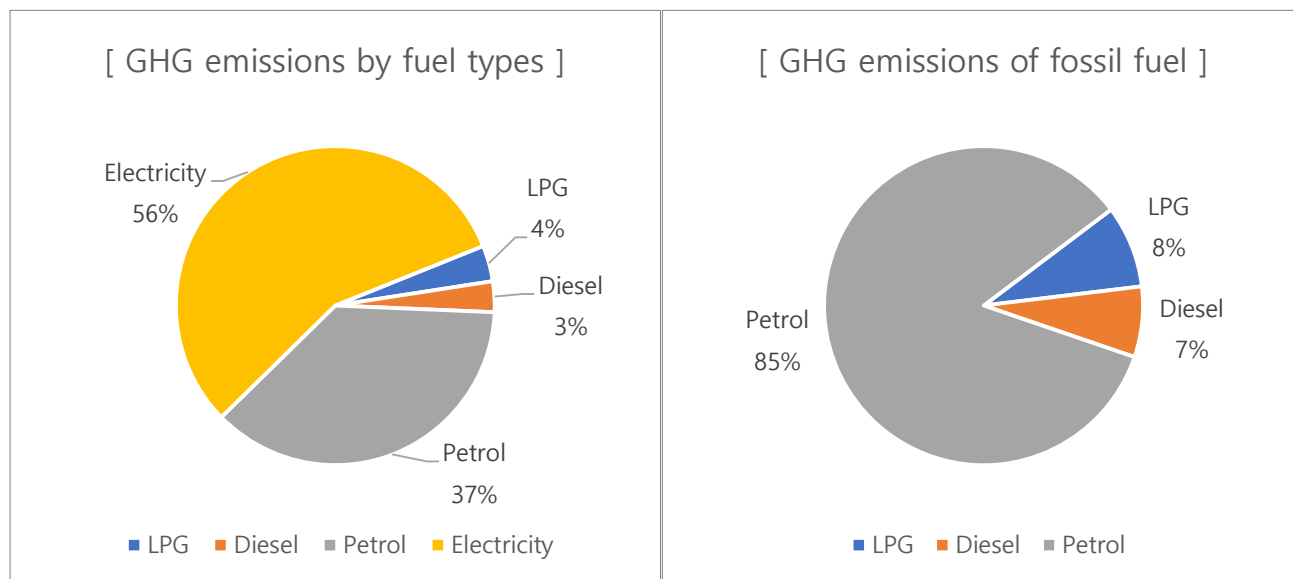
The GHG emissions by consumption of fossil fuels and electricity are calculated through the aggregation of the energy consumption in stationary energy sector and transport sector. The total GHG emissions except the GHG emissions in waste sector is 78,253tonCO₂eq. [Table 17]

Fuel Type	GHG emissions (tonCO ₂ eq)
LPG	2,098
Diesel	22,704
Petrol	21,208
Electricity	32,244
Total	78,254

[Table 17. GHG emissions by fuel type]

In [Table 17 and Figure 12], there are four kinds of fuel type used in Kurunegala City boundary. The GHG emissions by consumption of fossil fuels such as LPG, diesel, petrol account for 44% of the entire GHG emission amounts. The other parts as electricity consumption is 56% in the entire GHG emissions. It means the major GHG emission source in the City boundary is the electricity consumption.

In **[Figure 13]**, the GHG emissions by fossil fuels are produced from the consumption of 85% of petrol, 8% of LPG and 7% of diesel.



[Figure 12. GHG emissions by fuel types] (Left)

[Figure 13. GHG emissions of fossil fuel] (Right)

- Subsector GHG emissions by fuel type

Each fuel type can be classified into the subsectors that emit GHG by the consumption of specific energy. LPG and electricity are used in residential, commercial, institutional, and industrial areas. Diesel is used in commercial, institutional, and industrial areas and by transport vehicles. Petrol is used in commercial, institutional areas and by transport vehicles.

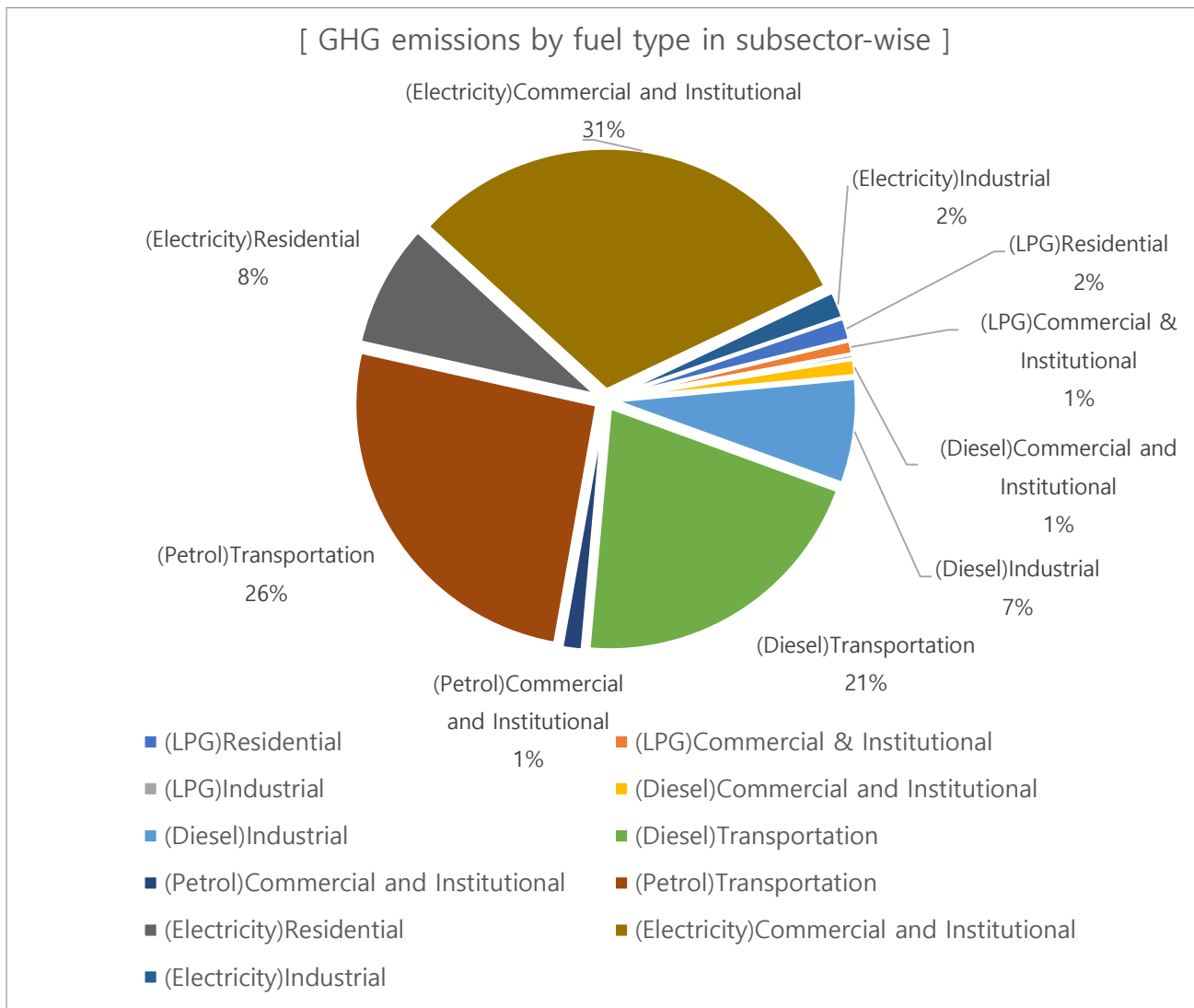
The major subsector emitting GHG emissions in each fuel type is the transport vehicles in diesel and petrol consumption and commercial and Institutional buildings/facilities in electricity consumption. **[Table 18]**

Fuel Type	Subsector	GHG emissions (tonCO ₂ eq)
LPG	Residential buildings	1,160
	Commercial and Institutional buildings/facilities	698
	Industrial sector	239

Diesel	Commercial and Institutional buildings/facilities	860
	Industrial sector	5,512
	Transport vehicles	16,333
Petrol	Commercial and Institutional buildings/facilities	1,060
	Transport vehicles	20,148
Electricity	Residential buildings	6,485
	Commercial and Institutional buildings/facilities	24,360
	Industrial sector	1,398
Total		78,254

[Table 18. GHG emissions by fuel type in subsector-wise]

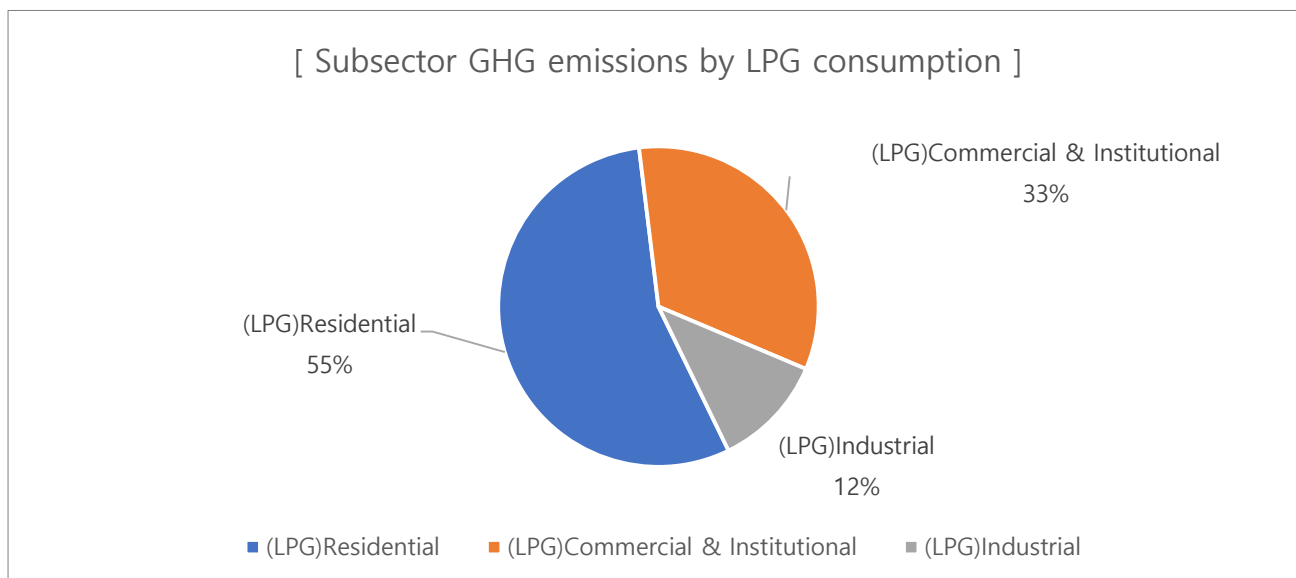
In **[Figure 14]**, the 78% of GHG emissions in classification of fuel types consists of 31% of electricity consumption in commercial and institutional buildings and facilities, 26% of petrol consumption by transport vehicles and 21% of diesel consumption by transport vehicles.



[Figure 14. GHG emissions by fuel type in subsector-wise]

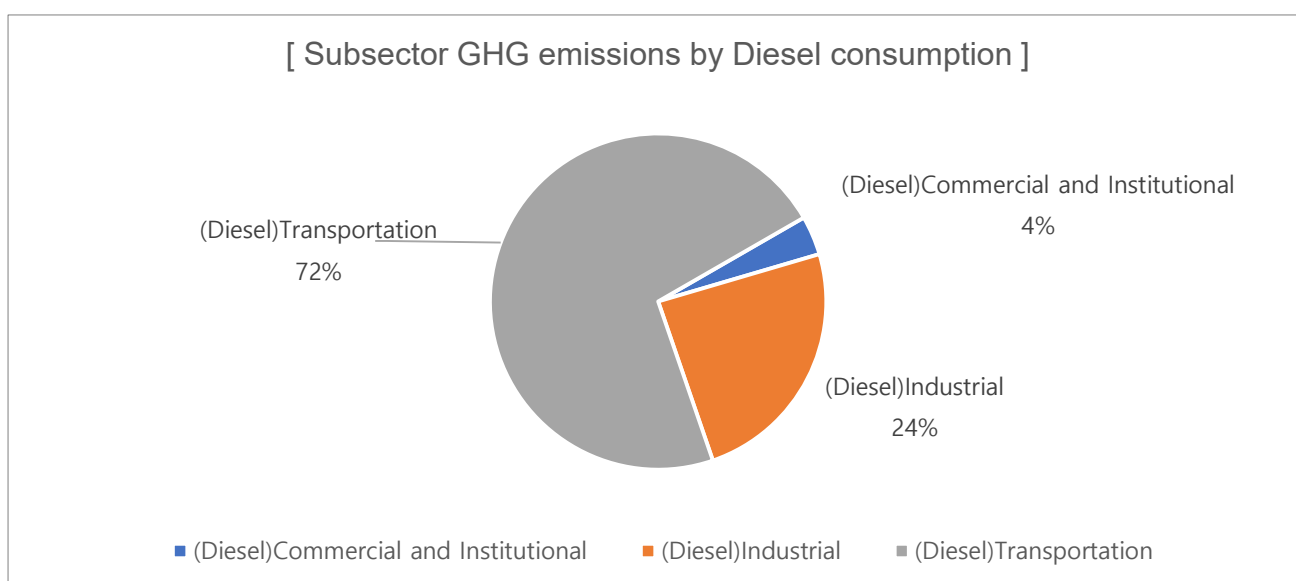
- Subsector GHG emissions in each by fuel type

In [Figure 15], the subsector of residential buildings is the largest GHG emission source (55%). The commercial & institutional buildings and facilities and industrial sector account for 33% and 12% of GHG emissions, respectively.



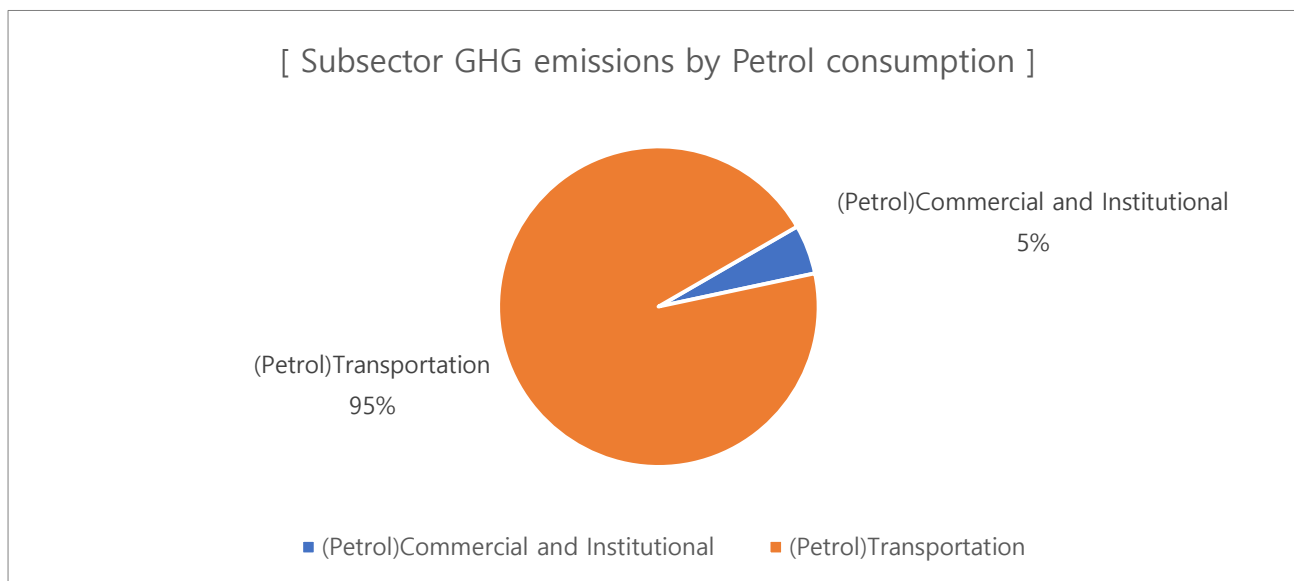
[Figure 15. Subsector GHG emissions by LPG consumption]

In [Figure 16], most of GHG emissions by diesel consumption come from the energy consumption of transport vehicles (72%) and in industrial sector (24%). Only 4% of GHG emissions is produced from the commercial and institutional buildings and facilities.



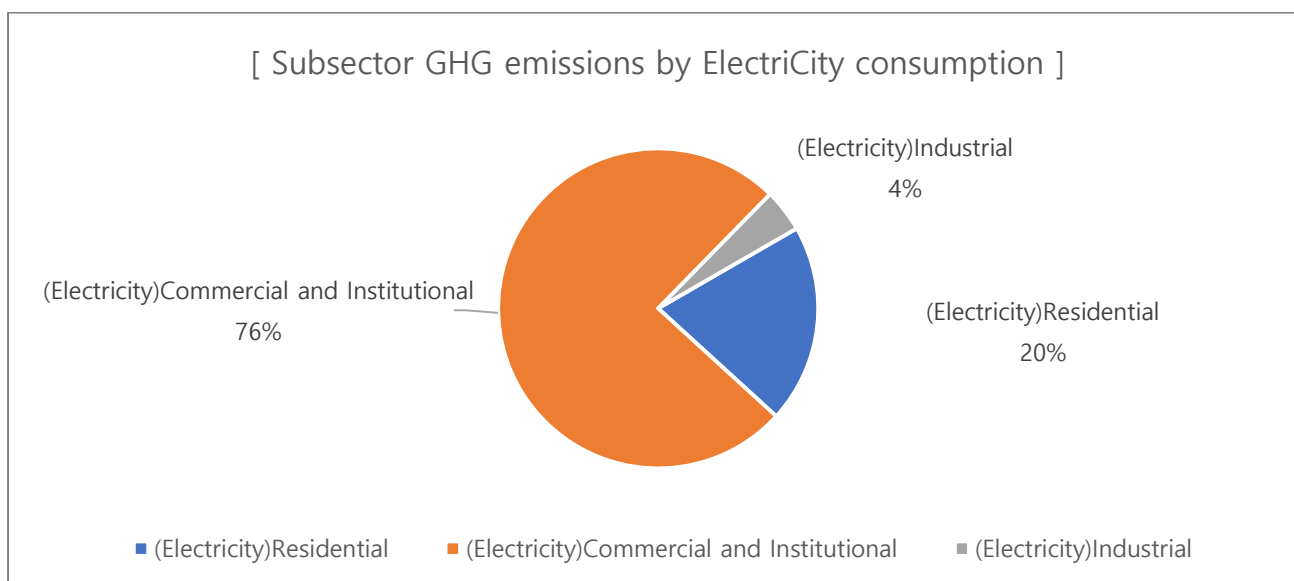
[Figure 16. Subsector GHG emissions by Diesel consumption]

In [Figure 17], the 95% of GHG emissions by petrol consumption come from the energy consumption of transport vehicles. Only the 5% of GHG emissions is produced from the energy consumption in commercial and institutional buildings and facilities.



[Figure 17. Subsector GHG emissions by Petrol consumption]

In [Figure 18], most of GHG emissions by electricity consumption come from the area of commercial and institutional buildings and facilities (76%) and residential buildings (20%). Only 4% of GHG emissions is produced from the energy consumption in industrial sector.



[Figure 18. Subsector GHG emissions by Electricity consumption]

5. Gender Mainstreaming

Based on the results of the technology's prioritization, the project implementer conducted gender equality analysis through a literature review and on-site survey to incorporate the component of gender mainstreaming into the roadmap. The project implementer and gender mainstreaming expert analyzed the legal framework of gender mainstreaming in Sri Lanka. According to the "National Action Plan to Address Sexual and Gender-based Violence (SGBV) 2016–2020," Human Development Report 2014 ranked Sri Lanka as 75th on the Gender Inequality Index (GII). This index indicates the inequality between women and men in empowerment (political participation and education) and labor market participation. Regarding the in-depth situation of labor market participation, in 2014, according to national data, 34.7% of females (15 years old and over) were economically active, and 74.6% of males were economically active. Additionally, regarding unpaid family workers (household members), females represent 20.6% and males 2.9%¹⁵. For the energy sector, "Gender Review of National Energy Policies and Programs in Sri Lanka" prepared by the Asian Development Bank (ADB) in 2015 reported that the national level policy elements provide a framework for achieving the goal but do not indicate how socially equitable development will be supported. The Ministry of Women's Affairs and the Women's Bureau have thus far not made linkages with the energy sector for providing inputs into the energy policymaking process. Regarding integrating gender into the energy sector and that of energy into gender development policy, they are not a priority.¹⁶

However, Sri Lanka has a high level of gender parity in education and the Provincial Statutes, which provide the framework for decentralized planning, and, for example, offers opportunities for gender mainstreaming in the energy sector. Additionally, the Sri Lankan government officially allocates part of the national budget for gender empowerment and elimination of discrimination against women, evidence of which was reported in the results framework of the "United Nations Sustainable Development Framework, Sri Lanka 2018–2022." According to "Open Government Partnership Sri Lanka's 2nd National Action Plan 2019–2021," the government committed to establishing a transparent, answerable process to implement the selected Concluding Observations of the Convention on Elimination of all forms of

¹⁵ "Policy Framework and National Plan for Action to address Sexual and Gender-based Violence (SGBV) in Sri Lanka 2016–2020," Ministry of Women and Child Affairs

¹⁶ "Gender review of national energy policies and programmes in Sri Lanka," ADB Grant-9158 REG, June 2015

Discrimination Against Women (CEDAW) in work plans of related ministries by 2020. The major milestone activities are as follows:

- 1) Ministry of Labour’s “Equal pay for work of equal value” to be mandatory in the informal sector and monitored based on gender-segregated data.
- 2) National level consultation will be held with relevant ministries and civil society organizations on the draft of the National Action Plan on Women-Headed Households in districts where women-headed households are predominant.
- 3) A minimum of one-third representation of women in Parliament will be ensured by extending pressure and lobbying with political parties for the provision of a quota system in parliament through amending election laws¹⁷.

The literature review demonstrated that the status of Sri Lanka has not been gender mainstreamed but that the government was committed to gender mainstreaming in related sectors.

Based on the literature review, the project implementer conducted an on-site survey to identify women’s employment status in stakeholders’ organizations. The survey was conducted with nine organizations in the public sector. The survey separately proceeded in two categories—the organizations’ general human resource management team and the female, manager-level, employees—to analyze the ratio of women employed at the decision-making level and the support from the organization for gender equality.

The survey comprised two categories: Category A for general human resource status, and Category B for female employees to answer regarding the support from the organization for their career.

Results and Reflection

The on-site survey and the literature complementary to each methodology were reviewed. The two most notable results are as follows: the government and stakeholders are in their initial stage of incorporating gender equality into policy, legal provisions, and employment, and gender mainstreaming’s incorporation should be pursued in the context of realizing gender equality as

¹⁷ “Open Government Partnership Sri Lanka National Action Plan 2019–2021”

means for reducing poverty, supporting inclusive growth and other broad development outcomes, and enhancing sustainability.¹⁸

¹⁸ ADB (2011, 2013a); World Bank (2011); Fourth High Level Forum on Aid Effectiveness (2011); Hunt, Nethercott, and Thomas (2010); and Hunt, Lateef, and Thomas (2007).

6. Result of Analysis

6.1 Analysis of existing policies

Sri Lanka has developed policies and plans in order to address Climate Change. It has encompassed both mitigation and adaptation area for Climate Change and been spread in local and national level policies.

In accordance with the ‘Nationally Determined Contributions (NDC) of Sri Lanka in 2016’ and the ‘Sri Lanka Long Term Generation Expansion Plan 2018-2037’, many kinds of renewable energy plants such as wind power plants, solar power plants and biomass power plants are declared to be introduced in the electricity supply plan to reduce the fossil fuel consumption when the electricity is generated. Furthermore, it is also suggested in NDC to convert existing fuel oil -based power plants to LNG power plants. Thereby, the national commitment to mitigate GHG emissions can be mainly actualized by the introduction of renewable energies in the power generation policy.

The policies and strategies for transport sector are stipulated in the National Transport Policy (draft) ‘Nationally Determined Contributions of Sri Lanka in 2016’ and the ‘Nationally Appropriate Mitigation Actions (NAMAs) Design Document for Transport Sector of Sri Lanka’. Primarily, the strategies regarding mitigation area address the introduction of low emission vehicles such as electric and hybrid vehicles, the improvement of public transport modes and the reduction of traffic congestion by establishing highway.

In the policy of the ‘National Solid Waste Management Program in Sri Lanka’2020, the proper disposal of waste and utilization of biogas are accentuated. It includes main activities such as ‘Installments of biogas plants for hospitals and other government institutions’, ‘Provision of waste management facilities’ and ‘Provision of necessary instruments or equipment for local authorities where compost sites are being operated’.

Through this brief search, it is confirmed that the policies and plans in local and national level to reduce GHG emissions has been prepared and organized well.

6.2 Contribution to GHG Emissions

As the analysis result of GHG emissions of Kurunegala City, the stationary energy sector is the highest GHG emission source (51%). The transport sector is the second-highest GHG emission source (44%). The aggregation of the two GHG emission sources amounts to 95% and the gap between GHG

emission sources is the only 6%. In other words, the majority of GHG emissions in Kurunegala City is emitted from the stationary energy sector and the transport sector.

Sector	Total GHG emissions (tonCO ₂ eq)		Contribution Order
Stationary Energy	41,773	51%	1
Transport	36,480	44%	2
Waste	4,309	5%	3
Total	82,453	100%	

[Table 19. Contribution order in the sector level]

When the GHG emissions in scope 1 is only considered, the contribution order changes. The transport sector takes most of GHG emissions (72%). And the stationary sector (19%) and waste sector (9%) follow by order.

Sector	GHG emissions (tonCO ₂ eq)			Contribution Order in Scope 1
	Scope 1		Scope 2	
Stationary Energy	9,530	19%	32,244	2
Transport	36,480	72%	-	1
Waste	4,309	9%	-	3
Total	50,209	100%	32,244	

[Table 20. Contribution order in the sector level by scopes]

In subsector level, the top three GHG emissions are produced from the area of transport vehicles (44.2%), Commercial & Institutional Buildings/Facilities (32.7%) and Residential Buildings (9.3%).

Contribution Order	Subsector	GHG emissions (tonCO ₂ eq)	
1	Transport Vehicles	36,480.25	44.2%
2	Commercial & Institutional Buildings/Facilities	26,978.80	32.7%
3	Residential Buildings	7,644.98	9.3%
4	Industrial sector	7,149.56	8.7%
5	Disposal of solid waste	4,181.70	5.1%

6	Wastewater	127.28	0.2%
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[Table 21. Contribution order in the subsector level]

In subsector level, the top three GHG emissions in Scope 1 are produced from the area of transport vehicles (72.5%), Industrial sector (11.4%) and Disposal of solid waste (8.3%).

Contribution Order	Subsector	GHG emissions in Scope 1 (tonCO ₂ eq)	
1	Transport Vehicles	36,480.25	72.5%
2	Industrial sector	5,751.53	11.4%
3	Disposal of solid waste	4,181.70	8.3%
4	Commercial & Institutional Buildings/Facilities	2,618.42	5.2%
5	Residential Buildings	1,159.74	2.3%
6	Wastewater	127.28	0.3%

[Table 22. Contribution order by fossil fuel consumption in the subsector level]

Following by contribution orders above [Tables from 19 to 22], the transport sector is identified as significant GHG emission source. However, since there was constraint of data gathering for energy consumption data in transport sector, referred in [4.2.c], the actual fuel consumption from transport sector may differ from the fuel consumption calculated in the Kurunegala inventory report. In other words, the actual fuels consumed by residents within the City boundary could be much lower than fuel consumption described in Kurunegala inventory report.

6.3 GHG reduction Potentials and Introduction Costs

Ahead of investigating the feasible climate technologies for each energy, transport and waste sector, it is difficult to identify environmentally cost-effective technologies due to constraints of data and information of actual fields. However, the estimation and prediction for GHG reduction potentials with consideration of introduction costs of climate technologies is necessary to identify priority sector among energy, transport and waste sectors. In this circumstance, the climate technologies for energy, transport and waste sectors in ‘Technology Needs Assessment and Technology Action Plans for

Climate Change Mitigation in 2014 (hereinafter TNA Report)’ are referred to in this analysis. In the TNA Report, several technologies are prioritized and selected as introduction strategies in each sector with consideration of many criteria such as costs, environment impacts, social impacts and economic benefits. Therefore, based on the result of assessment for the climate technologies from TNA Report, the most promising and environmentally cost-effective technologies representing each sector are selected as targets of analysis for GHG reduction potentials and estimated introduction costs.

6.3.a Representative Climate Technology

6.3.a.1 Climate Technology in Energy Sector

The first and second technologies by priority in [Table 23] are finally selected as beneficial technologies in the TNA Report.

Among the technologies in [Table 23], the ‘Smart Grid Technology for Wind & Solar integration with Hydro’ selected as the most promising technology is only considered in the analysis of GHG reduction potentials and estimated introduction costs as if it is applied in Kurunegala City.

Priority	Technology	GHG Reduction Potentials (tonCO ₂ eq/year)	Estimated Total Cost (US \$ toe)
1	200MW Smart Grid Technology for Wind & Solar integration with Hydro	299,400	2,153
2	Building Management Systems	9,998	2,844
3	Solar Tracker Cum	66	3,632
4	DC Motor Driven Alternator for Grid Solar PV Systems	133	3,632
5	Bio-methane for Transport	115	3,658
6	High Temperature Gasifier	1,114	4,519
7	Roof Mounted Solar PV for Net Metering	13	9,991
8	Concentrated Solar Thermal Electricity Generation	136,481	9,398
9	Water Pumping to Hydro Reservoir	7	30,996

Source: Ministry of Environment and Renewable Energy, Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation in 2014, p28

[Table 23. Energy Sector Climate Technology]

6.3.a.2 Climate Technology in Transport Sector

The three technologies in [Table 24] are finally selected as beneficial technologies in transport sector in the TNA Report. However, since the first technology by priority can be considered in country level strategy, it is excluded in the analysis of potential GHG reduction amounts and estimated costs.

Among the technologies in [Table 24], the ‘Non-Motorized Transport along with Regularized Public Transport’ selected as the second promising technology is only considered in the analysis of GHG reduction potentials and estimated introduction costs as if it is applied in Kurunegala City.

Priority	Technology	GHG Reduction Potentials (gCO ₂ /passenger/km)	Estimated Total Cost (US \$ million/km)
1	Electrified Railway System	96.5	0.75
2	Non-Motorized Transport along with Regularized Public Transport	103.0	0.17
3	Park and Ride Systems	219.2	0.35

Source: Ministry of Environment and Renewable Energy, Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation in 2014, p55

[Table 24. Transport Sector Climate Technology]

6.3.a.3 Climate Technology in Waste Sector

In the TNA Report, the technology of ‘Conversion of Biomass and Waste to Energy’ is sole alternative in the waste sector. [Table 25]

Priority	Technology	GHG Reduction Potentials (tonCO ₂ eq/year)	Estimated Total Cost (US \$ toe)
1	Conversion of Biomass and Waste to Energy	286,773	133

Source: Ministry of Environment and Renewable Energy, Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation in 2014, p28

[Table 25. Waste Sector Climate Technology]

6.3.b GHG Reduction Potentials and Introduction Costs

The location where the climate technologies are applied, and the scale of the project are assumed to make it simplify the estimation of GHG reduction potentials and introduction costs. Furthermore, the factors such as exchange rate, population circulation within the City boundary and the ratio of population using vehicles in the City, etc. are applied in the calculation. [Table 26]

Factor	Amount	Unit	Source
Distance of the local roads widened and developed	26	km	Kurunegala Town Development Plan, p148
Population circulation within the City boundary	18,120	people/day	Kurunegala Town Development Plan, p41
Ratio of people using vehicles in the City	40	%	TNA Report, p55
GHG mitigation potential of 1MW solar or wind power plant	1,497	tonCO ₂ eq/1MW	TNA Report, p28
Exchange rate	110	Rs./ US \$ 1	TNA Report, p32

[Table 26. Factors applied in the Estimation of GHG Reduction Potentials and estimated cost]

Approximately, the GHG reduction potentials and introduction costs are estimated based on factors in [Table 26]. The most environmentally cost-effective technology is the waste sector technology, ‘Co-firing Biomass with Coal’. The ‘Non-Motorized Transport along with Regularized Public Transport’ and ‘Renewable Energy’ present second and third effectiveness, respectively.

Sector	Technology	GHG Reduction Potentials (tonCO ₂ eq/year)	Total Cost (US \$ million)	Cost / GHG Reductions (US \$ / tonCO ₂ eq)
Energy	200MW of Solar and Wind Power	299,400	218.18	728.73
Transport	Non-Motorized Transport along with Regularized Public Transport	17,739	4.43	249.55
Waste	30MW Co-firing Biomass with Coal	206,000	9.31	45.19

Source: Ministry of Environment and Renewable Energy, Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation in 2014, p32 and p55

[Table 27. GHG Reduction Potentials and estimated cost of Representative Climate Technologies]

7. Conclusion

In terms of studying the related policies with Climate Change in Sri Lanka, the policies and strategies at the national and regional levels for GHG mitigation were researched and scrutinized. The primary strategies for GHG mitigation in each energy, transport and waste sector are as follows. In the energy sector, it is recommended to have the strategy for increasing the capacity of renewable energy generation. In the transport sector, increasing the use of public transportation rather than private vehicles is emphasized. In the waste sector, it suggests strategy for reduction of waste generation amounts and proper treatment and disposal.

With the analysis of contribution of Kurunegala City to GHG emissions in energy, transport and waste sectors, the respective share of GHG emissions in each sector is 51% of the energy sector, 44% of the transport sector, and 5% of the waste sector. If GHG emissions only from fossil fuel consumption are considered, it represents GHG emissions by 19%, 72%, and 9%, in respective sectors. Given that direct GHG emissions are due to the use of fossil fuels, the GHG mitigation potentials in transport sector is anticipated to be high rather than the other sectors.

According to the TNA report, which presents a variety of GHG mitigation technologies in diverse sectors and set the priority of application of these technologies, the technology to convert waste into energy is environmentally cost-effective way to mitigate GHG emissions compared to other technologies' GHG reduction potentials and introduction costs.

In conclusion, since each energy, transport and waste sector represent the possibility of GHG mitigation potentials, a variety of climate technologies for each sector should be investigated and considered in the feasibility study. However, the conclusion of this report is a result in the condition of data constraints, and it could not cover and reach the data in order to analyze the current state and GHG emissions of the City. If the additional data such as other kinds of documents or survey questionnaire is acquired, the analysis will be complemented and draw up more reasonable conclusion.

ANNEX A. SURVEY QUESTIONNAIRE

a. General Information

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

* If you have any questions regarding this survey, please feel free to contact us.

Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to general information.

1. Information for Kurunegala City

1-1. A current state of the City

Q. Can we identify the number of people in each subsector (residential, commercial, institutional, industrial) of stationary energy? (e.g. the number of people working in commercial area, the number of people residential in the City boundary)

Q. How about gender distribution by age of Kurunegala City in recent year?

Q. How about the ratio of working population between man and woman?

Q. How about the ratio of household, commercial, agricultural area, etc.?

Q. What are the climate characteristics of the City in a year (temperature, wind speed, etc.)?

Q. What is the basic data for the population growth rate of the City?

1-2. General information for the transportation sector

Q. When will the plan to build highway begin?

Q. What route of the highway will be developed?

Q. Is there public parking lot in the City boundary?

Q. Is the energy consumption of the institutional transportation included in the on-road sector?

Q. Describe the transportation control systems in the City. (e.g. signal, sign, etc.)

Q. When does the traffic congestion happen frequently? And why?

Q. Can we subdivide the energy consumption of whole fuel of the on-road sector into the energy consumption of private car, public buses and the other vehicles? If it is possible, separate the

energy consumption amounts by each vehicle type.

**Q. Can we measure the number of vehicles passing through the City? (by each vehicle type)
(to predict the volume of traffic in the future)**

1-3. Mandate of the municipal government

Q. What area is the range of mandate of municipal government to develop the City or conduct climate projects in energy, transport and waste sectors?

(e.g. installation of solar energy plant, introduction of electric public buses)

Q. Can the mandate of municipal government be extended to domestic area?

1-4. Related policies

Q. Present the policies related to the City development or affecting to make a sub-policies of the City. (To mention every policy)

(e.g. Urban Development Plan of Kurunegala City, Nationally Determined Contributions of Sri Lanka)

2. Projects undergoing or planned in energy, transportation and waste sectors within the City boundary

2-1. Energy sector project

Q. What is the main issue in energy supply or demand?

Q. Is there any ongoing or undertaking climate project in the City boundary?

Q. Do you consider any preferable climate technologies to be applied to the City in the energy sector?

2-2. Transportation sector project

Q. What is the main issue of traffic flow or traffic control?

Q. Is there any ongoing or undertaking climate project in the City boundary?

Q. Do you consider any preferable climate technologies to be applied to the City in the transportation sector?

2-3. Waste sector project

Q. What is the main issue of disposal or treatment of waste?

Q. Is there any ongoing or undertaking climate project in the City boundary?

Q. Do you consider any preferable climate technologies to be applied to the City in the waste

sector?

b. Diesel

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

* If you have any questions regarding this survey, please feel free to contact us.

Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to Diesel data.

1. Stationary Energy

1-1. Commercial Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 308 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kinds of material is the activity data or source of the amounts of energy consumption based on?

Q. What kind of facilities are using diesel in the commercial sector?

1-2. Institutional Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 308 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kind of facilities are using diesel in the institutional sector?

1-3. Manufacturing Industry and Construction

Q. Please explain what subsectors the energy consumption amounts of 1,975 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. Is energy consumption of construction site considered in this sector?

2. Transportation

2-1. On-road

Q. Please explain what subsectors the energy consumption amounts of 5,853 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

2-2. Railways

Q. Can we define and measure the amounts of energy consumption of railway transportation passing through the City?

2-3. Waterborne navigation

Q. Are there vessels using diesel in the lake or river of the City boundary?

--

3. Energy consumption data

3-1. Update of energy consumption

- Please update diesel consumption amounts in the commercial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update diesel consumption amounts in the institutional sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update diesel consumption amounts in the industrial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update diesel consumption amounts in the on-road sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

3-2. Periodical boundary

Q. Why does the periodical boundary of gathering activity data start from April not January?

If the periodical boundary of the City is not following the one of national inventory, can we gather the activity data as a range from January to December?

c. Petrol

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

* If you have any questions regarding this survey, please feel free to contact us.

Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to Petrol data.

1. Stationary Energy

1-1. Commercial Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 451 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kinds of material is the activity data or source of the amounts of energy consumption based on?

Q. What kind of facilities are using petrol in the commercial sector?

1-2. Institutional Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 451 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kind of facilities are using petrol in the institutional sector?

1-3. Manufacturing Industry and Construction

Q. Is there no facility using petrol in manufacturing industry and construction?

Q. Is energy consumption of construction site considered in this sector?

2. Transportation

2-1. On-road

Q. Please explain what subsectors the energy consumption amounts of 8,572 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

2-2. Waterborne navigation

Q. Are there vessels using petrol in the lake or river of the City boundary?

3. Energy consumption data

3-1. Update of energy consumption

- Please update petrol consumption amounts in the commercial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update petrol consumption amounts in the institutional sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update petrol consumption amounts in the industrial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update petrol consumption amounts in the on-road sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

3-2. Periodical boundary

Q. Why does the periodical boundary of gathering activity data start from April not January?

If the periodical boundary of the City is not following the one of national inventory, can we gather the activity data as a range from January to December?

d. LPG

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

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Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to LPG data.

1. Stationary Energy

1-1. Residential buildings

Q. Please explain what subsectors the energy consumption amounts of 701 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. How is the LPG supply distributed to consumer? (distribution by network or personal purchase)

Q. What kind of material is the activity data or source of the amounts of energy consumption based on?

Q. Is kerosene used in households within the City boundary?

Q. Is biomass used in households within the City boundary?

1-2. Commercial Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 422 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kinds of material is the activity data or source of the amounts of energy consumption based on?

Q. What kind of facilities are using LPG in the commercial sector?

1-3. Institutional Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 422 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kind of facilities are using LPG in the institutional sector?

1-4. Manufacturing Industry and Construction

Q. Please explain what subsectors the energy consumption amounts of 145 kL in 2016-2017 consist of. Explain and specify each energy consumption amounts of each subsector by unit of kL.

Q. What kind of facilities are using LPG in the industrial sector?

Q. Is energy consumption of construction site considered in this sector?

2. Transportation

2-1. On-road

Q. Is there no vehicle using LPG in the on-road sector?

3. Energy consumption data

3-1. Update of energy consumption

- Please update LPG consumption amounts in the residential sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			

Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update LPG consumption amounts in the commercial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update LPG consumption amounts in the institutional sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update LPG consumption amounts in the industrial sector as much as being

gathered, if you can subdivide the sector into subsectors.

(unit : kL)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

3-2. Periodical boundary

Q. Why does the periodical boundary of gathering activity data start from April not January?

If the periodical boundary of the City is not following the one of national inventory, can we gather the activity data as a range from January to December?

--

e. Electricity

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

* If you have any questions regarding this survey, please feel free to contact us.

Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to electricity data.

1. Stationary Energy

Q. What is the total amount of electricity consumption amounts of the City provided by the CEB? Please present the number by unit of MU. (to compare the total electricity consumption amounts of demand-side with one of supply-side)

1-1. Residential buildings

Q. Please explain what subsectors the energy consumption amounts of 9.28 MU in 2016-2017 consists of. Explain and specify each energy consumption amounts of each subsector by unit of MU.

Q. What is the degree of electrification of households? (to estimate GHG emissions in the future)

Q. What kinds of material is the activity data or source of the amounts of energy consumption based on?

1-2. Commercial Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 35 MU in 2016-2017 consists of. Explain and specify each energy consumption amounts of each subsector by unit of MU.

Q. What kinds of material is the activity data or source of the amounts of energy consumption based on?

Q. Does the data boundary of commercial buildings and facilities only consist of government sector (such as Religious Places, Street Lights and Government offices)? Or does it include any other facilities?

1-3. Institutional Buildings/Facilities

Q. Please explain what subsectors the energy consumption amounts of 35 MU in 2016-2017 consists of. Explain and specify each energy consumption amounts of each subsector by unit of MU.

Q. What kind of facilities are included in the institutional sector? Or does it mean government sector?

Q. Can electricity consumption amounts of each institutional facility be subdivided and distinctive into specific amounts for each one?

1-4. Manufacturing Industry and Construction

Q. Please explain what subsectors the energy consumption amounts of 2 MU in 2016-2017 consists of. Explain and specify each energy consumption amounts of each subsector by unit of MU.

Q. Is energy consumption of construction site considered in this sector?

1-5. Energy industries (renewable energy)

Q. Is there any renewable energy plant to supply electricity towards Kurunegala City?

Q. How amounts of electricity are generated from renewable energy?

2. Transportation

2-1. Electric vehicles

Q. Are there any electric vehicles operated in the City boundary? (e.g. public buses, tricycles, passenger ships)

3. Energy consumption data

3-1. Update of energy consumption

- Please update electricity consumption amounts in the residential sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : MU)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update electricity consumption amounts in the commercial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : MU)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update electricity consumption amounts in the institutional sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : MU)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update electricity consumption amounts in the industrial sector as much as being gathered, if you can subdivide the sector into subsectors.

(unit : MU)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- Please update electricity generation from renewable energy for each generation plant as much as being gathered

(unit : MU)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Plant1			
Plant2			
Plant3			
Plant4			
Add if necessary			

- Please update electricity consumption amounts in the transportation sector as much as being gathered, if you can subdivide the sector into subsectors. (e.g. public buses, tricycles, etc.)

(unit : MU)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

3-2. Periodical boundary

Q. Why does the periodical boundary of gathering activity data start from April not January?

If the periodical boundary of the City is not following the one of national inventory, can we gather the activity data as a range from January to December?

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f. Solid Waste

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

* If you have any questions regarding this survey, please feel free to contact us.

Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to Solid Waste data.

1. Disposal of solid waste generated in the City

1-1. Solid waste generation

Q. Please explain how the solid waste generation amounts are calculated as 16,808 ton in 2016-2017. If the data is the result of each amount of regions, explain and specify the amounts of each region by unit of ton.

Q. What kind of material is the activity data or source of the amounts of waste generation based on?

Q. How can we measure the mass of solid waste?

Q. How many landfills are there?

Q. Do not the landfills treating the solid waste of the City accept the solid waste of other cities?

Q. Are there any wastes generated outside the City boundary but disposed in the landfill that has disposed the waste of the City?

Q. Are there any wastes generated inside the City boundary but disposed in other landfill or open dumps disposing other City's wastes?

1-2. Waste composition

Q. Is there data focused on waste composition of Kurunegala City not one of country level?

1-3. Current state of landfill

Q. What is the type of landfill? (managed or unmanaged)

Q. Does the landfill consist of cover material and impermeable layer to block the leachate? Or is the waste dumped in the hole without cover material and impermeable layer to block the leachate?

Q. Whether is the landfill gas gathered or emitted in the air?

Q. If the landfill gas is gathered, is the gas used to generate electricity?

1-4. Disposal by composting

Q. In the table 1 of ‘Kurunegala GHG emission Inventory Report in 2016-2017’, the report mentioned there are disposals by composting. But the specific number of GHG emissions by composting is not revealed in the report. Is the solid waste treated by composting for now?

2. Biological treatment of waste generated in the City

Q. Is there no biological treatment facility in the City boundary?

3. Incineration and open burning of waste generated in the City

Q. Is there no incineration facility in the City boundary?

4. Data update

4-1. Update of solid waste data

- Please update solid waste generation of the City as much as being gathered, if you can subdivide the regions.

(unit : ton)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- **If there are disposals by composting, please identify the solid waste amounts treated by composting by unit of ton. And if there are several facilities, please subdivide treatment amounts of each facility.**

(unit : ton)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

4-2. Periodical boundary

Q. Why does the periodical boundary of gathering activity data start from April not January?

If the periodical boundary of the City is not following the one of national inventory, can we gather the activity data as a range from January to December?

--

g. Wastewater

Survey Questionnaire

First of all, thank you for participating in the survey.

Econetwork selected as an implementer of CTCN Technical Assistance project is conducting a research to mitigate greenhouse gases (hereinafter, GHG) emissions of the Kurunegala City, Sri Lanka in order to meet the challenges of climate change.

The purpose of this survey is to gather the information to analyze the City's GHG inventory already established and collect subdivided data for more detailed study.

Your response will be used as basic data for comprehending the current state and analyzing GHG emissions of the City, and your responses will be kept strictly confidential. Please take a moment to respond. Thank you.

2020. 03.

Econetwork & Kurunegala Municipal Council

* If you have any questions regarding this survey, please feel free to contact us.

Principal Investigator	Yunho Choi	Researcher	Hwansu Kim
E-mail	yhchoi@econetwork.com	E-mail	hskim@econetwork.com

Respondent Information

First name		Last name	
Name of organization		Gender	Male / Female
Position title			
Location of organization			
Office number		Mobile	
E-mail			
Primary responsibility in work	(Which is mainly related to data)		

Questions below are related to wastewater data.

1. Treatment of wastewater in the City

1-1. Identification of activity data

Q. Please explain how the wastewater generation amounts are calculated as 3,500,000 MLD in 2016-2017. If the data is the result of an aggregation of each region's amount, explain and specify the amounts of each region by unit of MLD.

Q. Does the 'Coverage of sewage network services (%)' represent same value from 2012 to 2017? Please explain why.

Q. Does the 'Treatment Capacity (MLD)' represent same value from 2012 to 2017? Please explain why.

Q. Does the 'Inlet BOD (mg/L)' represent same value from 2012 to 2017? Please explain why.

1-2. Current state of wastewater treatment facilities

Q. How many wastewater treatment facilities of the City are there?

Q. Is the wastewater treatment facility treating only the wastewater generated from the City or including the wastewater from the other cities?

1-3. BOD by sewage

Q. What method is applied to treat sewage wastewater of the City?

Q. Why does the BOD of each year present same densities?

Q. Where is the uncollected wastewater going? Discharging it to rivers?

Q. Where is the untreated wastewater going? Discharging it to rivers?

Q. Is the manure wastewater treated in sewer treatment facility?

Q. Is the rainfall wastewater treated in sewer treatment facility?

1-4. COD by industrial wastewater

Q. How is the industrial wastewater treated?

Q. Are there any industrial wastewater treatment facilities? Or is the wastewater treated in sewer treatment facilities?

1-5. Annual per capita protein consumption

Q. Is there data of annual per capita protein consumption?

2. Data update

4-1. Update of wastewater data

- Please update wastewater generation of the City as much as being gathered, if you can subdivide the regions.

(unit : MLD)

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Subsector1			
Subsector2			
Subsector3			
Subsector4			
Add if necessary			

- If there are any updated data below, please identify each value by each unit.

Subsector	April 2017- March 2018	April 2018- March 2019	April 2019- March 2020
Coverage of sewage network services (%)			
Treatment Capacity (MLD)			
Inlet BOD (mg/L)			
Annual per capita protein consumption (kg/person/yr)			

4-2. Periodical boundary

Q. Why does the periodical boundary of gathering activity data start from April not January?

If the periodical boundary of the City is not following the one of national inventory, can we gather the activity data as a range from January to December?

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ANNEX B. GENDER MAINSTREAMING SURVEY SHEET

[General Guideline]

Company/Organization's Workforce Gender Equality in Sri Lanka/Kurunegala	
1. Subject of the Survey	
To grasp women's employment status in stakeholders' organization/company to promote women workforces' participation in further energy, transport, and waste industries	
2. Purpose of the Survey	
The purpose of the survey is to see the possibility of women to actually participate in the future industry with decision making position. To achieve the successful gender mainstreaming incorporation into final roadmap of the low carbon technologies in Kurunegala, we hope women to have equal opportunity for participating in decision making process through quality training. We'd like to observe briefly on the current situation of women's employment rate in stakeholders' organization to use as measure of the baseline for the "decision-making from the women and women's voice in the organization"	
3. General Instruction of the Survey	
Here, the definition of the "Stakeholder" is the organization/company which related to the energy, transport, and waste sectors and decision making organization in these sectors.	
<p>Category A - It is recommended the personnel who is mainly in charge of company regulation, HR, or general management in the organization to input the data based on the officially proven document from organization. Please do not input the data based on one's impression, instinct, or assumption.</p> <p>Category B - Only for WOMEN who actually work as upper-senior management position(in the decision making position) in the company/organization</p>	
4. Basic Information <i>(Please input the information)</i>	
Date :	
Company/Organisation Name :	
Company/Organisation Type :	<input type="checkbox"/> Public <input type="checkbox"/> Private <input type="checkbox"/> Non-profit/NGO
Name(of person category A) :	
Position(of person category A) :	

[Category A. For HR personnel to respond]

Category A. Gender Balance in Leadership and Workforce - <i>For HR related personnel</i>
<p>Q1. Board of Directors or Non-Executive Board <i>(if none exists, the highest level position right under the head of the organization)</i></p> <p>* Note : Board of Directors refers to the group of people who jointly govern the company, establish broad policies, set out strategic objectives, and appoint the CEO. Where the company has a Supervisory Board and a Management Board, this refers to the Supervisory Board.</p>
<p>1-1. How many people compose the Board of Directors? <i>Please write the number of people below</i></p> <p>.....</p>
<p>1-2. How many of these people are women? <i>Please write the number of women below</i></p> <p>.....</p>
<p>1-3. What is the percentage of women on the Board of Directors? <i>Please write the % of women below</i></p> <p>.....</p>
<p>Q2. Executives or Executive Board or C-Suite <i>(if none exists, the 2nd highest position under the head of the organization)</i></p> <p>* Note : Executives refers to the highest level and most influential group of people that oversees the business operations of the company and form the C-suite, company executive committee, or equivalent.</p>
<p>2-1. How many people compose the Executive Board/Executives/C-Suite? <i>Please write the number of people below</i></p> <p>.....</p>
<p>2-2. How many of these people are women? <i>Please write the number of women below</i></p> <p>.....</p>
<p>2-3. What is the percentage of female Executives/members of the C-Suite? <i>Please write the % of women below</i></p> <p>.....</p>
<p>Q3. Senior Management or Managers <i>(not including executives)</i></p> <p>Note : This is the group of senior managers that report to the Executive C-Suite or Executive Committee/Board</p>
<p>3-1. How many people compose Senior Management group? <i>Please write the number of people below</i></p> <p>.....</p>
<p>3-2. How many of these people are women? <i>Please write the number of women below</i></p> <p>.....</p>
<p>3-3. What percentage of the company's Senior Management is composed of women? <i>Please write the % of women below</i></p> <p>.....</p>

Q4. Workforce
(entire employees)

4-1. How many people compose the company's workforce? *Please write the number of people below*

4-2. How many of these people are women? *Please write the number of women below*

4-3. What percentage of the company's workforce is composed of women?
Please write the % of women below

Q5. Organization Policy to Support Women's Maternity/Parental Leave

5-1. Does the organization have policy on maternity/parental leave for women? *Please answer as Yes or No*

If YES, please provide additional information :

a. Does the organization offer paid maternity/parental leave? *Please answer as Yes or No*

b. the number of weeks leave

c. note if this leave is fully paid or partially paid

d. is the primary care leave is available to women only or both men and women?

e. is this leave also available to all your employees?

5-2. Does the organization have policy or any other supportive method to support women's continuous career while they are out of office for maternity/parental leave? *If yes, please mention the policy name and the details below*

Q6. Training and Career

6-1. Does the organization have an Equal Opportunity Policy or equivalent, to ensure non-discrimination against any type of demographic group including women? *If yes, please provide the name of the policy or equivalent*

[Category B. For female workforce in high level position to respond]

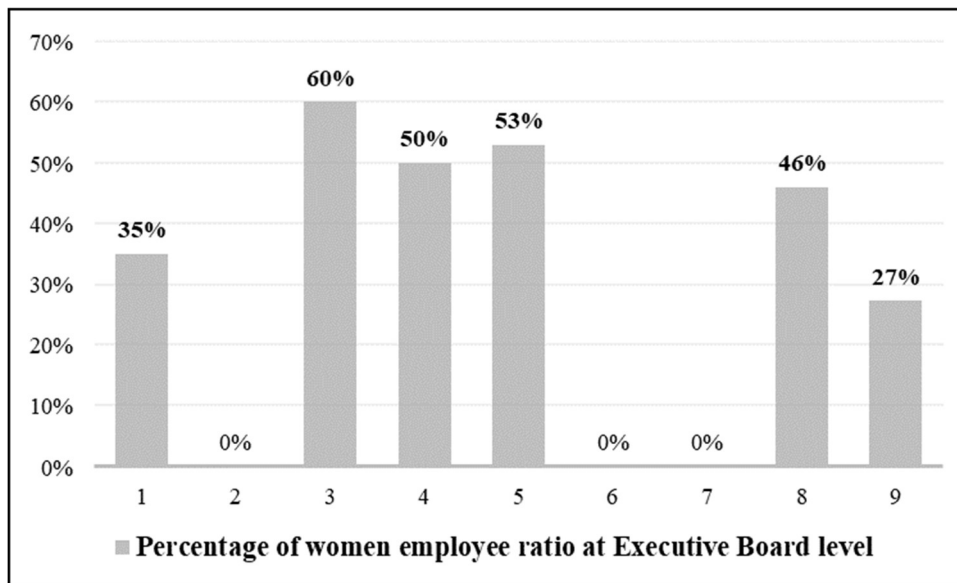
Category B. Equal Opportunity for Women - <i>For WOMEN workforce in high level position</i>
Q7. Women's Pregenancy and Parental Leave
7-1. Does your organization offer the maternity/parental leave? <i>Please answer as Yes or No</i>
If YES, is it easy to get back to work after maternity/parental leave? <i>Please answer as Yes or No with detailed reasons</i>
If NO, please provide additional information :
a. how do you manage your pregnancy and your career after the delivery?
b. are there any helps/support from community, family, or other sources to help you get back to work after the delivery?
Q8. Career Development in the Industry
8-1. Have you ever recognized the necessity of training on your career or tried to achieve the upper career goal for your self-development? <i>Please answer as Yes or No</i>
If YES, what kind of training is in need or your past/current effort to achieve the career goal?
8-2. Are you willing to participate in the future training or project regarding your professional field if the opportunity is provided? <i>Please answer Yes or No</i>
If NO, please describe the reason why you are not willing to participate

ANNEX C. GENDER MAINSTREAMING SURVEY RESULTS

The survey comprised two categories: Category A for general human resource status, and Category B for female employees to answer regarding the support from the organization for their career.

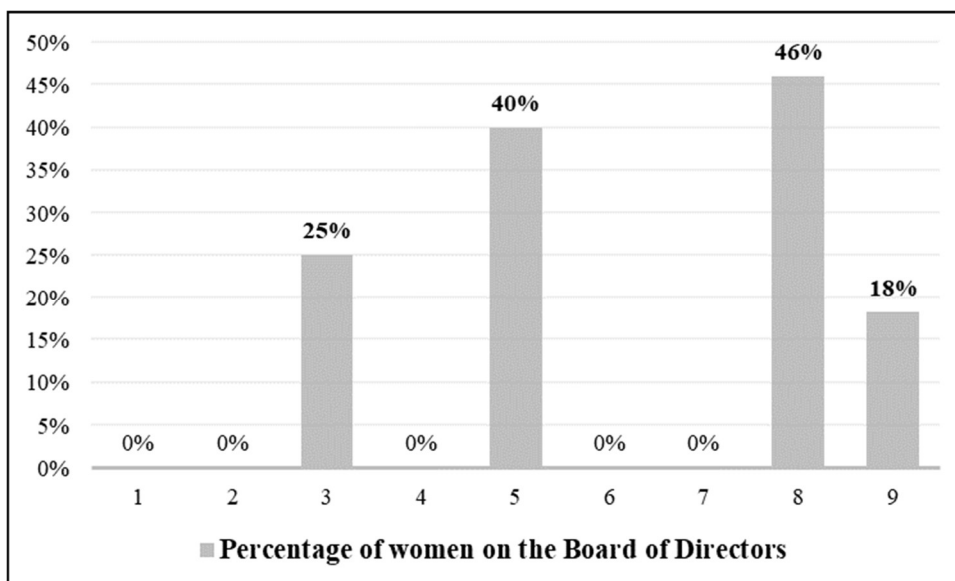
Category A comprises six sections. The results are as follows:

Q1. Percentage of women on the Board of Directors



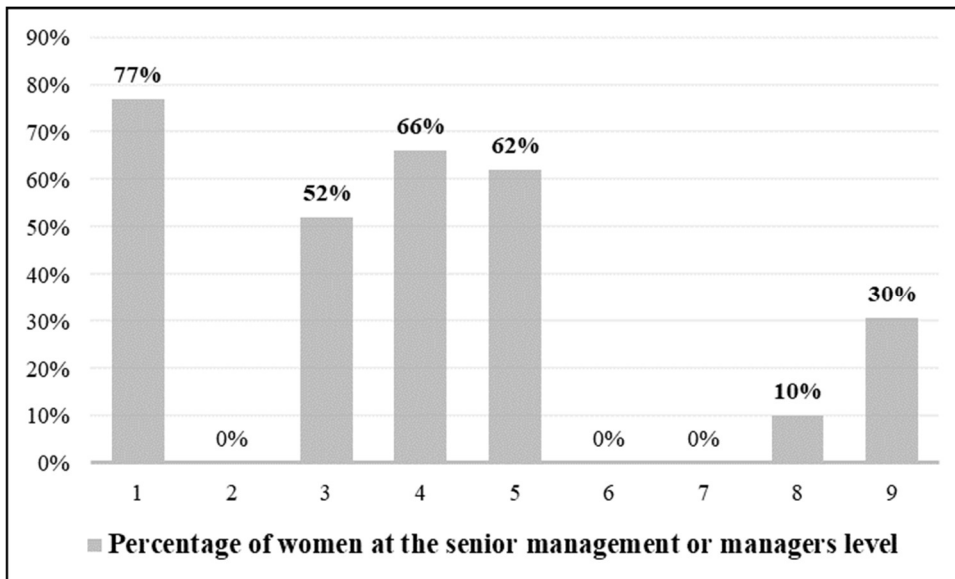
Of the nine organizations, four have women on the Board of Directors. The project implementer is the highest management level in each organization, and the ratio was below 50%.

Q2. Percentage of female employees ratio at the Executive Board level



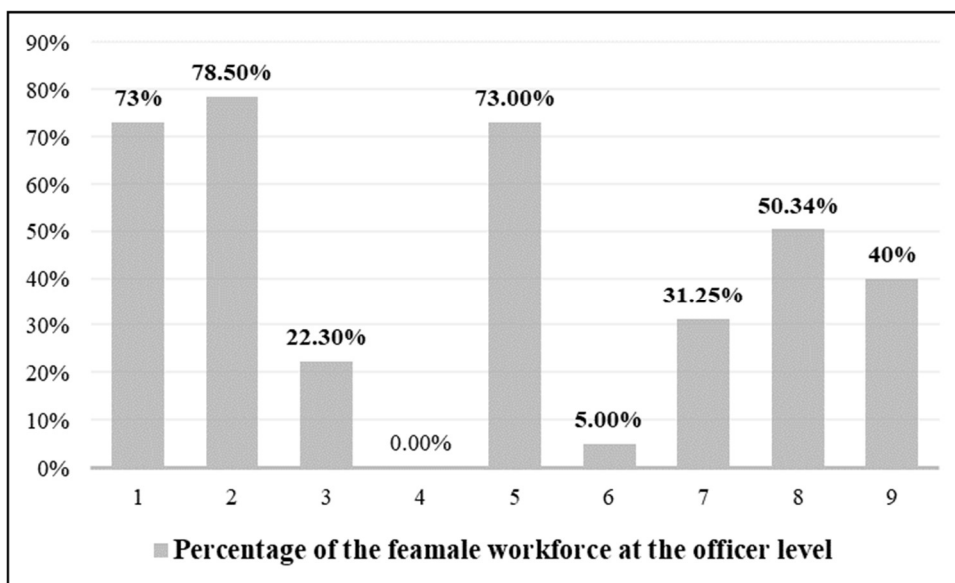
Six organizations have women at the Executive Board level. Organizations 1 and 4 have no female employees on the Board of Directors according to Q1 and have a relatively moderate ratio of women employed at the Executive Board level (35% and 50%, respectively). A higher ratio of women at the Executive Board level than women on the Board of Directors was observed.

Q3. Percentage of women at the senior management or manager level



For the senior management or manager level, six organizations have women at this level. The biggest disparities were between the data, which shows the highest standard deviation.

Q4. Percentage of the female workforce at the officer level



Eight organizations have women at the officer level. Organizations 1, 2, 5, and 8 have more women than men at this level. Organizations 4 and 6 have a lower percentage of women than men at this level.

Q5. Organization policy to support women's maternity or parental leave

According to the survey results, the nine organizations have policy to provide women's paid maternity or parental leave and under the government 4/2005 circular on maternity leave. A female employee is on maternity leave for 36 weeks. The nine organizations have policy to support these female employees' duties: they nominate cover personnel or appoint the other officer to perform the duties.

Eight of the nine organizations provide 12 weeks of fully paid leave, 12 weeks of half leave, and 12 weeks of unpaid leave. The remaining organization provides 17 weeks for fully paid leave, and no data were available for the remaining 19 weeks.

Q6. Organization policy to support equal opportunity for women and men or nondiscrimination against demographic groups including women

Of the nine organizations, six did not provide the data/information on this related policy. Three organizations provided information as follows:

- **(Organization 5)** All application forms for municipal activities are printed in three languages. Maternity and pediatric clinics are being conducted. Female representation in administration committees is 25%.
- **(Organization 8)** Providing 12 hours as a training opportunity for each officer as per government circular 02/2018 on human resource development.
- **(Organization 9)** A general policy in recruitment to government posts is that employment is not based on gender or ethnicity.

Category B was for female employees to respond. The results are as follows:

Q7. Women's pregnancy and maternity leave

The general result of the sub questionnaire on simultaneously managing pregnancy and a career after delivery is as follows: five respondents (55%) answered that it is difficult to manage a career after delivery if help from family or society or sufficient time is not available, and three respondents answered that returning to work after maternity and parental leave is difficult.

Q8. Career Development in the industry

Seventy-seven percent of respondents (7 of 9) recognize the necessity of training for their career or to achieve upper career goals for self-development. Four respondents would prefer to directly receive the job/profession-related training on-site. One respondent answered that she would prefer to have the opportunity for leadership, computer literacy, and language (Tamil and English) training.

Eight of nine respondents said that they are willing to participate in future training or future projects regarding their professional field if the opportunity is provided. One respondent said her participation is limited to long-term distance training because that would not interfere with performing her family duties.