



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

The First Stakeholder Review Workshop Report

“Report on the first stakeholder review workshop process and result”

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

SUMMARY

Kurunegala City, located in the North-Western Province of Sri Lanka, is one of the most intensively developing economic and administrative capitals. The population growth rate of Kurunegala city is approximately 0.4%¹, and the rate is relatively high, considering the residential area. Kurunegala is one of the central cities in Sri Lanka and is connected to main cities such as Colombo, Kandy, Dambulla, Negombo, Anuradhapura and Kegalle. The geographical characteristic of the city and the condition of the road cause severe traffic congestion, and the growing population increases energy consumption and generation of waste. In order to cope with these developing issues, Kurunegala city requested Technical Assistance (TA) to CTCN, which is to develop a roadmap to convert Kurunegala city to climate-smart city by mitigating greenhouse gases in energy, transport, and waste sectors.

In order to conduct the CTCN TA project, this stakeholder meeting was held to provide basic understanding of the project to stakeholders and discuss most feasible climate-smart technologies which could be adopted to Kurunegala city, and gather stakeholders' ideas related to the project. 40 persons (of which 10 were females) participated in the stakeholder meeting representing 26 different government and private sector institutes. The meeting was held on 28th August 2020 at the committee meeting hall, Kurunegala Municipal Council.

The primary outcomes were the discussions on the proposed expansion of the Kurunegala city to an economic and administrative hub, projects in the pipeline and present approaches to minimize GHG emissions. The focus was the need of identifying areas where policy changes would result in the enhancement of low carbon applications at minimum cost. This report provides the key discussions, highlights, contributions, and recommendations from the 1st stakeholder workshop.

¹ Source: JICA Report, KMC Website (<https://www.soslc.lk/en/cities/kurunegala-municipal-council>).

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1. Introduction

1.1 Background of the project

Kurunegala City, located in the North-Western Province of Sri Lanka, is one of the most intensively developing economic and administrative capitals. The population growth rate of Kurunegala city is approximately 4%, and the rate is relatively high, considering the residential area. Since Kurunegala is one of the central cities in Sri Lanka, the main highways pass through the city, and it is connected to main cities such as Colombo, Kandy, Dambulla, Negombo, Anuradhapura and Kegalle.

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 generation of waste.

To cope with these developing issues, Kurunegala Municipal Council together with the Climate Change Secretariat wrote a proposal to the CTCN requesting technical assistances. As a result, Technical Assistance was provided in 2 phases,

- Phase i: Adaptation recommendations for Water scarcity and Heat stress
- Phase ii: Develop a roadmap to convert Kurunegala city to climate smart city with mitigating greenhouse gases in energy, transport, and waste sectors

Phase ii of the Technical Assistance has the aim to:

- I. Analyze current state and baseline GHG emissions of Kurunegala city in energy, transport, and waste, and formulating a GHG inventory for the Kurunegala City.
- II. Identify list of low emission technologies for 3 sectors,
- III. Develop the roadmap including low emission technologies for each sector, and
- IV. Build the capacity of city planners and policy makers to guide them on how to transform Kurunegala city into a low emissions city.

By developing a roadmap, the Technical Assistance will contribute to reduce greenhouse gas emissions and support the transition to a low emission municipality.

Econetwork, which was selected as an implementer of the project, is a Korean environmental consulting company specialized in designing greenhouse gas (hereinafter, GHG) reduction project and conducting a feasibility study of the GHG reduction project. National Cleaner Production Centre, Sri Lanka (NCPCSL) was selected as the local consultancy team to assist the project implementer in gathering data and overcoming language barriers.

1.2 Background of the stakeholder workshop

Four workshops are scheduled to be held under this project, two stakeholder workshops, an institutional framework workshop and capacity building for the last. This first workshop was conducted to discuss the first screened climate mitigation technologies and assess the data availability from the required institutions. The workshop was conducted with the participation of relevant government agencies and stakeholders.

The overall objective of the 1st Workshop was to identify current climate change issues in Kurunegala city and discuss the next step for the CTCN TA. Specific objectives were as follows:

- (a) To facilitate and support the mutual understanding of the CTCN TA project (e.g. relevant activities/method/ expected outcome, etc.);
- (b) To identify GHG data gathering methodology;
- (c) To discuss on the first screened climate technologies in energy, transport, and waste sectors;
- (d) To envisage the need for institutional framework

The workshop was organized by Kurunegala Municipal Council (KMC) together with the National Cleaner Production Centre (NCPC) and Climate Change Secretariat (CCS). The relevant stakeholders and government institution representatives were selected by NCPC and KMC and invitation procedures were carried out by the KMC.

2. Presentations and Discussions

2.1 Opening remarks and Welcome notes

The stakeholders were welcomed by Mr. G.K.D Wikramasuriya, Deputy Commissioner of the Kurunegala Municipal Council. He explained the importance of the project and expressed his continuous support for the project.

The President of the Kurunegala Environment Committee Mr. Ariyasinghe addressed the stakeholders representing the Hon. Mayor, Kurunegala Municipal Council. It was mentioned that the utmost support for the Kurunegala development project can be obtained from the Prime Minister Mahinda Rajapakshe who competed in the General election from the Kurunegala district.



Figure 1: Welcome address by Mr. G.K.D Wikramasuriya, Deputy Commissioner, KMC

Welcome address was followed by a round of self-introductions. Each participant introduced themselves with name, designation, and the institute they were representing.

2.2 Background to the project

Introduction to the project and explanation of the background was explained by Ms. Kumudini Vidyalankara, Deputy Director of Climate Change Secretariat. She thanked the Climate Technology Centre and Network (CTCN) and Econetwork for their support for the project.

The presentation mainly focused on the necessity of the project and the benefits of formulating a baseline for Kurunegala, the importance of transforming a city to be climate smart. She also described, the main characteristic features of a climate-smart city and benefits of implementing those features. She also mentioned that the previous project conducted a year ago with assistance from CTCN, Korean Environment institute and Green Technology Centre, Korea was focused on the adaptation part which was the 1st phase. In that phase, heat stress and water scarcity were identified as the main issues of Kurunegala city. The 2nd phase of the project, which is focused on mitigation, is targeted towards building a GHG inventory related to the energy, transportation, and waste sectors and identifying low carbon technologies. Ms. Vidyalankara stated that such mitigation activities envisaged by the project could contribute towards achieving the Paris Agreement target which is to maintain Global temperature within 2⁰C.



Figure 2: Introduction to the project by Ms. Kumudini Vidyalankara, Deputy Director, CCS

2.3 Project Implementer's Note

A project manager, Mr. Choi Yunho from Econetwork participated to the meeting virtually through the zoom meeting while translation to Sinhala was done by Eng. Ruwan Wijemanne. Mr. Choi presented the project implementation institutional structure, key activities, and project implementation timeline.



Figure 3. Econetwork project manager's speech by Mr. Choi Yunho

2.4 Local Consultant's Note

The next presentation was done by Eng. Samantha Kumarasena, the Chief Executive Officer of the NCPC. Main areas covered in his presentation were, introduction to NCPC, its main task, selection of Kurunegala for this assessment, benefit of GHG baseline assessment before implementing climate-smart technologies, roadmap development using these climate-smart technologies to mitigate GHG emission.



Figure 4: Presentation by CEO of NCPC Eng. Samantha Kumarasena, CEO, NCPCL

During the local consultant's presentation, Mr. Thushara Sanjeeva Vithana, Hon. Mayor of KMC joined the meeting. Deputy Commissioner welcomed the Mayor and invited him to address the gathering. Hon. Mayor expressed his gratitude to the project donor and implementing agencies, he also promised his fullest support to the project. He requested project implementers to check possibilities for expanding project boundaries to cater to suburb and surrounding areas of the municipal council.



Figure 5. Hon. Mayor address the gathering

2.5 Baseline report and Data gaps in Energy, Transport and Waste Sectors

A presentation on data requirement for GHG Inventory and climate mitigation technologies was done by Eng. Ruwan Wijemanne. Detailed explanations on data gathering and calculation process under proposed categories were discussed. Participants were asked to check the availability of data with their institutes for GHG calculations. Feedback was given during the presentation by few stakeholders and few highlights are mentioned below,

- Waste is generated inside the city and collected and sent outside for composting and treatment. Waste treatment plant is located outside the Municipality area.
- Distribution of kerosene and furnace oil within city limits. Illegal pumping of kerosene to lorries and buses were discussed during the presentation.

- Data for wastewater treatment were obtained during the presentation and it was told that city wastewater treatment was conducted in a single plant where 2800 m³ per day of treatment occurs. Total capacity of the plant was given as 4000 m³ per day. 1800 institutions and households were said to be connected to the treatment plant. It is expected that the quantity will be doubled in the near future when most of the households and schools which are still not connected will be connected in the near future. Currently 2 tons of sludge is being collected which will be increased to 4 tons in the near future. Sludge is used as a compost. It has been tested and proved that it does not include heavy metals.
- Railway Department stakeholder mentioned that nearly 360 liters of diesel per day are consumed within the city limit. He also mentioned that a huge amount of litters accumulates at the train station.



Figure 6. Climate mitigation technology explanation

2.6 1st Screened Climate Mitigation Technologies in Energy, Transport and Waste Sector

1st Screened Climate Mitigation Technologies were introduced to stakeholders by Eng. Ruwan Wijemanne. Further, it was mentioned that Econetwork proposed 100 technologies out of which after an analysis 20 feasible technologies were shortlisted. The stakeholders were invited to comment on the technologies according to the application of the technologies and its

feasibility/suitability to Kurunegala municipal council under environmental (GHGs emission, and energy consumption), social and economic, factors. The climate technologies under the energy, transport and waste sectors were explained in detail to the audience. A summary of technologies is listed below, and details are annexed.

2.6.1 Energy sector

1. Smart grid with distributed energy resources
2. Green home (High efficiency home appliances, IoT based Smart Home)
3. Rooftop photovoltaic generation system
4. Water heating system by solar energy
5. Cook stove
6. Green building
7. IoT based Smart City
8. Rainwater recycling
9. Photovoltaic generation with CIGS solar cell on the commercial building
10. Light Replacement to LED

2.6.2 Transport sector

1. Electric car (Including large capacity ESS (Energy Storage System))
2. Hybrid electric vehicle
3. Fuel Cell Electric Vehicle
4. Motorized three-wheeler taxi
5. Advanced BRT (Bus Rapid Transit) system
6. Park and ride system
7. Restriction of vehicles idling

2.6.3 Waste sector

1. Electricity generation by incineration of Municipal Solid Waste
2. Internet of Things (IoT) based waste recycling system
3. Electricity and thermal generation by biogas from wastewater treatment

Participants were asked to note their choice for each technology in given feedback sheet which is annexed in this report (Annexed).

2.7 Institutional Framework and Way forward

The introduction of the Institutional Framework and future path of this project was done by Eng. Samantha Kumarasena, Chief Executive Officer of NCPCSL. The vision and mission of the project, and the activities of the project in the future were explained by him.

Furthermore, selection of institutions in this project, selection of representatives from these institutions and integration of this project among institutes were discussed. Data collection need to establish a data sharing mechanism, capacity building, policy making, application of technology feasibility in Kurunegala, and creating the road map were highlighted.

2.8 Discussion

Stakeholders were invited for an open discussion by the Deputy Commissioner, KMC to present their comments. Accordingly, tasks and contributions of all stakeholders were mentioned as below.

- Improper disposal of waste in the station area was mentioned by Mr. J.M.S. Samantha, the Chief Station Master, Department of Railways. Despite the fact that announcements are made at the station, waste is not sorted, and littering occurs. Furthermore, it was discussed that waste disposal practices and disciplines should begin at school level. Mr. Samantha further requested a wider awareness program to be held for commuters.
- Sewerage treatment plant data were provided by Mr. D.M.B.T.B. Dissangala, Engineer of Greater Kurunegala Water Supply & Sewerage Project, as follows; the total capacity of the treatment plant is 4500m³ per day, but present treatment volume is 2800 m³ per day only 1800 (from total 3500) connections are linked to the sewer system including all households, institutions and commercial buildings . Moreover, it was mentioned that 2 tons of sludge is produced currently, and it is estimated to increase to 4 tons in two years with increased number of sewer connections to the system.
- Member of Ministry of Health stated that the KMC is making efforts to minimize waste issues in the city. The E-waste problem in the city was mentioned. One or two collectors

had commenced a program to collect e-waste. However, this program had been abandoned due to high disposal costs for the waste generator. Unavailability of an option for e-waste disposal but only a rule saying “don’t throw waste anywhere” was a key weak point mentioned by him.

- Thereafter, current waste management problems in the city, problems of Sundarapola old waste dumping site needing expansion, waste for energy production were additional points discussed by the President of the Environment Society of the KMC. Currently, a Kawashima machine is in operation at the Sundarapola dump site to process organic wastes as composts. The Senior PHI stated that they had issues with discarded porcelain items. They were trying to use crushers to grind the porcelain to dust and mix it with cement and apply to road ruts. At the moment, when people cut trees on their land, they throw the branches haphazardly around the area. He said that they hope to purchase a wood cutter so that they could collect the branches and logs and cut them into small pieces and sell them as biomass for furnaces.
- Usage of solar power for energy operation in government offices was a recommendation made by Mr. K.J.C.K. Sirisena from Forest Department.
- Mr. D.M.S.K. Dasanayake, Central Environment Authority and Mr. Wasantha Lansaka, agreed to share data from past projects which are relevant to the three sectors.
- Aggregation of projects related to sustainable development in the city was mentioned by Mr. G.A. Kithsiri, of the Divisional Secretariat, Kurunegala consented to provide any required data from Grama Niladharies. He suggested a program for communities to be involved in producing and selling compost, selling bottles; ‘making trash into cash’. The Kurunegala plantation Company stated that they were in the process of planting trees in catchment areas.
- A centralized taxi system for three-wheeled vehicles was recommended since there are three-wheel taxi stands located haphazardly around the city. Development of road lanes categorized for different types of vehicles was suggested. However, this suggestion was questionable due to the narrow roads in the city.; bicycle paths were also recommended; integration of buses and trains with the time table, synchronized traffic lights; provisions need to be made for permission by Urban Development Authority (UDA) for roadside construction, improper second hand market for electric vehicles were key areas discussed

by Ms. B.M.N.P. Bandaranayeka, Road Passenger Transport Authority. It was highlighted that roadside parking, which is a main issue within the Kurunegala city limit, should be solved with the collective help of the KMC. Suggestion was made to designate parking areas and construct multi-story car parks.

- Capacity building of the school children, discipline improvement and awareness programs for school children were mentioned by Mr. K.D. Wickramasinghe, Deputy Commissioner of KMC
- Availability of raw data and the provision of major portion of fuel through the city for long distance travel from “Dhammika” shed were mentioned by, Mr. Anura Edirinayake, Head of CEYPETCO-Kurunegala District. He consented to provide data for the project.
- Officers of the Agriculture Department suggested promoting home gardening and the use of rapid composting systems.
- The Deputy Commissioner also suggested the use of abandoned paddy fields as a means of collecting rainwater and also as a means of cooling for the city.
- Urban Development Plans were discussed by Mr. E.M.P.K. Ekanayaka from the Urban Development Authority. Suggestion of the UDA green building concept to Kurunegala city was mentioned while he requested for any suggestions or comments on developing the concept.
- Promoting ‘Walkability’ was recommended.
- Promoting plantation programs in the city, implementing awareness programs at school level were recommended by all stakeholders while they thanked the Deputy Commissioner for the opportunity of voicing their recommendations and suggestions regarding current issues.
- Most of participants highlighted to have a Project Management Unit (PMU) at KMC to coordinate with all development projects, to monitor and implement and apply selected policy components to KMC regulations.
- The Deputy Commissioner requested the project to study the existing policies at Kurunegala and provide recommendations for amendments and by-laws. He stated that these simple changes will enable them to reduce GHG emissions from the city.



Figure 7. Discussion session

2.9 Closing Remarks

After a very interactive discussion session, the end of the workshop program was reached. The vote of thanks was delivered by Ms. Kumudini Vidyalkara. She thanked the Hon. Mayor of Kurunegala and all other stakeholders who participated in the meeting and tabled their valuable ideas for the success of this project. She requested continuous support from all participants for making sensible climate smart implementations in Kurunegala city.

3. Conclusion

The purpose of this stakeholder workshop was to assess the data availability required for climate mitigation technologies and provide an understanding for the stakeholders regarding the future activities of the project.

The workshop was considered as successful with positive feedback by stakeholders regarding data availability in energy, transport, and waste sectors. Stakeholders expressed their continuous support for this project with their enthusiasm to the sustainable development of the city since Kurunegala city is the hometown for most of the participants.

Annex A. Agenda of the program

AGENDA

1st Stakeholder Consultation Workshop on

Technical assistance for Climate Smart City - Kurunegala



Date: August 28, 2020

Time: 9.00 AM – 1.30 PM

Venue: Conference Room, Kurunegala Municipal Council

Time	Description
08.30 – 09.00 AM	Registration
09.00 – 09.15 AM	Opening Remarks & Welcome Note <i>Mr. GKD Wickramasuriya</i> Deputy Commissioner, Kurunegala Municipal Council
09.15 – 9.30 AM	Background to the project <i>Ms. Nilanthi Kumudini Vidyalankara (Deputy Director)</i> Climate Change Secretariat, Ministry of Environment
09.30 – 09.45 AM	Project Implementer's Note Director Econetwork Inc.
09.45 – 10.00 AM	Local Consultants Note <i>Mr. Samantha Kumarasena</i> <i>Chief Executive officer, National Cleaner production Centre</i>
10.00 – 10.15 AM	Tea Break
10.15 – 11.00 AM	Baseline report and Data gaps (Energy, Transport & Waste) <i>Project Officer, National Cleaner production Centre</i>
11.00 – 11.30 AM	Q & A session
11.30 – 12.30 PM	Selected Climate Mitigation Technologies (Energy, Transport & Waste) <i>Project Officer, National Cleaner Production Centre</i>
12.30 – 12.45 PM	Q & A session
12.45 – 01.00 PM	Way Forward <i>Mr. Samantha Kumarasena</i> <i>Chief Executive officer, National Cleaner Production Centre</i>

01.00 – 01.15 PM	Feedback from participants
01.15 – 01.30 PM	Vote of Thanks Dr. Muthunayake (Project Coordinator) Kurunegala Municipal Council
1.30 PM	End of the Session with Lunch

* * *

Annex B. List of participants

No.	Name	Designation	Institute	Email	Telephone
1	D.M.S.K.Pasanayake	Senior Environment Officer	Central Environment Authority		071 8440477
2	Wasantha Lansakara	Assistant Director (Acting)	Provincial Environment Authority		037 2225236
3	B.M.N.P.Bandaranayake	Technical Officer	Road Department Authority		037 2223228 / 071 4419622
4	E.M.P.K. Ekanayake	Town Planner	Urban Department Authority	morapke@gmail.com	077 3813924
5	P.M.B.T.B Dissanayake	Engineer (Sew)	Greater Kurunegala-Water Supply		071 4461807
6	H.P.A.P.K. Hemachandra	Supdt of Surveys	Survey Department	athulapkh@gmail.com	071 8033473
7	R.P. Sethkumara	Manager Estates	Plantation company	estatedivision1@gmail.com	071 6884084
8	B.M.N.P.Bandaranayake	Technical Officer	Road Passenger Transport Authority		071 4419622
9	Dr.I.P.Wickramasinghe		Ministry of Health	iprageeth7@gmail.com	077 7513487
10	B.G.Aruna	Chief EMV	Department of Motor Traffic	aruwathdin@gmail.com	071 4499645
11	J.M.S. Somarathna	Chief Station Maser	Department of Railway	sum.j.ms@gmail.com	071 7256872
12	Anura Edirinayake	MFA	Ceypetco District head	anura@gmail.com	071 6146336 / 071 4440471
13	T.A.U.K Weerasekara	Deputy Director	Department of Agriculture	weerasekara.ag@gmail.com	071 8041735
14	D.R.W.W. Kaluarachchi	Municipal Engineer	Kurunegala Municipal Council	kaluarachchi1959@gmail.com	076 6392630
15	K.J.C.K Sirisena	Forester	Forest Department	jagathsirisen@gmail.com	071 8215569
16	A.P.Jayaweera	Forest Extention Officer	Forest Office Kurunegala	amajyweera@gmail.com	077 9588008
17	J. Tennakoon	Planner	SUDP	tennakoon1019@gmail.com	071 8055819
18	A.M.S.Liyanage	S.I	Police Station		077 0406048
19	Dr.A.M.N.K. Atapattu	AD/QMV	PDHS Office	atapattunalinda@gmail.com	071 8012488
20	Hasula Wickramasinghe	Prog.Asst (Env)	Climate Change Secretariat	hasulan@gmail.com	071 8293685
21	Kumuduni Vidyalankara	Asst Director	Climate Change Secretariat		
22	Bandula Warnakulasooriya	Disaster Relief Officer	Divisional Secretariat	82eranga@@gmail.com	071 0330252
23	T.M.Dayawathie		Kurunegala Municipal Council		071 8431860
24	P.S.E.B Abeysinghe	Project Cordinator	SESAC	sachithabeysinghe@gmail.com	071 9698582
25	S.R.M.D.S.N. Ariyasinghe	Chief Municipal / Aoc	Kurunegala Municipal Council	acoime@gmail.com	071 9893868

26	A.P.P.Bandu Jayasekara		Kurunegala Municipal Council		
27	K.D.Wickramasinghe	Deputy Commissioner	Kurunegala Municipal Council	wicky70649@gmail.com	070 39222813
28	W.A.G. Upatissa	CPNQ	Kurunegala Municipal Council		071 7984041
29	G.A.Kithsiri	A.D.S	DS Kurunegala	kithsiriga@gmail.com	071 4459091
30	R.M.M. Rusiru	A.D.M	ADU Kurunegala	-	071 8142244
31	A.J.S. De Zoysa	Security Officer	CPSTL	shanthadezoysa625@gmail.com	071 2222735
32	Menaka Sanjeeva Herath	Environment Officer	Kurunegala Municipal Council	mohmeko@sewh.com	071 2707177
33	Thushara Sanjeeva Vitharana	Mayor	Kurunegala Municipal Council	-	
34	R.M.M. Rajapaksha	assistant distribution manager	PSTL/LBD- kurunegala		718142244
35	Samantha Kumarasena	CEO	NCPCSL		
36	Ruwan Wijemanner	SEE	NCPCSL		
37	M.M. Munsif	RECPT	NCPCSL		
38	Nayani Kanchanamala	RECPT	NCPCSL		
39	Thilina	RECPT	NCPCSL		
40	Harith Cooray	RECPT	NCPCSL		

Annex C. Data inquiry sheet

Technical Assistance for the Development of a Climate Smart City in Kurunegala, Sri Lanka



Baseline data Inquiry sheet

Kindly let us know the availability of data (past records) in your organization regarding relevant sectors for the Kurunegala City boundary.

1. Energy Sector

Electricity consumption data

2. Transport Sector

Fuel consumption data (Petrol, diesel, kerosene, LPG)

Vehicle Registration details

Rail transport (no. of trains, fuel consumption)

Electric vehicle charging stations

3. Waste Sector

3.1 Solid wastes (SW)

SW generation

SW collection

Quantity of SW recycled

Quantity of SW composted

SW anaerobically treated

Sewage sludge generation and disposal

Industrial sludge generation and disposal

SW Open burnt



3.2 Wastewater

- Wastewater generation amounts, if any
- Availability of the waste water treatment plants
- Waste water treatment plant capacity, if any
- Volume of treated Wastewater
- Inlet/outlet BOD or COD values

Name:

Organization:

Annex D. List of technologies

<Energy Sector>

1. Smart grid with distributed energy resources

General grid system causes unnecessary fossil fuel consumptions as much as 15% to make the energy supply stable. Smart grid system reduces the use of unnecessary fossil fuels by generating electricity accordingly by checking the demand in real time with the information and communication technologies that connect suppliers and consumers in real time. Smart grid system helps to manage the energy supply and demand, and consume the fossil fuels efficiently.

2. Green home (High efficiency home appliances, IoT based Smart Home)

Smart home with IoT (Internet of Things) technology is a technology that can save energy use by automating or operating home appliances efficiently connected to the network with a personal smartphone.

For example, electric appliances such as light fixtures, air conditioners, and TVs are operated through smart phones, or air conditioner is automatically operated according to the set temperature and humidity. Smart home system will reduce approximately 3% of GHG emissions when it is applied.

3. Rooftop photovoltaic generation system

Photovoltaic generation system on the house roof, the electricity needed for the home is supplied through solar power, and the insufficient electricity is replenished from the power grid. Normally used by electricity consumer when usage than 180 unit Ex: Rooftop Photovoltaic panel

4. Water heating system by solar energy

During the day, solar heat is collected by solar energy collector and it is stored in a water storage tank. The heated water during the day can be used for a whole day in any purpose.

5. Cook stove

Cook stove is usually used to make food. But some cook stove has bad heat conduction. Improved cook stove that has more efficient heat conduction consumes less biomass and thus it emits less CO₂.

6. Green building

1) Green roof

A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane.

The green roof helps the building absorb less heat from solar energy and reduces energy consumptions for cooling. Ex: Plants, Waterproofing membrane

2) Window and exterior wall with high insulation effect on building in new commercial buildings

Reducing heating and cooling energy consumption by using high-performance insulation windows and exterior wall insulation for new commercial building construction.

Ex: High-performance insulation window

Building envelope insulation (exterior wall insulation)

3) High efficiency ventilation system

Ventilation system with high efficiency heat recovery device can recover cool energy in the air to outside and it makes less consumption of energy to cool down the building.

Ex: Ventilation system with high efficiency heat exchanger

7. IoT based Smart City

Data is collected through sensors installed in various locations of the city, and these data are organized as meaningful information and it is informed to users in real time. For example, the illuminance of LED lights is automatically adjusted by the density of a person passing under the lights. The traffic volume information in specific area is analyzed and informed to drivers to avoid

traffic congestion area in real time. Or the empty parking space information is easily accessible for drivers. Smart city system will reduce approximately 15% of GHG emissions when it is applied.

8. Rainwater recycling

Collecting rainwater from a building's roof or from any other surface, and utilizing the water for car washing, gardening, flushing the toilet, etc.

9. Photovoltaic generation with CIGS solar cell on the commercial building

Photovoltaic generation with CIGS (Chemical material of Cu, In, Ga, Se) solar cell can be freely installed on the surface of buildings as it is flexible. And the generation efficiency is more stable and higher than general Silicon solar cell.

10. Light Replacement to LED

1) LED outdoor signboard - Reducing the power consumption by application of LED outdoor signboard

2) Replacement of existing light to high efficiency LED light - Replacement of existing light with high energy efficiency LED light

EX: High efficiency LED light, Usage of LED light for name board

<Transport sector>

1. Electric car (including large capacity ESS (Energy Storage System) in EV charging station)

A private automobile is propelled by one or more electric motors, and uses energy stored in rechargeable batteries. The electric car mitigates GHG emissions by reducing the use of fossil fuels such as gasoline or diesel.

A large-capacity Energy Storage System (ESS) for charging an electric vehicle is installed in an electric charging station, facilitating charge of multiple electric vehicles at the same time. ESS facility saving the electricity generated by renewable energy power plant only in the day time can supply the electricity in night time.

2. Hybrid electric vehicle

Hybrid electric vehicles are powered by an internal combustion engine and an electric motor, which uses energy stored in batteries.

A hybrid electric vehicle cannot be plugged in to charge the battery. Instead, the battery is charged through regenerative braking and by the internal combustion engine.

3. Fuel Cell Electric Vehicle

Like all-electric vehicles, fuel cell electric vehicles (FCEVs) use electricity to power an electric motor. In contrast to other electric vehicles, FCEVs produce electricity using a fuel cell powered by hydrogen, rather than drawing electricity from only a battery.

4. Motorized three-wheeler taxi

Tricycles consume less fuels than private vehicles. GHG emissions of tricycles is a third of private vehicles' GHG emissions.

Ex: Electricity wheeler taxi

5. Advanced BRT (Bus Rapid Transit) system

Bus rapid transit (BRT), also called a bus way or transit way, is a bus-based public transport system designed to improve capacity and reliability relative to a conventional bus system. [2] Typically, a BRT system includes roadways that are dedicated to buses, and gives priority to buses at intersections where buses may interact with other traffic; alongside design features to reduce delays caused by passengers boarding or leaving buses, or purchasing fares. BRT aims to combine the capacity and speed of a metro with the flexibility, lower cost and simplicity of a bus system. Advanced BRT system includes several green technologies such as cycle lanes, a bike sharing system, last-mile connectivity with e-pedicabs and improved pedestrian facilities, bus powered by bio methane.

6. Park and ride system

Park and ride (or incentive parking) facilities are parking lots with public transport connections that allow commuters and other people heading to city centers to leave their vehicles and transfer to a bus, rail system (rapid transit, light rail, or commuter rail), or carpool for the remainder of the journey.

The vehicle is left in the parking lot during the day and retrieved when the owner returns. Park and rides are generally located in the suburbs of metropolitan areas or on the outer edges of large cities.

7. Restriction of vehicles idling

Restriction of vehicles idling, control device of vehicles idling by installing 'Idling Stop & Go'

<Waste sector>

1. Electricity generation by incineration of Municipal Solid Waste

Incineration is one of waste treatment. Waste includes a various kind of organic substances and it becomes a fuel of combustion. Waste incineration produces the energy to generate electricity.

2. Internet of Things (IoT) based waste recycling system

When the user accurately sorts out wastes in the separation bin, data on the status of the waste separation is collected and transmitted through the network.

The compensation rewards for separating waste can be received through the individual smartphone application, and the information of wastes collected in separation bin is transmitted immediately to recycling and up-cycling companies, which can increase the waste recycling.

3. Electricity and thermal generation by biogas from wastewater treatment

If there is an anaerobic digester in wastewater treatment facility, it produces bio-methane. Electricity and thermal energy are generated by combustion of bio-methane.

Annex E. Technology feedback

පාර්ශවකරුවන් දැනුවත් කිරීමේ/ අදහස් ලබා ගැනීමේ පළමු වැඩසටහන
Technical assistance for Climate Smart City – Kurunegala
 කුරුණෑගල දේශගුණ සුහුරු නගරය සඳහා තාක්ෂණික සහය ව්‍යාපෘතිය



Feedback for the proposed technology list
 යෝජිත තාක්ෂණ ලැයිස්තුව සඳහා ප්‍රතිචාර ලබා ගැනීම

No.	Sector (අංශය)	Technology (තාක්ෂණය)	Remarks (අදහස්)
1	Energy (බලශක්ති)	Smart grid with distributed energy resources (බහුවිධ ශක්ති ප්‍රභව සහිත සුහුරු බලශක්ති ජාලය)	
2		Green home (High efficiency home appliances, IoT based Smart Home) (හරිත නිවාස (ඉහළ කාර්යක්ෂමතාවයකින් යුත් ගෘහ උපකරණ, අන්තර්ජාල පදනම් කරගත් සුහුරු නිවාස))	
3		Rooftop photovoltaic generation system (පියැසි සූර්ය පද්ධතිය)	
4		Water heating system by solar energy (සූර්ය ජල තාපන පද්ධතිය)	
5		Cookstove (කායීක්ෂම උඳුන)	
6		Green building (හරිත ගොඩනැගිලි)	
7		IoT based Smart City , (අන්තර්ජාල පදනම් කරගත් සුහුරු නගර)	
8		Rainwater recycling (වැසි ජලය ප්‍රතිචක්‍රීකරණය)	
9		Photovoltaic generataion with CIGS solar cell on the commercial building (බිත්ති මත සවි කල හැකි කාබන් පදනම් වූ සූර්ය පද්ධති)	

10		Light Replacement to LED (fluorescent light/ incandescent light/street light) (කාඩ්කේම් LED විදුලි ලාම්පු වෙත මාරු වීම)	
11	ගමනාගමනය	Electric car(Including large capacity ESS(Energy Storage System)) (විදුලි කාර් (විශාල ධාරිතාවකින් යුත් ESS (බලශක්ති ගබඩා පද්ධතිය))	
12		HEV(Hybrid electric vehicle) taxi (දෙමුහුන් විදුලි කුලී රථ)	
13		FCEV(Fuel Cell Electric Vehicle) ඉන්ධන කෝෂ වලින් ක්‍රියාත්මක වන විදුලි රථ	
14		Motorised three-wheeler taxi (විදුලි ත්‍රිරෝද රථ)	
15		Advanced BRT(Bus Rapid Transit) system අධිතාක්ෂණ පොදු මගී පදිංචි	
16		Park and ride system පුද්ගලික රථ ගාල් කර පොදු ප්‍රවාහනය මාධ්‍ය භාවිතය	
17		Idling restriction (bus/private car) රථය ධ්වනිය නොවන අවස්ථා වල එංජිම ස්වයංක්‍රීයව නතර කිරීම	
18	අපද්‍රව්‍ය	Electricity generation by incineration of Municipal Solid Waste (නාගරික සන අපද්‍රව්‍ය දහනය කිරීමෙන් විදුලිය උත්පාදනය කිරීම)	
19		IoT based waste recycling system (අන්තර්ජාලය පදනම් කරගත් අපද්‍රව්‍ය ප්‍රතිචක්‍රීකරණ පද්ධතිය)	
20		Electricity and thermal generation by biogas from wastewater treatment (අපජල පවිත්‍රකරණයෙන් ලැබෙන ජීව වායුව මගින් විදුලිය හා තාප උත්පාදනය)	

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