

# CLIMATE CHANGE MITIGATION – SRI LANKA’S PERSPECTIVE

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## *Abstract*

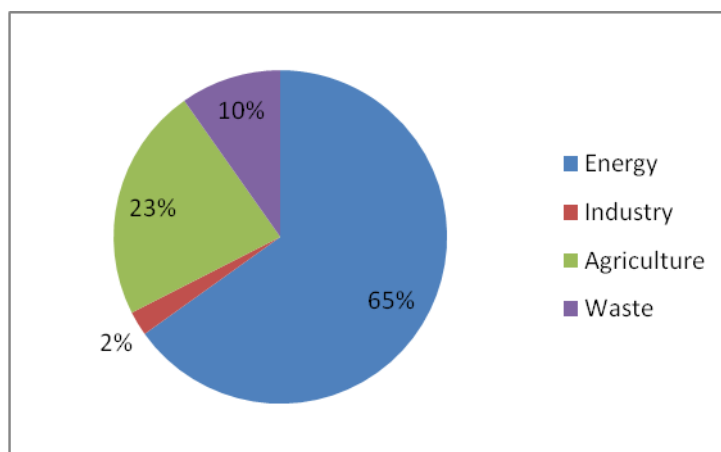
Climate Change with the associated increase in global temperature and sea level rise has become the most important global concern in the present day. A landmark event in this regard is the signing of the Climate Change Convention in 1992 in Rio, Brazil which provided targets for especially developed countries to reduce their Green House Gas (GHG) emissions by 5% of the 1990 levels by 2012. Mitigation of global warming involves taking actions to reduce greenhouse gas emissions and to enhance sinks aimed at reducing the extent of global warming. It has been found that almost 5400 million tons (Mt) of CO<sub>2</sub> equivalents are emitted annually from various sources linked to human activities. Sri Lanka's CO<sub>2</sub> emission from fossil fuel combustion estimated at 2007 had been about 12,400 Gg CO<sub>2</sub> which is only 0.04% of the global emission of 29,300 MtCO<sub>2</sub>. The corresponding per capita CO<sub>2</sub> emission was 648 kg in 2007 and although this is still much less than the global values, Sri Lanka has taken many policy measures that would result in mitigating GHG emissions.

Mitigatory measures have been taken in all the sectors including energy (power, transport, industry and household and commercial), land use, land use change and forestry, waste etc. The Energy Policy and Strategies (2006) of the country emphasizes the need to resort to sustainable energy and has a target of having 10% of the energy from renewable sources (Non Conventional Renewable sources) by 2015, a target which can be achieved if all the pending initiatives towards this is made operational. Further, the Government is constantly questing for clean energy. Some of the other initiatives to reduce the carbon footprint in the service sector are 'Leadership in Energy and Environmental Design' (LEED), 'Greening Sri Lankan Hotels Programme', setting up of the Sri Lanka Sustainable Energy Authority in 2007.

In the arena of industries, location of industries in industrial estates and conducting Strategic Environmental Assessments (SEA), voluntary standards like ISO 9001, ISO 14,001, Green building concepts, the Green Tax, Cleaner production initiatives, Clean Development Mechanism (CDM) benefits have provided incentives to reduce GHG in this sector. Many national initiatives are underway in reducing the GHGs in waste sector too. As a country with a high canopy forest cover of 23.5% and a forest cover of 40% in general the potential to act as a GHG sink in forestry sector is very high. While ensuring the sustainable development efforts this will help the country to obtain benefits from CDM or Reduced emissions from Deforestation and Land Degradation (REDD and REDD+) programs in the future.

## **1. INTRODUCTION**

Climate Change with the associated increase in global temperature and sea level rise has become the most important global concern in the present day. According to the 4<sup>th</sup> Assessment Report on Climate Change, during the last century, the temperature of the globe had increased by 0.77 °C and is expected to increase up to 5.8 °C by 2100 if the business as usual prevails. Out of the 12 years with the highest temperature, 11 had been recorded from 1995 to date. The sea level has already risen by 3.1mm and is expected to rise to 0.8m by 2100. The GHGs of concern are primarily carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). It has been found that almost 5400 million tons (Mt) of CO<sub>2</sub> equivalents are emitted annually from various sources linked to human activities. Sri Lanka's CO<sub>2</sub> emission from fossil fuel combustion estimated at 2007 had been about 12,400 Gg CO<sub>2</sub> which is only 0.04% of the global emission of 29,300 MtCO<sub>2</sub>. The corresponding per capita CO<sub>2</sub> emission was 648 kg in 2007 and this is still much less than the global values. The total emissions from all sectors is 20.794 GgCO<sub>2</sub> equivalents (*draft* Second National Communication, 2010). Figure 1 shows the percentage contribution of various sectors in Sri Lanka to the GHG emissions.



**Figure 1:** The percentage contribution of the different sectors in the GHG emissions in Sri Lanka

Of the GHG the main contributor is carbon dioxide (65%) followed by Methane (30%) and then Nitrous oxide (5%).

## 2. GHG MITIGATION

A land mark event in this regard is the signing of the Climate Change Convention in 1992 in Rio, Brazil which provided targets for especially developed countries to reduce their Green House Gas (GHG) emissions by 5% of the 1990 levels by 2012. Sri Lanka's CO<sub>2</sub> emission from fossil fuel combustion estimated at 2007 had been about 12,400 Gg CO<sub>2</sub> which is only 0.04% of the global emission of 29,300 MtCO<sub>2</sub>. The corresponding per capita CO<sub>2</sub> emission was 648 kg in 2007 and although this is still much less than the global values. As a Non Annex 1 country, Sri Lanka is more concerned with the adaptation to climate change than the mitigation however, it is noteworthy that Sri Lanka has taken many policy measures that would result in mitigating GHG emissions. These policy decisions were taken with a view to bring in environmentally friendly concerns among the people and industrialists and to avoid pollution of the country in general.

From Figure 1 it is apparent that energy sector which is represented by power supply, transport, industry and domestic and commercial has contributed the highest to the GHG in the country. This is followed by agriculture, land use and forestry sectors and then by waste sector. The status and mitigation options already carried out and also planned for the future are shown below;

## 3 POWER SECTOR

### 3.1 STATUS AND TRENDS

In 2007, the main share of primary energy had come from biomass (48%) followed by petroleum (43%) and hydro (9%). In the generation of electricity alone, petroleum oil has contributed 60% while hydro has contributed only 40% which also includes small hydro plants. However, with the government's decision to phase out dependence on oil for electricity generation as included in the National Energy Policy and Strategy (NEPS) (MP&E 2006) and the non-availability of any more major hydro plants than what is being developed or planned currently, the future generation will have to depend on coal which has to be imported from distant sources. Coal has been identified as the least cost option taking into consideration mainly the cost of production. The first coal power plant is currently under construction on the west coast, and its first generating unit of capacity 300 MW is expected to come into operation

in 2011. Two more units, each of 300 MW capacity will come into operation a few years later. Subsequently, the Government plans to build two more coal power plants each with a capacity of 1000 MW, on the east coast, close to Trincomalee. Among the electricity consumers, the highest are the domestic and commercial sectors.

### **3.2 MITIGATION OPTIONS**

The NEPS of Sri Lanka states that the Government will endeavor to reach by 2015, a minimum level of 10% of electrical energy supplied to the grid to be from NCRE. The Sustainable Energy Authority (SEA) established in 2007 has a comprehensive 10 year development plan which set out to achieve 3 types of goals ie, to provide energy security of the individual and the by 2015, to manage the energy intensity of economy at a favorable level by steering the country away from the path taken by many other developed economies. The energy intensity was 167 TJ/GDP in 2000 and in 2010 it has already escalated to 209 TJ/GDP. The target is to retain energy intensity in the economy at 209 TJ/GDP. In this respect SEA is using both regulations and incentives to both the industries and service sector.

With a view to encourage the development of the NCRE sources, the CEB has revised its tariff structure so that the power units are purchased at a price decided taking into consideration the technology used and cost incurred in its development. In addition to this, the World Bank (WB) is also providing support to the developers through local banks ie Energy Services Delivery Project followed by Renewable Energy for Rural Development (RERED). With the success of the initial phase of the project, WB has given a second grant of US\$ 42 million to establish a target of 50 MW of grid connected small hydro systems and provide small solar PV systems to 60,000 households located away from the grid.

The CEB is also embarking on measures to reduce loss incurred in generation, transmission and distribution amounting to 12% as well as demand side management which involves education and awareness of the consumers on purchasing energy efficient appliances, designing households and commercial establishments to be more energy efficient etc. The national potential for Clean Development Mechanism (CDM), is estimated to be 613 GgCO<sub>2</sub>/year in hydro power. The figures for wind is 673 GgCO<sub>2</sub>/year, biomass is 1,680 GgCO<sub>2</sub>/year. The estimated revenue from already commissioned projects by private sector is estimated to be US \$ 39.5 million at the rate of US \$ 12 per tonne of carbon (Batagoda et al, 2007).

If all the projects which are in the pipeline at various stages of approval become operational (Mini hydro power – 259 MW; Dendro power – 28 MW; Wind power – 74 MW and Waste to energy – 183 MW), the 10% contribution from NCRE sources could easily be achieved by 2015 as envisaged in the National Energy Policy. Further, if the total potential of wind energy can be harnessed, the share of clean energy to the energy supply system will be very much higher. In order to achieve the target of generating 10% of energy from NCRE by 2015, it is necessary to further develop the NCRE sources. According to the LTGE Plan of CEB, only 218 MW providing 636 GWh of energy will be generated by 2015 which is only 4% of the total energy supply. However, according to the studies conducted by the USAID on the potential of NCRE, wind has a potential capacity of 24,000 MW covering both coastal and mountainous regions. Out of these sites, those covering the coastal regions, particularly the southeastern, northwestern and northern coasts were found to have a potential of about 1,800 MW capacity which were economically and technically feasible for accommodating to the grid. Presently there are 60,000 PV systems installed in rural homes, however, only 6.4% of the non-electrified houses are using solar PV. It is expected that about 260,000 households who are not connected to the National Grid will opt for solar power in the near future.

When all these are taken into consideration it could be predicted that the GHG emissions can be reduced by 2 TgCO<sub>2</sub> by 2020. The effort of the SEA to keep the energy intensity at 500 toe/GDP is also a useful management measure at demand side. However, it is to be noted that the introduction of coal power plants to meet the needs of the country's development activities will result in escalating the emissions to exceed 20 TgCO<sub>2</sub> by 2021, according to CEB.

### **3.3 GHG MITIGATIONS IN THE TRANSPORT SECTOR**

According to 2000 GHG Inventory, road, rail, aviation and sea transport systems have emitted 5926, 80, 497, and 37 GgCO<sub>2</sub>, respectively. Their sum of CO<sub>2</sub> emissions, 6,540 Gg is 53% of the total CO<sub>2</sub> emissions from fossil fuel combustion - 12,410 GgCO<sub>2</sub>, and 22% of the aggregate emissions - 29,583 GgCO<sub>2</sub>Eq. The National Transport Policy drafted in 4(-)-260(4ra)-2(n)11(s Tm

The Green Tax enforced by the Central Environmental Authority (CEA) in 2008 on items which have a more energy efficient alternative for example incandescent lamps against CFLs or white lights increase the demand for such items from the consumers and encourage industrialists towards manufacture/importation of such energy efficient items. Many industries have performed fuel switching, thus resorting to biomass from fuel-oil thus reducing the GHG emissions and also increased the CDM potential in the country in this sector. The potential from the use of biomass in industrial energy generation is 500 GgCO<sub>2</sub>/year, assuming 50% of fuel switching. The CDM potential from energy conservation in the industries is 66 GgCO<sub>2</sub>/year for electricity use and 114 GgCO<sub>2</sub>/year for petroleum use.

### **3.5 MITIGATIONS IN THE AGRICULTURE, LAND USE AND FORESTRY SECTOR**

The total GHG emissions from agriculture related activities have been estimated to be 4,726 GgCO<sub>2</sub> eq. The emissions from rice fields have been estimated as 2,465 GgCO<sub>2</sub>eq., while that of the enteric fermentation and manure management of livestock have been estimated as 1,254 and 145 GgCO<sub>2</sub>eq., respectively. Further, nitrous oxide is also emitted both directly and indirectly which adds to the GHG emission. The total share of emissions from the agriculture sector to the national inventory is 22.7% in 2000. GHG emission from land use and forestry in year 2000 has been recorded to be 2156 GgCO<sub>2</sub>Eq (8310.84 Gg CO<sub>2</sub> equivalent) while the non CO<sub>2</sub> emissions due to forest fires was 0.38 Gg CO<sub>2</sub> equivalent.

The National Agricultural Policy (2007) which identifies Agricultural Sector is an important part in the Sri Lankan economy emphasizes that the importance of conserving the environment and spells out the adoption of technologies that are environmentally friendly and harmless to health in promotion of agriculture in the country. Among the actions that has been recommended by the Policy with regard to GHG mitigations, were promoting home gardening and urban agriculture to increase tree cover and carbon sequestration, promotion of the investments in agriculture especially with regard to post harvest management which tends to reduce the waste accumulation and methane emissions, fostering, preserving and disseminating traditional knowledge in agriculture relating to organic farming, pest control and preservation and processing of food, use of bio fertilizers and integrated plant nutrition systems. An Island-wide programme to popularize food production utilising organic fertiliser is being implemented under a project launched by the Agriculture Development and Agrarian Services Ministry. The Government expects to manufacture 25 percent of the country's fertiliser requirement under this project. Five thousand (5,000) units of solar power drip were provided to the farmers on the basis of need. This project is in operation in many districts namely Hambantota, Anuradhapura, Polonnaruwa, Matale, Ratnapura, Puttalam, Kurunegala, Ampara, Kandy, Kegalle, Moneragala, Badulla and Trincomalee. While boosting the agricultural yields it also helps to reduce the use of oil thus reducing GHG emissions to the atmosphere.

With regard to Land Use, Land Use Change and Forestry, the National Council for Sustainable Development in its Haritha Lanka Action Plan, 2009 has incorporated saving the fauna, flora and ecosystems as well as responsible use of land resources in its mission. Forests are the biggest storehouses of biodiversity. The total annual carbon dioxide abatement by forestry sector is 2.6 million tons as for the year 2000 by only taking the abatement capacity of forest plantations and excluding natural forests according to IPCC Guidelines. As a country with a high canopy forest cover of 23.5% and a forest cover of 40% in general the potential to act as a GHG sink in forestry sector is very high. While ensuring the sustainable development efforts this will help the country to obtain benefits from CDM or Reduced emissions from Deforestation and Land Degradation (REDD and REDD+) programs in the future.

### **3.6 MITIGATIONS IN THE WASTE SECTOR**

Of the total GHG emissions of 20.794 GgCO<sub>2</sub> equivalents in the country, waste sector contributes 10% (*draft Second National Communication, 2010*). By way of mitigation many actions have already been taken by the Government. The Ministry of Environment and Natural Resources identified solid waste management as a priority area in development agenda and formulated a national strategy for solid waste management in 2000. A National Policy on Solid Waste Management was also formulated in 2007 with the following objectives; ensuring environmental accountability and social responsibility of all waste generators waste managers and service providers, to actively involve individuals and all institutions in integrated and environmentally sound solid waste management practice, to maximize resource recovery with a view to minimize the amount of waste for disposal, to minimize adverse environmental impacts due to waste disposal to ensure health and well being of the people and on ecosystems. Based on this Policy, National Strategy on Solid Waste Management was updated in January, 2008 and a set of technical guidelines prepared for solid waste management by the CEA.

A Waste Management Authority was also formed in 2007 under the Statute No. 1 of 2007 of the Western Provincial Council. This Authority is vested with the functions pertaining to the management of waste including collection, segregation, transportation, transfer, treatment and disposal of the waste in the Western Province. The National Council for Sustainable Development developed a National Action Plan for *Haritha Lanka* Programme and one of the important missions is doing away with waste dumps in the country. The main strategies of the mission are as follows; promote Life Cycle management of waste, strengthen the institutional mechanism for solid waste management in every Local Authority, establish necessary infrastructure for solid waste management in each Local Authority or adopt appropriate alternative methods, prevent accumulation of hazardous wastes into the non hazardous waste streams, apply Polluter Pay Principle and environmentally sound treatment and disposal of industrial solid waste and apply zero waste concepts in agricultural farms. It has identified key performance indicators, short, medium and long term targets and lead responsible agencies for carrying out the actions. Fourteen (14) major composting plants are planned to be constructed and implemented directly by the Pilisaru project during the initial stage. Fifty LAs will be covered by this and is expected to handle an estimated 1,085 tons of waste per day. Total compost production of these direct implementing projects will be 60,272 tons per annum and the annual revenue is estimated to be at Rs. 421 million. Expected net profit of this project is Rs. 130 million per year. The Project also envisages to bring down the waste dumps in the country for example to bring the 19 dumps in the Western Province to 10 by the end of the Project. Three sanitary land fills have been proposed in the Western Province having capacities of 100 to 300 t/day to be established soon. The Government bodies dealing with waste management are working with the private sector, schools, other govt. organizations like hospitals to achieve the target of making the country clean.

## **4. CONCLUSION**

Despite the fact that Sri Lanka is emitting relative small quantities of GHGs it is affected as much as any other country in the world from them. Although much attention has been focused on climate change by the Government at policy level, it has not filtered down optimally to the institutions and personnel optimally. Therefore although the climate change has been addressed at varying levels in sectoral policies and plans, the implementation of the same is rather poor. Therefore much attention needs to be given to this. Climate change mitigation needs process improvements and novel technological advancement which is lacking. Research and development in many sectors are needed for proper mitigations. The mitigation options provided in the sectoral policies and programmes needs to be infiltrated/integrated into the institutional policies and action plans. Capacity requirements to address these would then be identified and acted upon.

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