

# Mitigating Climate Change via Non-Conventional Renewable Energy: Case of Sri Lanka

A. S. Withanaarachchi, L. D. J. F. Nanayakkara, and C. Pushpakumara

**Abstract**—In 1995 Sri Lanka produced 95% of the grid electrical energy needs from conventional hydro power plants. But today Sri Lanka's electricity generation sector is largely dominated by fossil fuel sources. Though the Sri Lanka's current carbon foot print is much less than the global average, rising energy demand has resulted in escalated greenhouse gas (GHG) emissions. The focus of this study is primarily on Non-Conventional Renewable Energy sector and the challenges that need to be overcome for a clean and sustainable energy future. The study took the form of three phases: primary data-gathering process through literature review, semi-structured interviews, followed by an expert panel discussion. Results show that, as small hydro power potentials have already been utilized, wind has come to the forefront as the most promising energy source. However, technical and infrastructural limitations have hindered the further development of not only wind, but also biomass and solar energy sources.

**Index Terms**—Climate change, renewable energy, Sri Lanka.

## I. INTRODUCTION

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" [1]. The impacts of electricity generation on the environment could be due to one or several factors including: particulate emissions; Greenhouse gaseous emissions (GHGs); warm water discharges into lakes; rivers or sea; liquid and solid waste and changes of land use. Although many of these are common to any development project, particulate and gaseous emissions are of primary importance in the case of electricity generation using fossil fuels.

Access to energy has an important impact on long-term poverty reduction in developing countries [2]. By now energy mix of many developing nations and countries in transition, has been largely dominated by fossil fuels. Today overdependence on fossil fuels has forced the world to consider global warming and climate change via GHGs a critical issue which needs to be addressed immediately.

In 1995 Sri Lanka produced 95% of its grid electrical energy needs from conventional hydro power plants. However, expansion of household electricity consumption

and the boost in the industrial sector of the country have forced the country to depend on alternative energy resources such as fossil fuels. The total amount of electricity generated during 2012 was 11,878.8 GWh out of which 70.9% was from thermal power plants (both oil and coal), while 23.0% was from major hydro and the balance 6.2% was from Non-Conventional Renewable Energy (NCRE) which comprised of small hydro, wind power, biomass and solar [3].

## II. RESEARCH OBJECTIVES

Considering the fact that Sri Lanka's largest reserves of hydro power have already been utilized, the Ceylon Electricity Board (CEB) of Sri Lanka had diversified to thermal power, resulting in a gradual shift in the industry power mix [4]. Based on World Bank reports, the following table (Table I) exhibits the per capita carbon dioxide emissions of different regions compared with Sri Lanka.

The per capita carbon dioxide emission in Sri Lanka at present is only 0.6 metric tons per year, which is far below the global average of 4.9. This indicates that Sri Lanka has adequate carbon space for establishing fossil fuel power plants [5]. As evidence by many international publications, the unprecedented levels of economic growth emerging in the developing nations will make them responsible for future growth in energy demand [6]. In catering to the rapid demand growth, current electricity generation expansion plan of Sri Lanka is mainly concentrated on imported coal.

TABLE I: AVERAGE CO<sub>2</sub> EMISSION METRIC TONS PER CAPITA IN YEAR 2010

Country/ Region	2010 CO <sub>2</sub> Emissions (MT/capita)
World	4.9
Low middle income countries	1.6
South Asia	1.4
Sri Lanka	0.6

Coal has been identified as the least cost option taking into consideration mainly the cost of production [7]. Based on the published data, energy sector is the main contributor to the GHGs emission [8]. Thus clean energy is an essential requirement in combating the climate change.

The focus of this study is primarily on NCRE based electricity generation of Sri Lanka and the challenges that need to overcome for a clean and sustainable energy future. Further this study is aimed at identifying and investigating factors, which influence the development of the NCRE sector of Sri Lanka. These factors were derived as an outcome of a workshop which was conducted with the experts in the renewable energy sector of Sri Lanka.

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The authors are with the Department of Industrial Management, University of Kelaniya, Sri Lanka (e-mail: amila.green@gmail.com, julian@kln.ac.lk, chamli@kln.ac.lk).