

# CHAPTER 1

## INTRODUCTION

### 1.1 Principle and Rationale of the study

Using energy in every country is an engine of economic growth. Energy is essential for achieving social and economic development, and also for improving the quality of life. It is a major component of a nation's economy, both as a sector in itself and as a factor in all other economic activities. Environmental resources are directly provided for in the production of goods and services. The environment supported other services that enable business. Moreover, the environment is vital for our well-being, providing us with recreational opportunities, improving our health and much more.

Myanmar is endowed with rich natural resources of commercial energy. The current of energy sources is found for use in Myanmar. These sources are crude oil, natural gas, hydropower, coal and renewable energies like biomass, geothermal, biofuel, the wind and solar power, bio-ethanol, bio-diesel, and biogas are the potential energy sources for using in the economy of Myanmar. Myanmar has relied thoroughly on natural resources to boost its resources sectors being forestry, agriculture, fisheries and mining in Myanmar economy. These areas have played important roles in the economic development and transformation of the country, and their operations become more intensive and extractive in the several years.

The total forested area is becoming reduced in the current situation of Myanmar. So the serious environmental problems have emerged as a result of deforestation loss of rich biological diversity and increased pollution. In many rural communities, all people

have used the traditional method of cooking. These methods are making a three –stone cooking with firewood. The lack of energy resources is widespread poverty among rural communities of Myanmar. Low-income households have to use biomass for cooking and heating. If their income increases, they use modern fuels thoroughly for lighting, modern appliances, pumps and communication but they do not substitute for cooking and heating. The energy consumption of household may be expected to increase in the future with growth in the economy and also raise per capita. The higher income groups have completely substituted biomass for household consumption in the current situation of Myanmar. In urbanised areas, more people have concentrated on working in non-agricultural activities. Rapid urbanisation processes and policies are favouring urban cities, and industrialisation is changing urban areas. Rapid population growth and urbanisation have been affecting the increasing demand for jobs, housing energy, clean water, food, social services and transportation infrastructure. The total population increased from 44.32 million in 2000 to 60 million in 2015 in Myanmar. The population is assumed to increase by about 1.0 percent per year. Population growth along with economic growth will increase energy demand, and other services in urban areas, which in turn result in increased GHG emissions particularly from buildings, transport and industry. Buildings with sufficient energy efficiency standards will be contributed to reshaping considerably Myanmar's GHG inventory in future. Reforming political affairs along with economic growth tremendously increases in transport sector including vehicular growth from less than one million registered vehicles in 2004 to almost four million in 2002. Moreover, political reform will continue to grow as economic capacities of households increase, and the productive sector diversify. It will lead to increase transport infrastructure and services to boost economic activities and emissions will be including the impact on the environment. As the economy grows, the expansion of the energy, transport and industry sectors will lead to extreme livelihoods for a significant proportion of the population (61 percent of the labour force) and is dominated by small scale landholders. About 30 percent of the population has access to electricity and rest relies on other forms of energy of which about 70 percent come from biomass. The real growth of the agricultural sector has been fastened than other areas. The food industry required area gains to include for growth during a period when its markets were liberalised and connected to world markets. The international environment and the new

political reform provide Myanmar concerning with an excellent opportunity to join the global and regional economy. The agriculture sector had an untypically high share of 59% of total GDP at current prices during 1995-96. Myanmar had reformed and opened its economy in the midst of economic integration of neighbouring countries. The share of GDP was increased to approximately 60% until 2000s may be erroneous due to the overestimation of GDP figures. Many economists believe that official GDP figures are overestimated, and the real growth rates are significantly smaller. A comparative advantage will be remaining with primary activities such as agriculture, livestock breeding, fisheries and agro processing for the foreseeable future in Myanmar. The growth of strategy has anchored in agricultural progress for several years. Myanmar's GDP will be expected to grow at an average annual rate of around 7.0 percent from 2010 to 2035. Myanmar wants to implement for attracting foreign investors. Foreign direct investment promotion can contribute to economic growth. Myanmar's ratio of inward FDI to GDP is the lower among CLMV and Thailand. The changes of economic system have to create market oriented concerning with many economic activities such as infrastructure development construction and investment in all sectors of the economy leading to increasing demand for energy in Myanmar. The main sectors of energy consumption included industry use, transport consumption and household consumption from the energy sources of biomass, oil products gas and electricity. The economic growth of the country is rapid with structural changes in society. The household sector is the largest energy consumption in Myanmar. So, more energy consumption causes to increase CO<sub>2</sub> emissions.

This paper attempts to investigate empirically the long run effect of the relationship between CO<sub>2</sub> emissions and economic growth of Myanmar over the period 1980 to 2015. The structure of this paper is organised as follows: Section 2 provides the literature review for the studies that examined the relationship between CO<sub>2</sub> emissions and economic growth. Section 3 presents theoretical framework whereas section 3 presents the data and methodology used for this study. Empirical results are discussed in section 4. Section 5 draws some concluding remarks.

### **1.1.1 National Environmental Policy of Myanmar**

The National Commission Environmental Affairs (NCEA) drafted the national environmental policy in 1994. The National Environmental Policy is as follows: To establish sound environment policies concerning with utilisation of land, water, forests, mineral, marine resources and other natural resources to conserve and prevent environmental degradation. The objective of Myanmar's environmental policy is intended to achieve harmony and balance between the developmental processes necessary to grow the economy, and the quality of the life of all citizens. Under this policy, the main environmental body is the national commission for environmental affairs (NCEA). In 1990, the NCEA was established to advise the government on environmental policy and to promote environmentally sound and sustainable development. The main vision of NCEA is to ensure sustainable use of environmental resources and to achieve environmentally sound practices in other economic activities and industry.

Myanmar's Environmental management pattern is largely sectoral. For instance, the Ministry of Forestry is being responsible for sustainable forest management including wildlife conservation while the Ministry of Industry controls and regulates industrial activities and pollution. The Ministry of Health is responsible for discussion concerning with environment relation. The Ministry of Livestock Breeding and Fisheries carried out the conservation of marine and freshwater fishery resources. The Ministry of Agriculture directly administered the environmental issues about agriculture. The objective of the Ministry of Energy is to save non-renewable energy for future energy sufficiency to promote efficient utilisation of energy and to prevent deforestation caused by the excessive use of fuel wood and charcoal. The NCEA undertakes the formation of Myanmar in 1997 onwards. The main purpose of formulating the agenda is to provide concerning with a framework of programmes and activities for achieving sustainable development in the country. Myanmar Agenda 21 aims the strengthening and promoting systematic environmental management in the country. Programming about Myanmar agenda 21 is the integration of environment and development in decision making integration of sustainable development concerning with national economic planning and development processes .

### **1.1.2 Energy Policy of Myanmar**

The government of the Union of Myanmar, through the Ministry of Energy, the developed policies that focus on energy efficiency improvement, development of alternative and new and renewable energy in all sectors. This policy intended to maintain of energy oil stockpiles exploration and development of new resources and reduce dependency on oil import.

In Myanmar, the increased domestic production of available primary energy resources strives the energy policy towards maintains the status of energy independence through intensive searching and development activities. Moreover, it describes electric power like the main driving source of energy for economic development and the need to generate and distributes regarding volume, density and reliability. Energy policy was advocated for the utilisation of water resources, renewable energy resources for generating electricity to save non-renewable sources of energy such as fossil fuels for alternative and future use. Emphasizing energy efficiency and conservation is to conserve energy and to reduce power consumption by minimising harmful environmental impacts. Energy efficiency and preservation encouraged utilising new and renewable energies, especially solar and the wind which are abundant under Myanmar's climate condition. It must be accepted as the fact that utilisation of traditional energy sources. Authoritarian and preventive actions are necessary for the sustained harvesting of this primary energy sources.

Savings in energy consumption in Myanmar can be achieved through the realisation of energy efficiency programs in all energy consuming sectors. Energy savings are expected to enhance in manufacturing technologies by at least 10 percent by 2020 in the industry sector. The efficient energy method and energy management systems are anticipated to encourage significant saving in the traditional and commercial sector. Efficiency could be achieved for enhancing fuel economy in the transport sector. Moreover, the government was encouraged for the use of biofuel in the transport and agriculture sectors by reducing oil dependency and carbon dioxide (CO<sub>2</sub>) emissions. These efforts are already replaced although the amount of biofuel used in the country is still small for the time being. The clean fuel program has been initiated by the Ministry of Energy to reduce carbon dioxide emissions by increasing the use of gas in the industrial

sector and for power generation this includes converting gasoline, diesel and liquefied petroleum gas (LPG) vehicles to compressed natural gas (CNG) vehicles. The government enhanced the Environmental Conservation Law in March 2012. This Law provides the legal basis for implementing a range of enhanced environmental management measures. The purpose of primary energy saving will be to reduce energy consumption by 5 percent in 2012 and 10 percent in 2030. Specifically, the goals could be achieved by the following strategies.

(i) Energy efficiency improved by 10 percent against BAU in the industrial sector and reduces energy related greenhouse gases by 2020.

(ii) Substituting biofuel in the transport sector has at least 8 percent by 2020.

(iii) The total installed power capacity of renewable energy to 15 per cent 229 by 2020.

(iv) Energy efficiency improves in the commercial/residential sector by 8 percent by 2020.

Also, the following measures are considered important in achieving the goals.

- To develop energy statistics and support systems to help improve energy efficiency in all sectors by encouraging information dissemination and cooperation between the public and private sectors.
- To develop voluntary action plans for the private sector by 2010-2012.
- To develop labelling systems for appliances and buildings by 2015.
- To increase research and development.
- To develop an energy management system through the ASEAN Energy Manager Accreditation Scheme Program by 2010-2015.

On a sectoral basis, the energy efficiency and conservation measures in Myanmar are listed below:

- Replacing of low-efficiency equipment with higher efficiency alternatives will be encouraged in the industry.

- Encouraging fuel switching in the transport sector would be to biofuels and natural gas as alternative fuels. Moreover, the state aims to achieve energy savings through exploiting more efficient transportation networks. Improving in fuel efficiency in the transport sector is also considered.

In the residential and commercial sectors, the following are the measures that will be implemented:

- The use of alternative energy will be encouraged and improvement in energy efficiency in existing buildings in the public and private sectors.
- The use of higher energy efficient appliances and energy saving equipment in the residential and commercial sectors is promoted.
- The use of bio-diesel launched in rural communities.
- In the electricity sector, the following measures that will be implemented are:
- Expanding energy mix and supply sources through utilisation of the full energy developed of the country including frontier exploration and development and intensive research on oil, natural gas, coal, hydropower, geothermal, energy efficiency and conservation and new and renewable sources of energy.
- Replacing transformers and install the capacitor banks in the main sub-station.
- Optimize the voltage, conductor size and loading of transformers.

**Table 1.1:**The value of CO<sub>2</sub> Emissions and GDP per capita, Urban Population of Myanmar during 2000 to 2015.

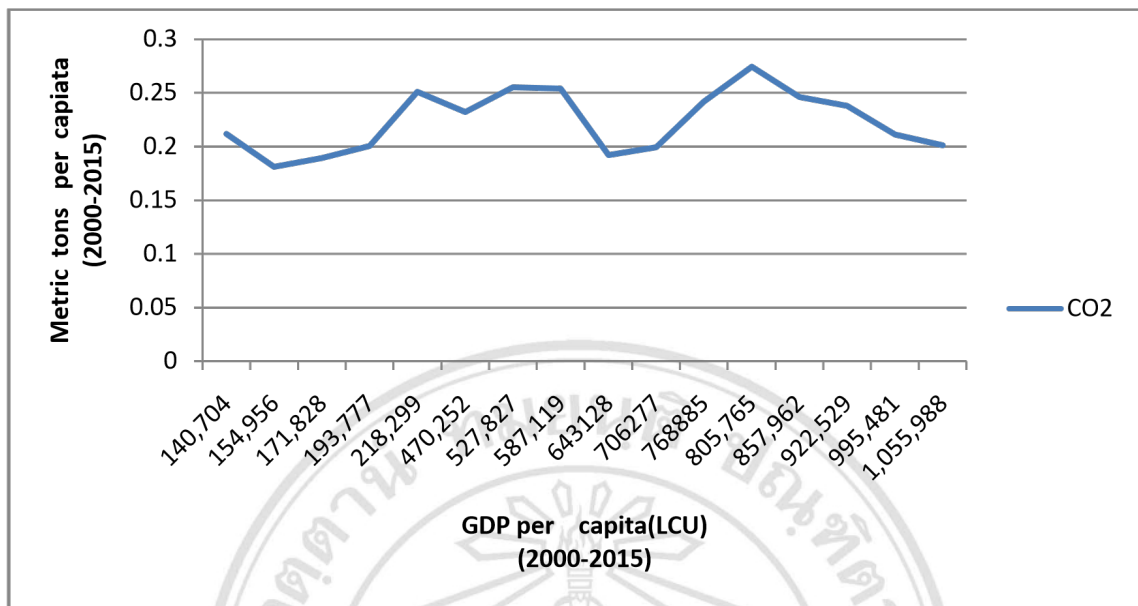
Year	CO <sub>2</sub> (metric tons per capita)	GDP per capita (Constant Local Currency unit )	Urban population (Number of population)
2000	0.211621	140704	12855589
2001	0.181008	154956	13166097
2002	0.189112	171828	13481761
2003	0.200315	193777	13802361
2004	0.250789	218299	14128605
2005	0.232045	470252	14460575
2006	0.255169	527827	14797485
2007	0.253947	587119	15141201
2008	0.192081	643128	15494241
2009	0.199163	706277	15863485
2010	0.241924	768885	16246753
2011	0.274293	805765	16646250
2012	0.246147	857962	17060460
2013	0.237874	922529	17488372
2014	0.211	995481	17928701
2015	0.213	1055988	18377852

Source: Statistical Year Books of Myanmar and World Bank database

The table shows CO<sub>2</sub> emission and GDP per capita, the urban population for the period 2000 to 2015. The table showed that income growth consumed energy causes increase CO<sub>2</sub> emission year by year. On the other hand, the urban population increases



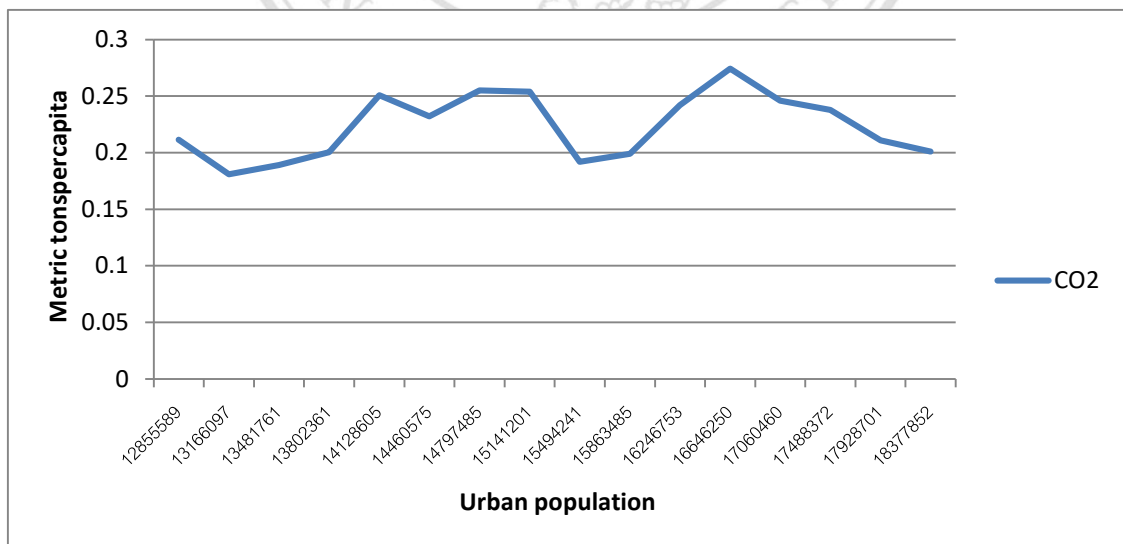
causes more power consumption. The CO<sub>2</sub> emission was increased during 2000 to 2015.



Source: Statistical Year Book of Myanmar and World Bank database

**Figure 1.1:** Trends and patterns of CO<sub>2</sub> emissions according to GDP per capita in Myanmar .

The figure showed that the income growth by using energy causes carbon dioxide emission year by year. An increase in revenue would be consumed energy. Power consumption produced wastes thoroughly pollution.



Source: Statistical Year Book of Myanmar and World Bank database

**Figure 1.2:** Trends and patterns of CO<sub>2</sub> emissions according to urban population growth in Myanmar.

The figure showed that the urban population increase year by year. The more consumption increase energy such as liquid and gas fuel. So, the carbon dioxide emissions increase year by year.

### **1.1.3 Definition of Carbon emission**

Carbon dioxide emissions are stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during utilisation of solid, liquid, and gas fuels and gas flaring. Carbon emissions discharge of carbon into the atmosphere. The burning of fossil fuels has increased by using directly since the industrial revolution. The natural environment is acting an important role in providing economic activity. It has contributed directly, by providing resources and raw materials such as water, timber and minerals required as inputs for the production of goods and services; and indirectly, through services provided by ecosystems including carbon sequestration, water purification, managing flood risks, and nutrient cycling. Natural resources play a vital role in securing economic growth and development, not just today but for future generations.

The relationship between economic growth and the environment is more complex. Several different drivers come into play, including the scale and composition of the economy principally the share of services in GDP as opposed to primary industries and manufacturing and changes in technology that have the potential to reduce the environmental impacts of production and consumption decisions while also driving economic growth.

With many keys in natural resources and ecosystems services scarce or under pressure, achieving sustained economic growth will require absolute decoupling of the production of goods and services from their environmental impacts. This means that sustainably consuming environmental resources whether by improving the efficiency of resource consumption or by adopting new production techniques and product designs. It also means avoiding breaches in critical thresholds beyond which natural assets cannot be replaced and can no longer support the desired level of economic activity. Economic growth usually refers to an increase in the amount of goods and services produced by as estimated by measuring such as Gross Domestic Product (GDP). GDP and other similar measures reflect the value of goods and services provided through the market; they

exclude many others not provided throughout the market, but that nevertheless contribute to the overall welfare.

Human well-being is a complex and diverse concept, determined by a wide-range of factors including levels of income, health status, educational attainment, housing conditions and environmental quality. It has sometimes been characterised by self-reported or subjective measures of happiness. While economic growth has produced many benefits which it has also resulted in the depletion of natural resources and the degradation of ecosystems.

### **1.2 Purpose of the Study**

The main objectives of this research are

- (1) To explore environmental issues in Myanmar
- (2) To examine the relationship between CO<sub>2</sub> emissions and GDP per capita and CO<sub>2</sub> emissions and the urban population of Myanmar

### **1.3 Advantage of the Study**

As mentioned earlier, energy has been used as an engine of economic growth. The expected outcomes of this research are to recognise the long run economic growth which is a result of energy use and carbon dioxide emission. The study of the relationship between CO<sub>2</sub> emissions and Economic Growth in Myanmar will be helpful for guiding the country's decision-making process. The results of this paper will be useful in formulating policies related to environmental problems in Myanmar.

### **1.4 Scope of the Study**

This study focuses on the relationship between CO<sub>2</sub> emission and economic growth of Myanmar between 1980 and 2015. The data used in this research are secondary data. Variables included in this research CO<sub>2</sub> emission as dependent variables Gross Domestic Product per capita and urban population as independent variables. In this empirical analysis, Carbon Dioxide CO<sub>2</sub> emissions are used as an environmental indicator, and the GDP per capita and urban population are used as economic indicators.

## 1.5 Organization of the Study

This thesis comprises five chapters. The first chapter includes principle and of the study, objective of the study, the advantage of the study, the scope of the survey and the organisation of the study. Chapter two provides a theoretical framework and a literature review. Chapter three discusses the methodology of the study. Chapter four examines the empirical results, and Chapter five reports some conclusions.



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