

# CHAPTER I

## INTRODUCTION

### 1.1. Background

Industrial revolution was started in the 18<sup>th</sup> decades which bring the innovation and great change in many sectors which include agriculture, mining, manufacture, transportation and others. Industrial revolution has called as industrialization which firstly appeared in Britain. Industrialization is still run until this day which brings the improvement of production. The invention of technology is a sign of industrialization, where technology has purpose to create the effective and efficiency of the production. There are many kinds of technology which found in industrialization era such as steam engine, electricity, train, production machine, etc.

The technology can improve quality and quantity of production. Technology in this era cannot be separate with every single sector of human life such as industry sector needs machine to speed up the production. In order to operate technology, in this term is machine, it needs source of energy. Energy plays a necessary role in development process, it is not only enhances the productivity of production (capital and labor) but also promotes higher living standard. The energy comes from renewable and non-renewable resources, for renewable resources such as water, wind and solar energy while for non-renewable resources such as coal, oil, and gas energy. These energies should be

transformed to other energy form in order to run technology. The general form of transformation energy is electricity.

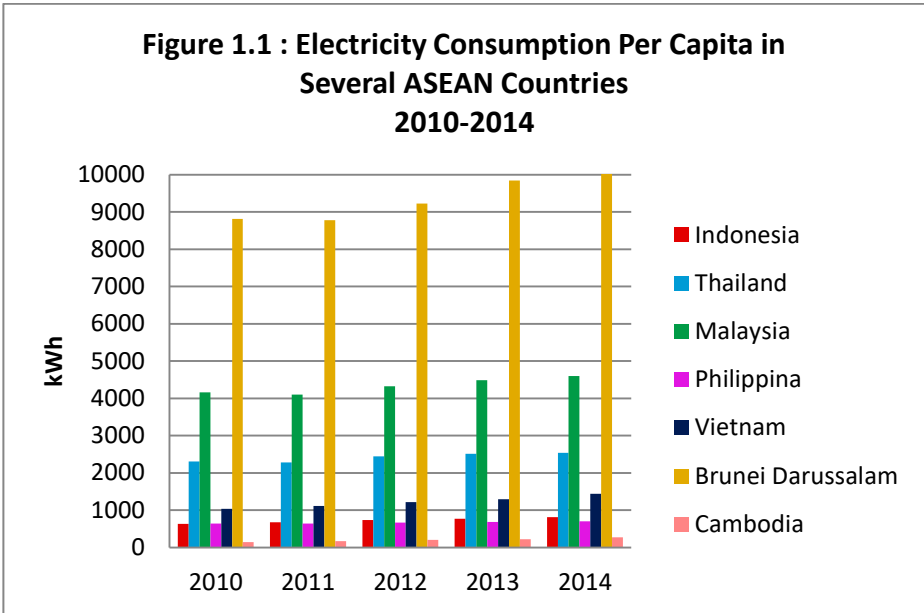
According to International Energy Agency (2017), the world consumption of electricity in 2015 is 20.200 TWh (*Terrawatt hours*), it has been increase 1.6% from 2014. The average growth rate of electricity consumption in the world since 1974 was 3.4% per year. Unfortunately, the source of electricity in the world is mostly supported by nonrenewable resources. According to World Bank data in 2014, 66.4% of electricity came from nonrenewable resources such as coal, gas and oil while renewable resources play minor role.

The electricity from nonrenewable resources will be a threat for the world in maintaining electricity sustainability because nonrenewable resources are expected to be scarce as consequences of limited reserve. The use of nonrenewable resources produces large emission that rise the greenhouse gas effect. Greenhouse effect will generate the global warming which increases the average world temperature, the major contribution of greenhouse effect are deforestation, burning of fossil fuel, industries, electrical appliance, and population growth (Khan, 2017). Besides limited resources and produce emission, use of nonrenewable resources for electricity spends large cost. Based US Energy Information Administration (2017) average cost for electricity in 2022 which based on US\$ 2016 imply for nonrenewable resources is US\$91.15/MWh (*Megawatt hours*), for renewable resources is US\$137.02/MWh and hydroelectric is US\$66.2/MWh. This price of electricity is excluded from any government incentives. These reasons become the sign for the world to change energy

consume for electricity from nonrenewable to renewable resources especially hydroelectric.

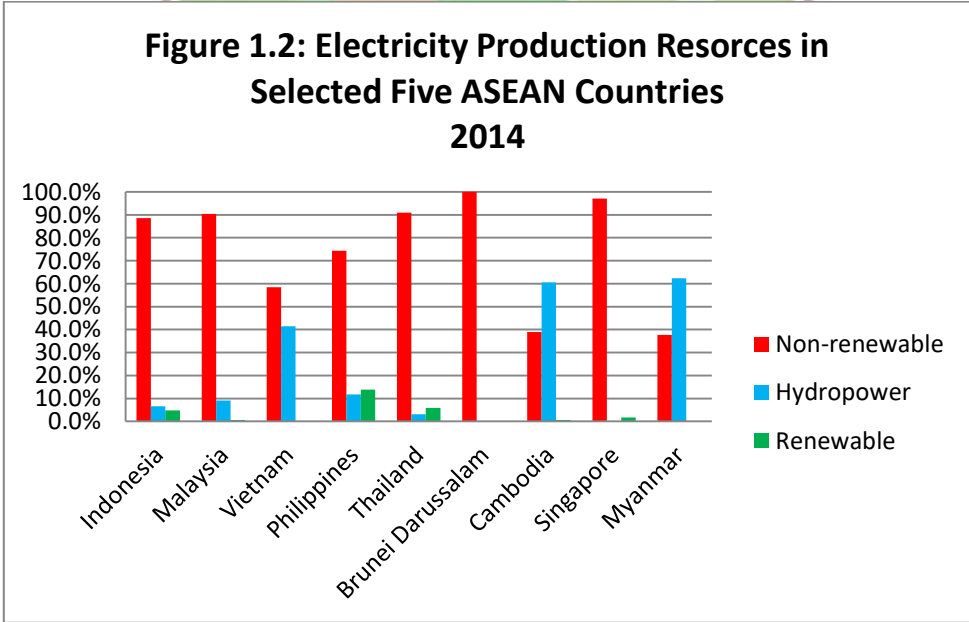
There are many kinds of renewable resources such as solar, wind, biofuel and hydropower, each kind has different availability, flexibility, level of development, and return to investment. So, every kind of nonrenewable resources will need different policy. The characteristic of hydropower are more responsible compare to other energy because hydropower has steady supply of power. Unlike the other forms of renewable energies, hydropower has another benefit besides energy supply such as recreation, water supply, and aquaculture (Kumar A, et. al, 2011). Hydropower is also able to solve the distribution of electricity through small and micro hydro project. According to International Energy Agency (IEA) 2015 hydropower is the most firmly established renewable energy source with a significant amount of unused potential.

ASEAN (Association of South East Asia Nation) consist of several countries which located in Southeast Asia which has members of ten countries. ASEAN has purpose to boost economic growth for each members and recorded 5.2% of economic growth in 2006-2013 based on ASEAN Secretariat (2014). Boosting economic growth generates rapid energy demand in particular electricity power which driven up energy security risk. Electricity consumption in ASEAN countries increase year by year, according to ASEAN Centre of Energy (2014) average growth rate of electricity demand in ASEAN countries in 2002 – 2014 is 4.6% per year, as shown in figure below.



Source: World Bank Data

The source of electricity in ASEAN is mostly contributed by nonrenewable resources. It is unfortunate because ASEAN countries have abundant natural resources but not optimally utilize for energy resources.



Source: World Bank Data

The presence of hydroelectricity can support energy supply and even fulfill the rural electricity demand and improve the electricity consumption which can improve the production. Development of hydropower sector have long-term project life thus generates long-term effect to economic sector such as lead the job creation, industries and economic growth. Besides these reasons, the improvement of electricity supply even through renewable resources can support sustainability of electricity and even reduce emission.

So, in this case it can be conclude the condition and this research will concern on five countries in ASEAN there are Indonesia, Malaysia, Thailand, Philippines, and Vietnam. These five countries include in top ranked in Southeast Asia of hydropower installed capacity (International Hydropower Association, 2016). This research has desire to analyze what is the impact of hydroelectricity consumption per capita to economic growth in five selected ASEAN countries and to know what is the relationship between hydroelectricity consumption per capita to economic growth. So, based on the research problems above the writer is interesting in analyzing the research with title:

**“The Effect of Hydroelectricity Consumption to Economic Growth in Five Selected ASEAN Countries”**

## **1.2. Research Problem**

Economic development needs technology to improve economic activity especially for production sector. The use of technology cannot be separated with electricity which is the main energy of technology. The source of



electricity is mostly by the nonrenewable resources which cannot maintain the sustainability of electricity. Then, renewable resources become a solution for electricity sustainability which has low cost operational, friendly environment, and maximize utilization yet. ASEAN countries have great potential for maximizing hydropower as renewable resources for electricity production. Moreover ASEAN countries facing fast economic growth and rush development in many sectors which need more energy to support the development.

Based on the description above, the main question for this research are:

- a. Is there long-run relationship between hydroelectricity consumption per capita to GDP per capita?
- b. What is the causal relationship between hydroelectricity consumption per capita and GDP per capita in selected five ASEAN countries?
- c. What is the impact of hydroelectricity consumption per capita to economic growth in selected five ASEAN countries?

### 1.3. Research Objective

Based on the research problem, the basic objectives of this study are:

- a. To analyze the relationship between hydroelectricity consumption per capita to GDP per capita.
- b. To explain the causal relationship between hydroelectricity consumption per capita to GDP per capita.

- c. To examine the impact of hydroelectricity consumption per capita to GDP per capita.

#### **1.4. Research Advantages**

The advantages of this research are to know the condition of hydroelectricity in Indonesia, Thailand, Malaysia, Vietnam, and Philippine and what the impact to economic growth. The result from this study will provide some advantages for:

- a. For readers are expected to understand and gain knowledge particularly in terms of impact hydroelectricity consumption per capita to GDP per capita.
- b. The result of this study will give consideration to government in generating the regulation especially in hydroelectricity consumption per capita and GDP per capita.
- c. To improve the ability of researcher writing and scientific paper.
- d. To be useful for other researchers to use the theory to research development about hydroelectricity consumption to GDP per capita.

#### **1.5. Limitation of Study**

This study will take a specific topic about the impact of hydroelectricity consumption to economic growth in selected five ASEAN countries such as Indonesia, Thailand, Malaysia, Vietnam, and Philippine. First, the author will set the methodology and formula to solve the equation

with Panel Co-integration in order to estimate the effect of hydroelectricity consumption to GDP per capita by using software/system and manual approach to process the data. Then author will describe the impact of hydroelectricity consumption to GDP per capita. Second, the author will describe through modeling approach, it will be explain by some output of data processing. The data of this study is provided by World Bank Data, BP Statistical of World Energy, and other resources that relevant to this study.

### **1.6. Systematic of Writing**

Systematic writing use to give a description in this research, in systematically is divided by three parts:

Chapter I : Introduction

There are six parts of this first chapter, there are background which is explain about the current situation of electricity consumption and hydroelectricity consumption in Indonesia, Thailand, Malaysia, Vietnam, and Philippine. Then research problem that stated about what is the impact of hydroelectricity consumption to economic growth, and then objectives of research, advantages of research, limitation of study which concern in hydroelectricity consumption and economic growth, and systematic of writing.



Chapter II : Literature Review

This chapter consist of theories and empirical studies which are related about the hydroelectricity consumption and economic growth and also hypothesis for this study.

Chapter III : Research Methodology

This chapter will explain about the theoretical framework, data, definition of variable and model of study that is Panel Co-integration.

Chapter IV : Empirical Result and Analysis

This chapter explain about the output of the research and the analysis from the processed of data.

Chapter V : Conclusion and Recommendation

