



## **FACTORS AFFECTING THE RELATIONSHIP BETWEEN ENERGY CONSUMPTION AND ECONOMIC GROWTH IN ASEAN COUNTRIES**

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### **Abstract**

The study generalizes theoretical issues and realities on the factors affecting the relationship between energy consumption and economic growth in ASEAN countries, thereby determining which are exogenous and What are endogenous factors that influence this relationship.

**Keywords:** energy, relationship, growth.



## **Introduction**

At present, the study of the impact of factors on the use of renewable energy with economic growth in ASEAN countries is limited. In the context of deep integration into international conventions and global economy, it is imperative to assess the impact of renewable energy consumption on economic processes and environmental protection.

## **Method**

- Data collection: Published books, newspapers, magazines, research programs, published research results of research institutions, domestic and foreign scientists, documents. on the Internet. Published data on renewable energy, economic growth, factors affecting the relationship between energy consumption and economic growth in ASEAN countries. These are scientific baseline data, exploited from the sources of: World Bank, OECD database, the study selected the secondary database collected on renewable energy consumption. GDP per capita from 1971 to 2014 of 5 countries in ASEAN (Vietnam, Philippines, Singapore, Indonesia, Thailand).

### **1. A number of arguments on the factors affecting the relationship between energy consumption and economic growth**

#### ***1.1. Recycled energy***

Renewable energy (renewable energy): Defined as the energy obtained from continuous sources is considered infinite. These energy sources can be renewable in nature, or refilled at a rate equal to the rate at which they are used.

Accordingly, "Renewable energy is the natural energy with limited supply".

#### ***1.2. Economic growth***

According to Simon Kuznets (1966), "A country's economic growth is a long-term increase in the ability to provide a growing and diverse range of economic products to its population, based on this increasing capacity. advanced technology and the institutional and ideological adjustments it requires.... ". He also said that "Economic growth is a sustained increase in products per capita."

"Economic growth is an expansion of a country's gross domestic product (GDP) or potential output," said Paul Athony Samuelson. In other words, growth occurs when a country's production capacity limit (PPF) moves outward. "

#### ***1.3. The relationship between renewable energy consumption and economic growth***

In the development of countries need a lot of energy resources to serve the development process. Demand for energy in countries increases rapidly with strong socio-economic growth in the context of the world and the region. Meeting the energy demand for the country's socio-economic development in the coming time is facing many difficulties and challenges, especially



the ever-increasing supply of energy. domestic primary price, oil price, coal price always tend to escalate and change erratically.

Therefore, the efficient and rational exploitation and use of new and renewable energy sources is extremely important and strategic in all socio-economic aspects. national security, energy security and sustainable development.

The rational and efficient exploitation and use of energy resources; diversifying investment and business methods in the field of energy, forming and developing a healthy competitive energy market; promote the development of new and renewable energies, bioenergy, nuclear power and other energy sources that are the backbone for each nation's socio-economy, thus applying the mechanisms, policies and measures for encouragement and support need to be clearly calculated, based on objective arguments, suitable to the reality, context, infrastructure and superstructure of each country. under different conditions.

However, the practice of policies and laws of each country on state management in the development of energy resources before the requirements of sustainable development in each country is much different, as in Vietnam. support for renewable energy consumption is still limited and difficult as the law is inadequate, has not adjusted all relationships arising in practice; many provisions of current law are contradictory and overlapping; The state agencies, enterprises and investors in the application of these regulations still face many difficulties and difficulties that need to be removed. Typically, there is a lack of legal regulations on the energy market; In addition, energy security, trade balance, current account and international payment, national reserves, and budget balances are not strong enough to cope with unexpected and big fluctuations. .

Therefore, in order to harmoniously develop the relationship between increasing renewable energy consumption and economic growth, the contribution of national governments on development policies and mechanisms to diversify sources of energy supply is required. For economies of countries in different periods. The adequate supply of energy is the driving force for the national economy, besides creating a competitive environment for energy suppliers is also a measure to be taken in time to promote the market. energy growth in countries. It is from these that developing clean or renewable energy is the driving force for the economy of developing countries.

It can be seen that renewable energy consumption and economic growth are closely related in countries and in all sectors of the economy. If there is a shortage of energy for the activities of a country from simple activities such as daily consumption, to complex activities such as production and business ... will face many difficulties and the economy will not be able to. Therefore, the addition of renewable energy sources is necessary to improve the shortage of energy sources for socio-economic development. On the contrary, if the economy cannot develop, the consumption of renewable energy is also constrained by the economical use of energy resources, or due to insufficient economic supply. Therefore, the relationship between energy consumption and economic growth is always interwoven and mutually supportive.



## **1.4. Factors affecting renewable energy consumption and economic growth**

### **1.4.1. Objective factors**

#### *Adding more energy sources:*

The shortage of traditional energy being used today is concerned by politicians as well as scientists due to the danger of energy shortage risks. Therefore, the addition of new and renewable energies is completely consistent with the indispensable needs of the development of scientific progress. In addition, the level of energy consumption in countries is increasing, leading to an energy shortage in countries.

#### *Science and technology potential*

Today's countries are aware of the importance of natural resources, especially non-renewable natural resources such as coal, oil, etc. However, many countries have not yet received the science and technology. truly developing, so being able to take advantage of green resources is still a difficult problem in the future. Therefore, the sharing of scientific and technological potentials on finding and developing clean energy among nations has become increasingly urgent.

#### *Environmental pollution*

Environmental pollution is a challenge not only in one country but also at a global level. Especially since the global warming, natural phenomena and natural disasters have been increasing, causing serious economic impacts, policymakers really have a different view on environmental pollution. To be able to minimize that requires a change in energy thinking. Here, we need to talk about renewable energy, which is the necessary additional clean energy sources and can replace traditional fossil energy sources.

### **1.4.2. Subjective factors**

#### *Commitment to the implementation of the agreement.*

The signing of commitments by countries to cut CO<sub>2</sub> emissions into the environment has led to a reduction in the economic output of many countries. Therefore, the need for additional energy to continue and economic development needs a new source of energy, renewable energy. Besides, the commitment to reduce CO<sub>2</sub> also means more active protection of the environment now and in the future.

#### *Demand for additional renewable energy sources*

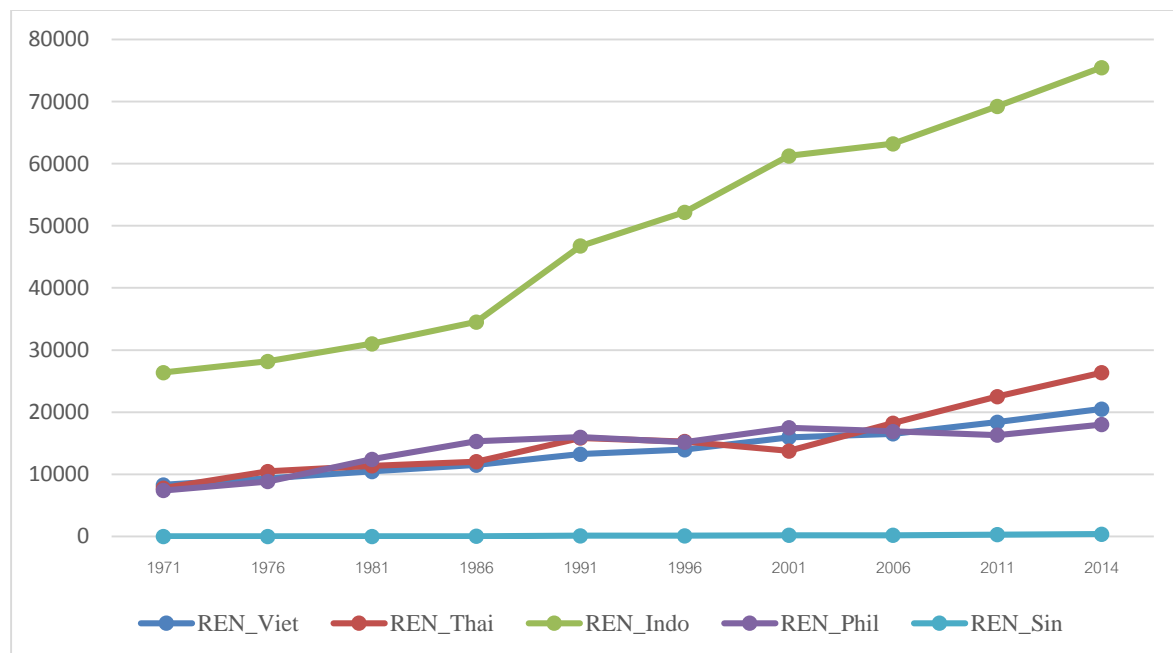
Policymakers have a more diverse view of energy resources for economic development. Renewable energy is known as a potential energy source, with large reserves. However, in order to exploit it, it is necessary to supplement the creative energy source of science and technology. Renewable energy is considered as a source of eternal energy that can serve economic and social activities in

countries. However, the initial cost is very large, requiring detailed projects and specific plans. Therefore, new renewable energy projects are mainly developed in countries with advanced science.

## 2. Situation of renewable energy consumption of ASEAN region

Development of renewable energy sources is a general trend of the whole world in general and of ASEAN region in particular. According to the ASEAN Energy Center, ASEAN's energy needs continue to surpass global growth, mainly due to the target annual economic growth of 5.4% by 2025. Total basic energy supply is projected to increase 2.3 times over the period 2015-2040. However, through a combination of energy efficiency (EE) efforts and the contribution of renewable energy (RE), energy savings of around 25% can be realized. The region's electricity is expected to triple during this period to meet ASEAN's rapidly growing power demand, greatly reducing the use of traditional biomass in the region.

Currently, to assess renewable energy consumption, OECD uses the formula to calculate the contribution of renewable energy to the total national basic energy consumption. This study uses the OECD renewable energy data source. Therefore, some countries have large total energy consumption, but with limited use of renewable energy, the consumption of renewable energy will be lower than that of countries with total energy consumption. collect less energy. This is noticeable in Figure 01.



(Source: OECD)

Figure 01. Renewable energy consumption of some countries in ASEAN region



In the period 1971-1986, the level of renewable energy consumption in countries in ASEAN region increased sharply. Especially Indonesia, with an increase of more than 2 times compared to other countries in the region. In the period of 1987-2001, ASEAN countries showed signs of slowing down in the development and consumption of renewable energy when countries were facing the Asian financial crisis. is Thailand.

The restriction on energy consumption has had a strong impact on investment in renewable energy development as well as the use of this source of energy. However, after the 1997 Asian economic crisis, Thailand experienced rapid growth in renewable energy use, and renewable energy development.

In addition, Singapore also has signs that the country has an interest in developing renewable energy after the crisis, after 5 years of renewable energy consumption in Singapore has increased from 101,102 thousand tons. (1996) amounted to 195,028 thousand tons in 2001. In the period of 2006-2014, the consumption of renewable energy in some countries has changed markedly, especially after the establishment of the ASEAN energy center. In 1999, it marked a milestone for the development of renewable energy in the ASEAN region, and at the same time, the attention of the member states.

Every year, the ASEAN energy center conducts reports and assesses the situation of energy consumption as well as the strategy of developing energy, especially renewable energy for countries in the region in particular, of the whole ASEAN region. general. As can be seen, Indonesia is the country with the highest level of interest in developing and consuming renewable energy in the region (according to OECD assessment). Next is Thailand, in 2014, the energy consumption reached 26362,898 thousand tons, an increase of nearly 2 times compared to 2001. Vietnam also had the third increase in consumption of renewable energy in the region in 2014. , reaching 20,503,233 thousand tons. In the Philippines, the nation's difference in renewable energy consumption compared to 2001 was insignificant when it increased from 17,497,185 thousand tons (2001) to 18,005,824 thousand tons (2014). Meanwhile, Singapore also has significant renewable energy consumption compared to 2001 when it consumed 370,633 thousand tons in 2014.

With the trend of developing clean energy sources (renewable energy) is indispensable in countries in particular, and in the region in general. The challenge of nations is how to ensure a sustainable energy system to ensure economic development in the country in particular and the overall development of the region. The problem of energy consumption and economic growth always requires the authorities and policymakers to make accurate and timely plans to ensure there is no shortage of energy for economic development. and vice versa.

Some countries in the ASEAN region have a relatively small area, so the development of renewable energy also faces difficulties such as: Singapore, most of the solar projects are designed integrated on high-rise roof systems. , wind energy is very little used in this country ... However, currently, countries outside the goal of economic development, the issue of sustainable



development is also a question to be researched and The participation of not only policymakers, but also the participation of scientists and applied research to forecast economic scenarios in the context of increasingly scarce resources. rare and need alternatives.

In recent years, many countries in the region have been interested and invested. Currently, according to the report of the 35th ASEAN Energy Ministers Meeting (AMEM 35) ASEAN has reached the target of 13.6% of renewable energy in the ASEAN energy network by 2015 and the Ministers agreed. will continue efforts to reach the 23% target by 2025. Accordingly, the role of investment and finance is important in the widespread deployment of renewable energy in the region.

Besides, extensive cooperation with Canada, China, Japan, Russia and the United States in supporting ASEAN to build capacity in nuclear energy policy, technology and management. Together with technical experts on nuclear regulation, safety and emergency response; Public acceptance and safety are critical to building nuclear power plants in the region, including potential impacts on neighboring countries.

With initial success in developing renewable energy sources, many countries in the region invest in renewable energy projects but the ability to recover investment capital of the projects is still left open. , because these projects require large capital and high technical level. Many countries in the region still belong to the group of middle and low-income countries, so the investment capital for the renewable energy sector is small, if any, the ability to recover the initial investment if not. government support is hard to recover; The intellectual and technical level is not high to ensure the construction and development of renewable energy systems.

The strengths of solar energy of some countries in the region such as:

Brunei Darussalam has significant solar, hydroelectric and biomass potential, while Indonesia is focusing on developing geothermal resources.

Thailand has a special need to use new types of energy, as its abundant gas resources will be depleted within the next 10 years (Thailand energy agency report 2015). This means that Thailand will become dependent on imported fuels like Singapore, but with a larger number to provide a larger population and manufacturing facilities.

Indonesia has significant potential for developing geothermal energy as it has 40% of its geothermal resources globally. There are an estimated 276 locations throughout Indonesia.

The Philippines is seeking to triple its production from renewable energy sources from geothermal, solar, wind and biomass projects. In particular, the Philippines government towards the homes of people in the island of this country are fitted with solar batteries to create electricity for consumption to offset the shortage of energy here. In addition, wind power is also developed by the country from a \$ 315 million loan agreement with a number of national and international banks to fund wind power projects.





Vietnam is considered the most active member of ASEAN member countries in the exploitation of nuclear energy, has prepared the site, trained human resources and proceeded to establish a legal framework. The plan is to install three Russian reactors at Phuoc Dinh in Ninh Thuan province in the south, which is expected to begin construction in 2019.

Singapore is currently developing solar energy through investment cooperation with Microsoft to create a stable source of energy for Singapore. The agreement marks the first US technology company's renewable energy contract in Asia and the third in the world. Expect the deal to generate up to 60 MW of electricity, which will provide "enough electricity to more than 90,000 Singapore apartments in an hour."

### **3. Situation of factors affecting renewable energy consumption and economic growth in ASEAN**

#### **3.1. Objective factors**

*World trends towards developing renewable energy sources:*

Renewable energy sources are the general trend of the world, so ASEAN countries need to take strategic steps to attach the development of renewable energy sources to replace traditional energy sources. In addition, it is necessary to gradually replace traditional energy in business development in countries with renewable energy through renewable energy projects signed between countries. The partners are major investment corporations in the world.

*Depletion of fossil energy sources:*

The traditional energy source for production and daily consumption is increasingly exhausting, requiring alternative sources of renewable energy. The development of renewable energy sources, replacing traditional energy sources, has been studied and evaluated for a long time by scientists because the dependence on traditional energy sources will push the input prices of all raw materials. The production and consumption processes lead to the manipulation of countries with large non-renewable energy resources or inefficient use of these resources in poor and underdeveloped countries.

*Environmental Protection:*

The greenhouse effect is becoming ever more hot on the economic forums as well as the discussion and debate of nations. The greenhouse effect has caused many economic losses as well as difficulties for people's lives such as drought, pests, air pollution ... Therefore, developing renewable energy is a factor. determine the future environmental and economic coherence for a green and sustainable economy.





### **3.2. Subjective factors**

#### *Demand for developing renewable energy sources to replace fossil energy sources:*

ASEAN's economy has grown rapidly for many years, leading to the increasing demand for energy and the shortage of energy, which has been a common problem for ASEAN countries. These things have left the region facing energy shortages. However, coal or natural gas is not the fuel that the world is aiming at, but instead is a renewable energy source. Therefore, many Southeast Asian countries have implemented a series of measures to promote the development and use of clean energy and this is also the common goal of ASEAN. With renewable energy production costs falling by such methods as wind and solar, Southeast Asia is said to be facing a golden opportunity to meet the demand for energy development in a cost-effective manner. lasting.

#### *Commitment to implement the Kyoto Protocol:*

The countries of ASEAN have signed the Kyoto Protocol, which is an agreement on reducing greenhouse gas emissions, associated with the United Nations Framework Program on Climate Change (United Nations Framework Convention on Climate Change - UNFCCC). The Protocol requires participating countries to commit to achieving specific greenhouse gas emissions targets that are specific to each country. The Protocol was completed and opened for signature on December 11, 1997 in Kyoto, Japan. At the same time, the economic growth in the countries requires based on the general provisions of the Kyoto Protocol. Economic growth means countries need to ensure committed CO<sub>2</sub> emissions and have a common roadmap to reduce CO<sub>2</sub> emissions, so finding new sources of energy to replace traditional energy sources with emissions High CO<sub>2</sub> is a mandatory requirement for countries.

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