Master's Thesis of Public Administration

Sustainability in Energy Planning:
A Case Study in the Philippines

에너지 계획에서의 지속 가능성:
필리핀 사례를 중심으로

August 2017

Graduate School of Public Administration

Seoul National University

Global Public Administration Major

Codillo Rosalinda Gatongay

Sustainability in Energy Planning:
A Case Study in the Philippines

Academic Advisor Hyun Sub Kum

Submitting a master's thesis of Public Administration

April 2017

Graduate School of Public Administration
Seoul National University
Global Public Administration Major

Codillo Rosalinda Gatongay

Confirming the master's thesis written by

Codillo Rosalinda Gatongay

June 2017

Chair Byong Seob Kim (Seal)

Vice Chair Seok-Jin Eom (Seal)

Examiner Hyun Sub Kum (Seal)

Abstract

Sustainability in Energy Planning:

A Case Study in the Philippines

Codillo Rosalinda Gatongay
Global Public Administration Major
The Graduate School of Public Administration
Seoul National University

This research paper is a descriptive design study of the sustainability of the energy planning in the Philippines. As a very important tool in achieving sustainable development, the social, economic and environmental dimension of sustainability must be integrated in the energy planning process. By using the available energy indicators for sustainable development developed by the International Energy Agency (IEA), this paper tried to keep track and measure the progress of the countries' national energy system, that will help evaluate its performance and identify effective and appropriate policies to achieve the country's sustainable development goals.

For the purpose of possibly adopting successful strategies in promoting sustainability that are being implemented in the developed countries such as Korea, the trend or the historical performance of the energy indicators for both countries were measured and the result identified several gaps mostly on economic dimension of development and a discussion for the possible reasons behind the huge gap was presented. The comparison

helps identify the Philippines' energy planning's strengths and weaknesses and the factors that hampers the slow development of the country.

The performance of the Philippine energy systems covering the period 1973 – 2014 for the three dimensions was measured, not only in comparison with Korea's energy indicators as a developed country but likewise with the energy indicators of the equally developing countries in the Association of South East Asian (ASEAN) region. The comparison helps identify the level of integration of these energy indicators into the current energy planning process and helps assist energy planners to formulate appropriate policies in promoting sustainable development. Another way of assessing the level of integration is comparing the existing Philippine energy plan with Korea Energy Masterplan brief summary of the similarities and distinctions of the two energy plans was presented that helps identify the common indicators mostly used and integrated in the current energy planning process.

Finally, to achieve the sustainable energy development objectives, that is to realize a sustainable energy planning for the Philippines, several policy recommendations and suggestions were presented that will help pave a way for the possible integration of all those defined unavailable energy indicators. The assessment of the trend and the result of the study will likewise help and assist the government in reviewing the effectiveness of policies undertaken and formulate appropriate strategies to achieve its goals and objectives.

Keywords: energy planning, sustainable development, energy indicators, Philippine Energy Plan, Korean Energy Masterplan

Student ID: 2015-24455

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ASEAN	-	Association of South East Asian Nations
CO2	-	Carbon Dioxide
CSD	-	Commission on Sustainable Development
DOE	-	Department of Energy
EE&C	-	Energy Efficiency and Conservation
ECO	-	Economic
EISD	-	Energy Indicators for Sustainable Development
ENV	-	Environmental
ERA	-	Energy Reform Agenda
GDP	-	Gross Domestic Product
GHG	-	Greenhouse Gas Emission
IEA	-	International Energy Agency
IAEA	-	International Atomic Energy Agency
JPOI	-	Johannesburg Plan of Implementation
PEP	-	Philippine Energy Plan

TOE	-	Tons of Oil Equivalent
TPES	-	Total Primary Energy Supply
RPS	-	Renewable Portfolio Standard
SDGs	-	Sustainable Development Goals
SOC	-	Social
UN	-	United Nations
UNDESA	-	United Nation Department of Economics and Social Affairs

CHAPTER 1- INTRODUCTION

1.1. Background of the Study

The concept of sustainability has different meanings and can be viewed from different perspectives. Sustainability may be the income of the family for the household sector, it may refer to the good and sound business' financial status for the commercial sector or for the environmental point of view, the sustainability of the environment. While the world is continuously progressing, and people keep on searching for new technological advancements and new innovations for their prosperity, convenience and happiness, the sustainability of the environment should never be taken for granted. In spite of all these gains for convenience and the improvement of the people's quality of life, the protection of the natural environment, human and ecological health towards sustainable development, must be given the highest priority in the nation's development agenda.

The process of continuous improvement in the quality of people's lives is also known as Sustainable Development. The Brundtland Report of the World Commission on Environment and Development defined it as *"the development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*[1]. Sustainability concerns about the assurance of meeting the needs of the future generation while utilizing the present available resources. In achieving the sustainable development's goal of long-term stability, the inclusion or consideration and acknowledgment of the social, economic, and environmental concerns throughout the decision making process is extremely imperative.[2]

[1] ftp://ftp.fao.org/seur/ceesa/concept.htm

[2] https://sustainabledevelopment.un.org/content/documents/5839GSDR%202015_SD_concept_definiton_rev.pdf

The significant role of energy in human life's development has been established in many literatures. The availability and the provision of sufficient and reliable energy play a very significant role in providing goods and services that are needed to survive. The world now can enjoy a comfortable and convenient life through technological advancement, innovations and inventions through the use of energy. The improvement of well-being, the comfort and convenience, the improvements in safety and health, among others are all linked to the availability and access to energy. However, although energy is one of the major contributory factors in human development, it has also significant contribution to environmental degradation. It has a big role in global warming brought about by unrelenting consumption of fossils fuels like coal, fuel oil and natural gas.[3]In order to cope up with these challenges and to adapt to the changes in the world, it is important to consider the integrated approaches in the energy planning with the integration of the three important dimensions of development.

The study provides for the deeper insight into energy planning and how it can be used as a tool for implementing sustainable development, there is a need to establish the relationship between the planning theory and the principles of sustainable development.

1.2. Objectives

This thesis focuses on the national energy planning process in relation to achievement of sustainable energy development in the Philippines. The Department of Energy (DOE), by virtue of Republic Act 7638 or the Department of Energy Act of 1992, is *mandated to prepare, integrate, coordinate, supervise and control all plans, programs, projects and activities of the Government relative to energy exploration, development, utilization, distribution and conservation.*

[3] http://www.environmentalscience.org/sustainability

The aim is to discuss whether there is a need for the existing energy planning process to be developed or enhanced in such a way that it can integrate into the process the sustainability of the Philippine energy system. With the current global concerns about sustainability, the author believes that it is imperative to have the energy planning system/process adapted or be in tune to the growing energy demand, volatile energy prices, technological advances, growing environmental concerns and other limitations, as a tool for sustainable development. The overall objective of the thesis is to examine the level of integration of energy sustainability objectives in the Philippine planning process in terms of the numbers of energy indicators for sustainable development developed by the International Energy Agency (IEA).

To examine whether the energy planning system has weaknesses inherent in conventional energy planning methods used and suggests how these methods can be improved. Furthermore, this thesis attempts to suggest the necessary energy indicators needed to be integrated in the planning process and to suggest long-range policies to help steer the country's national energy planning system in the right direction by employing the best available practice in the planning process.

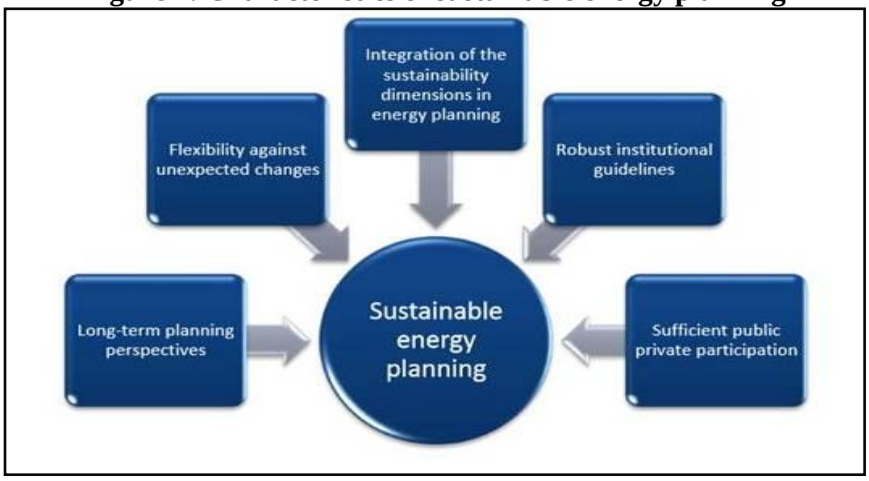
1.3. Problem Statement

The DOE, prior to submission of the Philippine Energy Plan to Congress every 15th of September of each year, is mandated to conduct a series of public consultations to be participated in by different stakeholders, local officials, interest groups, non-governmental organizations, among others. During these occasions, comments and inputs are solicited from among participants for integration and improvement of the Plan. Among the comments that was normally solicited from among the stakeholders concerns about the adoptability of the plan to the present situation. This concern brings the situation to a scenario where the energy plan should be responsive to the changes and

challenges such as global warming, climate change, high price of electricity, and lack of access to electricity and poverty, among others. In consideration of these many issues, the three dimensions of sustainable development must be carefully considered in a most sustainable way.

In the Philippines, as a developing country, a sustainable energy planning as a tool for sustainable development is extremely necessary that will comprehensively assess the country's utilization of energy andits activities in the past, the formulation of future objectives, and determines the programs that will be most effective for the achievement of its goals. Energy plans are necessary and considered to be valuable tools in identifying opportunities for improvement, an effective way to evaluate the effectiveness of strategies and provide methods how to achieve the goals identified for the improvement.[4] In this study, the researcher would like to investigate whether the Philippines possesses the following characteristics, particularly the integration in the energy planning process of the different dimensions of development as shown in the diagram[5] below:

Figure 1: Characteristics of sustainable energy planning



Source: On Sustainability in Local Energy Planning, Farhad D. Rad

[4] http://www.mapc.org/system/files/bids/Create%20a%20Local%20Energy%20Plan.pdf
[5] On Sustainability in Local Energy Planning, Derakhshan, Farhad, Lund University, 2011

1.4 Research Question

The researcher would like to answer the following questions: "*Is the Philippine energy planning in accord with the sustainable energy development objectives?* What is the level of integration of sustainable development indicators in the energy planning process with respect to the different dimensions of sustainable development?

Sub-Questions:

1. In comparison with other countries, such Korea and other neighbouring countries, what is the trend of the Philippine energy development with respect to the three dimensions of development?
2. What are the characteristics of the Philippine energy planning and which needs improvements?
3. How can the four (4) dimensions of sustainable energy planning and which needs improvements)

1.5. Significance of the Study

This study will be beneficial to the government of the Philippines and will have a significant contribution on the following areas.

1. As a research output – it can be expected that anyone can obtain information that is reliable on matters relating on the sustainability of the national energy planning
2. As a material for future research program – the researcher and academicians hope that the study will contribute significantly to the researchers that focusing on the sustainable development and sustainability of the national energy planning in the Philippines
3. As an input to the formulation of future policies of the government on the formulation and preparation of the national energy plans. - It provides the necessary guidelines on the how to achieve sustainability of the national energy planning thereby achieving the sustainability of the energy related objectives.

1.6 Research Outline

This study consists of Five (5) Chapters:

- Chapter 1 focuses on the overview of the research problem, its purpose and objectives. The research questions and hypotheses are highlighted as well as the significance of the study.
- In Chapter 2, a review of the related literature is discussed highlighting the relational aspects of the concepts.
- Chapter 3 provided for the theoretical framework and discussion on the research methodology including the identification of research design and approaches, data collection and the method of analysis was also presented.
- Chapter 4 provides for the presentation, analysis and interpretation of data.
- Chapter 5 provides for the conclusions and recommendations.

CHAPTER 2 – REVIEW OF RELATED LITERATURE

2.1. The concept of Sustainability

Literature provides for many different views on what the concept of sustainability is all about, with different concepts of sustainability as well as the ways or strategies by which these goals of sustainability can be achieved or realized. The most well-known and recognized definition of sustainability is the one defined in the Brundtland Report of 1987 which provides that "sustainable *development which meets the needs of the present without compromising the well-being of future generations"*. In this report, sustainability was defined in such a way that there is a need for balancing between the provision of 'needs' for the survival of the poor people in this world and keeping the sustainability of the planet earth and addressing the ability to meet the present and future needs of human race.[6]

Aside from this definition, there are also other definitions provided in many literatures. According to the World Commission on Environment and Development, sustainability is "*a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations".*

According to the Forum for the Future, "*Sustainable development is a dynamic process which enables people to realise their potential and improve their quality of life in ways which simultaneously protect and enhance the earth's life support systems*".[7]

[6] *Our Common Future*, by the World Commission on Environment and Development, 1987, p. 43.
[7] http://www.globalfootprints.org/page/id/0/5/

The world is continuously growing its population, and as population grows, demand for basic needs also grow, the demand for food and employment also grow, and if the country is poor and underdeveloped, mostly likely it will be difficult for the government to provide these basic needs to its people. So too much population could be a hindrance to economic development of the nation. To support the world's growing population, a sustainable model must be developed that will help achieve the goals on sustainability and as part of this efforts, there is a need to revisit the existing policies on environmental protection, their existing strategies and initiatives to adopt to the present situation, as well as their economic practices and social responsibility policies and rules to adjust to the ever-changing world.

Many literatures likewise established the existence of three (3) pillars of sustainability, the environment, economic and social dimensions. For environmental sustainability, it is important that the natural resources be properly managed, minimize the impact of the energy use to the environment as much as possible, minimize pollution, and maintain rates of renewable energy resources, among others. For economic sustainability, decisions which have something to do with economic prosperity and will give a long term impact on the economy must be done in a most reasonable and sensible manner. There must be some kind of indefinite capability or ability of economic production as well as the prudent financial disbursement and disposition of resources, among others. For social dimension, the promotion of peaceful, healthier and better society for present and future generation. The latter should likewise enjoy the same quality of society that the present generation is enjoying or even greater, so that the making of decisions, effecting actions and implementing policies must be geared towards the improvement of a sustainable society. [8]

[8] *http://thwink.org/sustain/glossary/Sustainability.htm*

2.2. Energy's relation to sustainable development

It has already been established in many literature that energy plays a very significant role in sustainable development. Energy fuels the economy, economic activities requires energy, technologies and innovations requires energy, and in improving the quality life of the people, giving them the basic needs and services also requires energy. Life's comfort and convenience also necessitate energy, like access to electricity. Nowadays, despite of this modern age, there are still many parts of the world that do not have access to electricity and still living in darkness. And there are also still many others problems like, air pollutions, the environmental degradation, health problems due to the use of unsustainable fuels, among others. All these benefits derived from the use of energy must be sustained and issues must be resolved. To realize the goal of achieving sustainability in all the different dimensions, there is a need to balance the energy requirements and the needed modern energy services or the demand for such services with its effect on the environment.

There are already pronouncements that the current levels of energy consumptions and productions are not anymore sustainable if the demand will continue to increase[9]. It was likewise highlighted the importance of using energy resources in such a way that its use will protect the atmosphere, human health, and the natural environment.

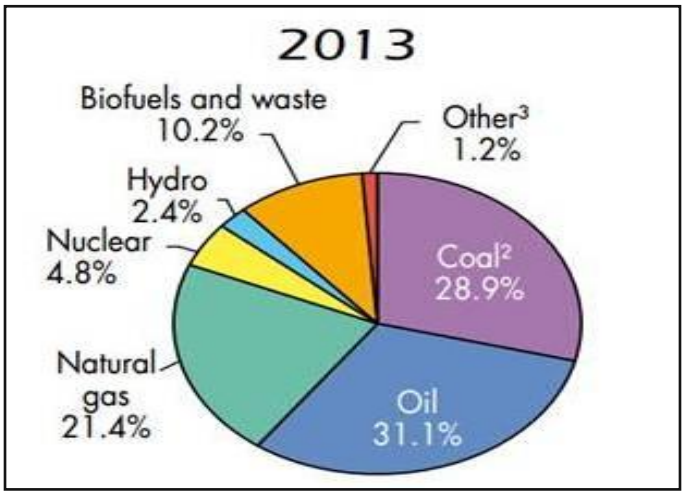
In pursuit of the objectives of sustainability, an agreement was forged among countries to give stronger emphasis on cleaner energy, efficient energy technologies and expanded role of alternative energy sources[10]. Further, the improvement of the access to reliable, affordable,

[9]United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992, Agenda 21

[10](9th session of the Commission on Sustainable Development (CSD-9) in 2001).

economically viable, socially acceptable and environmentally energy for all is one of the development goals. In fact, the United Nations (UN) initiated programs and issued resolutions on energy sustainable development and proposed a set of sustainable developments goals (SDGs) for energy under SDG #7 which calls to "ensure access to affordable, reliable, sustainable and modern energy for all".[11]It has been established that energy plays a very important role in sustainable development. An adequate and affordable energy supply is necessary in pursuing modern and service oriented societies. Figure 2 below shows the world's total primary energy supply by fuel for 2013.

Figure 2: World's total primary energy supply by fuel



Source: (OECD/IEA, 2015)

The share of fossil fuels such as coal and oil has the biggest chunk, contributing 28.9% and 31.1%, respectively. The renewable energy sources' share in the mix is still slow with biofuels and wastes' share of 10.2 percent, hydropower with 2.4%. Nuclear has 4.8% and Natural gas 21.4%.[12]

[11]https://sustainabledevelopment.un.org/topics/energy

[12] https://www.iea.org/publications/freepublications/publication/KeyWorld_Statistics_2015.pdf

The sustainable path is not shown in the balance between the non-renewable and renewable energy sources. Fossil fuels like oil and coal dominates the mix and a little share from renewable energy. The patterns in the next century are dictated by the patterns and changes of today.[13] So it is important to make sure that the actions and decisions in this present generation will result in the provision of sufficient and secure energy supplies for future energy needs.

2.3. Sustainability dimensions in relationship with energy

As discussed above, the concept of sustainability is related to the interconnected spheres of development namely, environmental, economic, and social aspects. These three dimensions are balanced and aimed at developing human well-being. As population continuously growing so also their needs are growing, the balanced dimensions are likewise constantly changing. Since the dimensions of sustainability are not independent of one another, the constant balancing act of sustainability makes it a dynamic concept rather than a static state (Peace, 1999)

The UN Conference on Sustainable Development in 2012 produced an outcome document which called for the commitment of many countries to detailed or specific actions for the achievement of sustainable development to include universal access to energy, the formulation and development of sustainable development goals (SDGs) to include or integrated into the successive framework of Millennium Development Goals (MDGs). It recognizes the availability of the energy services and access to it as a very crucial factor in solving or addressing many of

[13] http://www.un-documents.net/ocf-07.htm

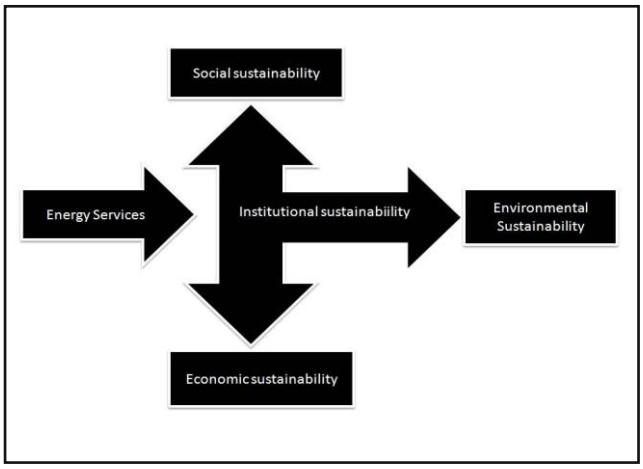
today's global issues as well as the key development challenges existing in the international community.[14]

The general concept of sustainability deals with the relationship between human activities and the living environment. These activities, with the aim of developing human well-being, affect the natural environment. Sustainability is actually a balancing act between the social, environmental and economic dimensions of human needs

The unsustainable or unsound manner or pattern of how energy is being produced and how it is being used or consumed will not only give a negative impact on human health and in the quality of life of the people but also threatens and affect the ecosystems that most likely contribute to climate change. Sustainable energy then can be a good engineor mechanism in reducing poverty, promote social progress and equity, enhanced resilience, social and economic growth, and environmental sustainability. [15] Without energy, small and medium businesses or enterprises cannot function at maximum capacity**.** Without energy, industry cannot survive. Without energy, women and girls will continue to spend long hours looking for fuel sources, and will not have jobs. [16]

[14]https://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Women_and_Youth/GUIDANCENOTE_FINAL_WEB.pdf
[15] http://www.undp.org/content/undp/en/home/ourwork/climate-and-disaster-resilience/sustainable-energy.html
[16] Kandeh K. Yumkella, UNIDO Director General, April 2013

Figure 3: The model of energy and sustainability dimensions



Source: On Sustainability in Local Energy Planning, Farhad D. Rad

2.3.1. Energy and the environmental dimension

In many scientific literature reviews, the relationship between energy, the environment and sustainability has been explained. Energy and environment are directly related to each other. All energy production and consumption has environmental impacts. In the process of development, energy plays a big role and as energy is produced and utilized, the natural environment is affected. The improper exploitation of energy resources and its inefficient use has negative impact on the environment and this has become a very important global issue over the last decades.

In pursuing sustainable economic growth, it is imperative that the environment must be protected and energy resources must be used in an efficient and sustainable manner and this must be made an integral part of the development process. [17] It has been established that natural resources of the earth are limited, thus achieving environmental sustainability requires a rational use of natural resources.

[17] http://ec.europa.eu/environment/integration/energy/index_en.htm

Environment and natural resources must be managed properly. The ecosystem must be protected and we have to try to minimize as much as possible the negative effect of any economic activity on the environment. As much as possible, any uncalled for disturbances to the environment should be prevented, and in the event disturbances cannot be avoided, it should be mitigated to the maximum practicable extent. [18]

With what the world is experiencing today on environmental degradation, it can be inferred that the current energy supply/use patterns are not functioning in an appropriate sustainable manner, and energy plays a very important role in sustainable development. Under the scenario, the decision and actions of higher authorities are very important. The environmental impacts of the proposed outcome or result of their decisions should always be considered.

2.3.2. Energy and Economic Dimension

From economic point of view, the function of energy in the process of development covered a wide range area from supply or the production to the use of energy in communities. Almost all parts of the society from small to the biggest infrastructure, transportation, markets, manufacturing, social welfare, among others are influenced by the strong relationship between energy and economic activities (D. Rad, 2008).

Economic sustainability concerns about producing goods and services on a continuing basis. In the production of these commodities, energy is used. For energy policy-making, energy intensities by economic activities are used. It is the ratio of energy use to GDP and may also be called "aggregate energy intensity" or "economy-wide energy intensity".

[18] https://soapboxie.com/social-issues/The-Environmental-Economic-and-Social-Components-of-Sustainability

The term "energy intensity" is also used for ratios of energy use by the different economic activities to output.[19]

In the industrial and manufacturing sector, which is considered the most energy-intensive sectors, energy is the key element. The rate of energy consumed per production or also known as the energy per GDP ratio can be considered as an appropriate index for the economic growth rate of a country. In fact, it is one of the economic indicators used in assessing the level of economic development of a country.

In a study of causal relationship between energy consumption and GDP Growth, it was found out that different income levels of the country affect the relationship between energy consumption and economic development. The study shows that, for the rich people or the high income class, there is a great environmental improvement as a result of more efficient energy use and reduction in the release of CO2. However, in the upper middle income group countries, after the energy crisis, the energy efficiency declines and the release of CO2 rise. The study recommended that since there is no evidence indicating that energy consumption leads economic growth in any of the four income groups, a stronger energy conservation policy should be pursued in all countries.[20]

At any rate, in pursuit of economic sustainability, the decision making of all the governments worldwide is very important. They should be made in a most equitable and fiscally sound way possible while considering the other aspects of sustainability, especially in the conduct of activities and use of energy, which is a fundamental factor in the development (Ockwell, 2008).

---

19 http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/consumption_production/energy_use_intensity.pdf

20 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2484437

2.3.3. Energy and the Social Dimension

The concept of sustainability concerns about the promotion of the betterment of society. To make the society sustainable and functional, there are so many components and principles to be considered. Meeting the basic needs of all groups in the society is one fundamental aspects of equity (Baines et al., 2005).

The primary development challenge of providing adequate food, shelter, clothing, education, health care, water, sanitation and access to information has a lot to do with the provision of energy services. The provision of basic needs is directly linked to the use of energy such as cooking food, having a comfortable living temperature, the use of lighting and appliances, educational aids, communication, transport, and many others. Energy also fuels productive activities, including agriculture, commerce, manufacture, industry, and mining. Therefore, the lack of adequate energy inputs can be a severe constraint on the development[21] and thus energy can be a dimension or determinant of poverty and development.

Social development, as one of the three pillar of sustainable development, is the one which is often marginalized. In this modern world, there are social problems that are related to energy use like poverty or the quality of life, lack of access to electricity, and health. There are still about 1.5 billion of the world's population still have no access to electricity. There are still those who are using unsafe network of about one billion. And about 3 billion people use only biomass to prepare food and provide heat. This means that over 40% of the world's population have problems accessing energy. [22] Energy clearly plays a significant role in achieving social

[21]http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Sustainable%20Energy/ wea%202000/chapter2.pdf

[22] http://www.leonardo-energy.org/blog/sustainable-energy-definitions-focus-and-social-dimension

2.3.4. Energy and the Institutional Dimension

The objectives of sustainable development are defined for the economic, social and environmental dimension, but for effective compliance as well as for sustainability characteristics such as justice or participation they must be complemented by core institutional objectives.[23]

In order to measure the effectiveness of the relevant institutions, the central role of institutions as a tool for implementation of sustainable development and assigning clear tasks to institutions, e.g., organizations of the UN, intergovernmental as well as national, regional and local governments is very important(Pfahl, 2005). Although no clear definition of institutions can be found in Agenda 21 or in the UN's manual on institutional indicators, it can be seen in both documents that institutions are recognized as political or social organizations with legal personality and staff that are involved in policy-making or implementation. [24]

To facilitate the transition towards a more sustainable development, governance should be aligned with the requirements of global sustainability. Institutions influence the governance of sustainable development. At the global level, the economic dimension of sustainable development is probably the best represented in institutional terms. The social dimension, while of a somewhat lower profile, is also well represented through a variety of governance structures. [25]

The institutional setting is a critical component of sustainable development in which development policies are conceived, funded, implemented and managed (Brinkerhoff and Goldsmith, 1990).

[23] http://onlinelibrary.wiley.com/doi/10.1002/sd.184/abstract

[24] https://www.researchgate.net/publication/303445576_Stefanie_Pfahl_Institutional_Sustainability

[25] UNEP Foresight Process on Emerging Environmental Issues (UNEP 2012a)

2.4. Energy Planning – a tool for sustainable development

Like sustainable development, energy planning is defined in many ways.One common definition is that energy planning is the process of developing long-range policies to help guide the future of a local, national, regional or even the global energy system.Energy planning preparation and activities are mostly or oftentimes conducted within Governmental institutions but may also be conducted by large energy companies such as electric utilitiesor oil and gas producers.Energy planning may be conducted in such a way that different stakeholders drawn from government agencies, local utilities, academia and other interest groups may provide inputs and suggestions for a better energy planning.[26]

2.4.1. Sustainable Energy Planning

Energy planning in a sustainable way is very important in achieving sustainable development. In this modern world, where demand for energy keeps on increasing, the advances in modern technologies, scarcity and limitations of resources, it is necessary to develop a rational planning and policy-making methods for the realizationof sustainable development. The changes in the society affects the demand and supply of energy and its complex relationship with some other factors like institutions, economy, and environment, are all part of the process of planning and managing a cost-effective sustainable development.

2.4.2. Characteristics of sustainable energy planning

Sustainable energy planning should consider several factors in the light of the threat of the worsening condition particularly the issue on global climate changemainly attributable to greenhouse gases emissions from the world's energy systems. With this development, global

[26] https://en.wikipedia.org/wiki/Energy_planning

integration of energy supply systems and local and global environmental limits amplifies the scope of planning both in subject and time perspective. Sustainable energy planning should take a more holistic approach to the problem of the planning for future energy needs. [27]

Conventional energy planning methods generally concerns about energy supply and use, and ending with set of policies to meet future energy needs. However, these methods can hardly integrate all energy-related aspects into the energy planning process. Existing planning methods maybe able to address some economic and environmental aspects, but they lack the capacity to cover all energy-related issues simultaneously. Further, conventional energy planning methods are also sensitive to upcoming changes in their surrounding environment. In other words, they could easily be influenced by factors like energy market fluctuations, the political systems and new technologies.

There are factors that need to be considered in energy planning to be sustainable. First, energy plan should have a ***long-term planning horizon*** (Thornqvist, 1980).The time horizon serves as a future frame-border, whose dimension is time. The time horizon indicated in the strategy becomes a durable future border. Many advantages related to the selection of a long-term time horizon of a strategy[28] can be seen in many literature reviews. For one, the energy infrastructure like natural gas pipelines and energy distribution facilities can technically be in service for up to 30 years.

Another factor is that energy planning should be ***flexible against unexpected changes.*** There can be technological advancements and changes in the energy use within the planning period, the plan should be flexible on these changes. ***Public private participation*** is also essential in the sustainability of the energy planning. According to Webler and Tuler

[27] https://en.wikipedia.org/wiki/Energy_planning
[28] http://www.joebm.com/papers/174-W00011.pdf

(2006), a good (planning) process should consider readily and openly share information among all stakeholders and people, and should propose the best scenario in which all participants' interests are satisfied. Likewise, support for the proposed policies could be secured if there are dialogs between experts and ordinary citizens whose involvement are recognized from the early stages of the planning process. Another is the ***robust institutional guidelines*** that will guide the process especially when coping up with different challenges and issues. The challenges and issues facing the conventional energy planning methods should be addressed through the integration of the sustainability dimensions in energy planning.

2.5. Energy Planning in the Philippines

Energy has always been on top of the Philippines' economic and political agenda. As a cornerstone of modern society, energy empowers economic growth and development. With living standards on the rise due to population growth, rapid urbanization and improving economy, the country's ever-growing energy demand must be satisfied in a sustainable way.

The Philippine Energy Plan, which the government requires to formulate on a yearly basis, defines the overall energy sector policy framework of the country, puts premium on the role of having a diversified energy mix at par with the dynamism of the energy sector. Specifically, embodies the country's major plans and programs, the prudent assessment of major energy trends and development, as well as energy challenges and issues that need to be addressed within the planning period. The Plan puts priority on the delivery of energy access, promoting energy efficiency, utilizing renewable and alternative energy resources and promoting the entry of new investments in energy infrastructures that is expected to give millions of Filipinos individual choices that will help

provide proper balance of supply and demand that the Philippine economy needs.[29]

2.5.1. The Philippine Energy System

Philippine Energy Plan (PEP) formulated by the Department of Energy (DOE), is the government's energy plan for 2012-2030 to alleviate poverty and to promote better quality of life for the Filipino people will ensure the delivery of secure, sustainable, sufficient, affordable and environment-friendly to all economic sectors. The ERA has outlined the following major pillars as its overall guidepost and direction: (a) Ensure energy security through the development of indigenous energy such as renewable energy and hydrocarbon fuels (oil, gas, and coal); (b) Achieve optimal energy pricing in electricity and oil; and, (c) Develop a sustainable energy system through the formulation and update of national plans and programs. The energy planning process was guided by ERA which is consistent with the national development directives such as the President's Social Contract, the Philippine Development Plan; and, responsive to long-term (beyond 2016) global policy frameworks on energy such as the UN Sustainable Energy for all initiatives and APEC Green Growth goals.

For the power generation in 2012, the gross electricity generation in went up by 5.4percent from previous year's level of 69 percent. For overall barangay electrification, the level in 2012 stood at 99.99 percent with only six (6) remaining to be energized. These barangays are located in the Autonomous region. When it comes to household, electrification stood at 76.69 percent with 16,114,213 out of 21,010,890 households already provided with electricity. In the case of sitios, 87,474 out of the 122,983 potential sitios had access to electricity.

[29] The Philippine Department of Energy, Philippine Energy Plan

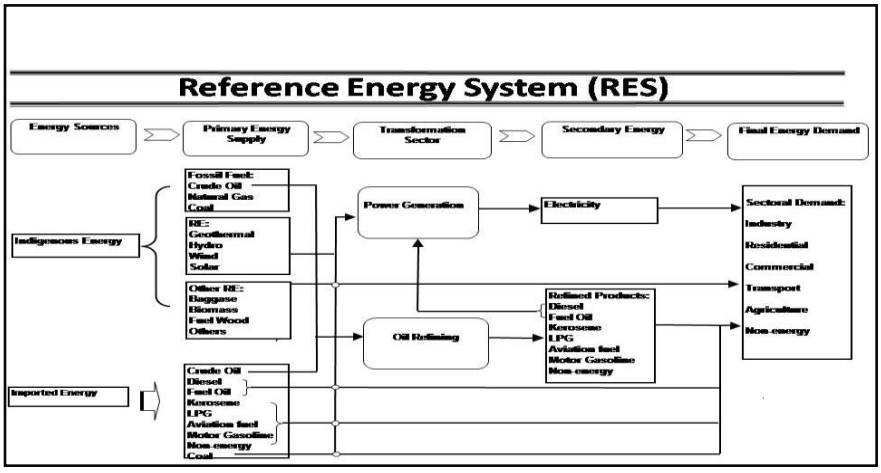
For the indigenous energy supply, coal remains to be a leading contributor to the country's energy supply, the government continues to optimize the exploration, development, production and utilization of indigenous coal reserves. In 2012, indigenous coal production (run-of mine) was recorded at 7.4 million metric tons (MMMT).

For the downstream oil sector in 2012, there werea total of 1,908 players engaged in various activities like marketing, distribution and storage. In the production of biodiesel for the transport sector, production reached 137.88 million liters, while that of bioethanol was at 32.44 million liters. In the area of compressed natural gas, there are 41 CNG public utility buses commercially operating along South Luzon routes. Under electric vehicle program, on the other hand, there are about 20 e-trike units in Mandaluyong City. On the promotion of energy efficiency and conservation (EE&C) as a way of life for Filipinos, the country was able to save 4.70 under the NEECP program.

On energy supply, oil will still be the primary fuel source with an average share of 28.2 percent to the total energy supply and with an average growth rate of 2.1 percent in the Business As Usual (BAU) scenario. However, under Low Carbon Scenario (LCS), the share of oil is expected to decline. Natural gas, on the other, is seen to contribute an average share of 9.0 percent to the total primary. Coal, however, will contribute an average share of 30.1 percent to the country's primary energy supply under the BAU and will increase at a rate of 7.2 percent. Likewise, contribution from Renewable Energy will grow at an annual average rate of 0.8 percent (and with average share of 32.6 percent). The passage of Renewable Energy Act of 2008 strengthens the policy of the government to accelerate the exploration and development of RE resources in the country. With this, around 9,300 MW from indicative and potential RE resources.

Figure 4 below shows the Reference Energy System (RES) which provides for the process how the energy system works in the Philippines. From the energy sources, we classify the primary energy supply of the country, pass through transformation process to produce secondary energy and determine the final energy demand. The indigenous energy are classified into fossil fuels which consists of crude oil, natural gas and coal and the renewable energy consisting of geothermal, hydro, wind, solar and other RE like bagasse, biomass, fuel wood and others. Transformation sector consist of the power generation and oil refining which produces finished products such electricity and refined or petroleum products. It is likewise accounting for imported energy that also pass through the process which responds to sectoral demands of industry, residential, commercial, transport and agriculture.

Figure 4: Reference Energy System (RES)



Source: Department of Energy

2.5.2. The Role of the Department of Energy

In response to the power crisis in the 1990's, the Department of Energy (DOE) was created under Republic Act No. 7638 otherwise known as the Department of Energy Act of 1992. Under the law, the DOE is tasked to prepare, integrate, coordinate, supervise, and control all

plans and programs, projects and activities of the Government relative to energy exploration, development, utilization, distribution and conservation.

Specifically, the DOE is tasked to formulate policies for the planning and implementation of a comprehensive program for the efficient supply and economical use of energy. These policies must be in accord or consistent with the approved national economic plan. Likewise, the DOE is mandated to develop and update the existing Philippine energy program, promote the exploration, development, utilization, distribution and conservation of energy resources while at the same time formulating policies that will have a preferential bias for environment-friendly, indigenous, and low-cost sources of energy. Also, the government provides policy direction on the privatization of the government agencies that play a significant role on energy development. It likewise formulates related policies on deregulation of the power and energy industry and reduction of dependency on oil-fired plants, among others. The Plan is submitted to the Congress of the Philippines not later than the fifteenth day of September every year thereafter.[30]

[30] http://www.lawphil.net/statutes/repacts/ra1992/ra_7638_1992.html

CHAPTER 3- RESEARCH METHODOLOGY

3.1. Introduction

This chapter embodies the framework and the research model used in this paper as well as the data collection methods and techniques to come up with a more realistic and appropriate policy lessons. This study utilized the information and data available in books, journals, surveys and websites and from other relevant sources where the researcher could get all the necessary data to elaborate the theoretical basis for this study. The different steps and methods used to maintain the validity and reliability of the data was presented.

3.2. Research Methodology Approach

The research approach or methodology deemed most appropriate was used in this study. A qualitative approach adopting both descriptive case study design and interpretative method was used and presented in this paper. A descriptive analysis of historical data will be used to answer the research questions. The key variables will help to understand the sustainability in energy planning in the Philippines for the promotion of sustainable development. The paper starts with the comparison of the historical energy trends using the International Energy Agency's (IEA) recommended energy indicators between Philippines and Korea and continues to compare the indicators with that of Association of South East Asian Nation (ASEAN) member countries.

3.3. Data Sources and Time Frame

The goal of this study is to determine the level of integration of the energy indicators for sustainable development in the energy planning process in the Philippines. The description of the trend for the period 1974-2014 of the energy planning system in the Philippines for the promotion of sustainable energy planning. The focused was on the energy

indicators for the three dimensions of sustainable development. In that sense, data was obtained from the International Energy Agency.

Likewise, secondary data from the Philippines and Korea was used, particularly the Philippine Energy Plan 2012-2030 and Korean Energy Masterplan for 2008-2030 and energy data of the ASEAN member countries also published by IEA. A comparison of the trend of energy indicators available that is common to all Association of South East Asian (ASEAN) nation member countries to identify the level and the trend of energy development as well as the integration of these indicators to the energy planning process. The approach is based on identification of a set of indicators provided by the International Energy Agency (IEA).

3.4. Research boundaries and limitations

As discussed in the preceding chapter, sustainable development has four dimensions, economic, environmental, social and institutional. Energy planning deals with a wide range of various aspects within the ambit of these dimensions. This thesis is focused only on the evaluation of the trend of the energy indicators available for the countries concerned, and the level of the integration of these indicators in the energy planning process. The energy data analysis is limited to the data available for comparison with the time frame 1973-2014.

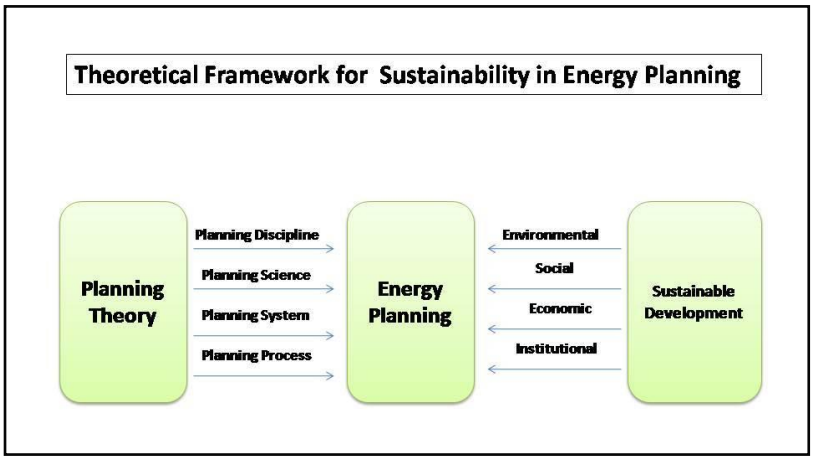
Two major limitations affect this paper. One, not all energy indicators provided in the IESD list are available in the Philippines, therefore that analysis of data shall be focused only on the indicators that are available in the country. Second, the comparison covers only the case of Korea and other ASEAN member countries.

3.5 Conceptual and Theoretical Framework

The chapter provides for the discussion to understand the relationship between energy planning and sustainability aspects based on two theoretical pillars: *Planning Theory* and *Well-defined principles of*

Sustainable Development. In the conceptual framework shown below, there is the network of links between planning theory and the principles of sustainable development. The logical structure of the energy planning is explained as well as the principles of the sustainable development consisting of the four (4) dimensions, social, economic and institutional principles of sustainable development being integrated into the planning process. The author adopted the theoretical framework used in the study *of Dr. Farhad D. Rad, in his paper On Sustainability in Local Energy Planning* with the diagram shown below:

Figure 5: Theoretical Framework for Sustainability in Energy Planning



Source: On Sustainability in Local Energy Planning, Farhad D. Rad

3.5.1. Planning Theory

As framework starts with the definition of the planning theory, it is also essential to discuss first the concept of Planning. Planning is defined a method of making a rational decision, a method which is common to many areas and is used in many different fields. However, planning methods and techniques is a broad term and has become the subject of many studies which makes the planning theory more complicated.

The **planning theory,** as a system approach, provides that the general interactions between the *planning process* and *surrounding environment* are a part of a social guidance system (Faludi, 1973). According to Faludi, planning theory explains the planning processes performed by societal guidance institution that have in common including their systematic variations and this definition should be general enough to cover all the specific areas of planning application (Faludi, 1973; Friedman, 1987*).* According to Faludi, a specific theory of planning should explain how the activities of a particular planning system relate to a general theory of planning. However, some scholars argue that it is not easy to define planning theory because of the following (Campbell and Fainstein); ***First,*** planning theory appears to overlap with theory in all the social science disciplines, and it becomes hard to limit its scope or to stake out a turf specific to planning; ***Second,*** the boundary between planners and related professionals (such as real estate developers, architects, city council members) is not mutually exclusive: planners do not just plan, and non-planners also plan; **Third,** the field of planning is divided among those who define it according to its object (land use patterns of the built and natural environments) or its method (the process of decision-making); ***Fourth,*** many fields are defined by a specific set of methodologies; yet planning commonly borrows the diverse methodologies from many different fields, and so its theoretical base cannot be easily drawn from its tools of analysis.

With all of these reasons, there was some kind of disagreement as to the scope and role of planning and some issues as to who really the planner is which brought some difficulty on the demarcation and description of an appropriate body of theory. However, many scholars would argue that the composition of the economy and policy would really rely on the content of the planning theory.[31]

[31]http://www-personal.umich.edu/~sdcamp/up540/theoryintro.html

Another scholar developed new perspectives on this theory. He classified the planning traditions into five parts, the synoptic, incremental, transactive, advocacy and radical planning. These classifications have their own characteristics in which the scholar believes that these are sufficient to address various issues that planners may identify. He further stressed that planners should have the ability to adjust or mix the different approaches in order to respond to the diversity and complexity of problems (Hudson, 1997).

Planning theory was further detailed into four (4) traditions or ***planning disciplines*** namely, *social reform* which concerns about the disciplines of sociology, institutional economics, and pragmatism, *policy analysis* which is the disciplines of systems analysis, welfare and social choice and policy science, *social learning* includes the field of organization development and *social mobilization* which includes neo-Marxism, the Frankfurt School (critical theory) and a category called utopians, social anarchists, and radicals. Under this approach, the major object of planning theory is to solve the *"meta-theoretical problem of how to make technical knowledge in planning effective in informing public actions*". However, this approach of Friedmann (1987) was considered to have a more sophisticated understanding of planning theory too complex to be bounded. According to Allmendinger (2002), Friedmann was pluralizing the theory by putting some additional meaning to it instead of addressing why it was happening.

Another viewpoint on Friedmann's approach was of Archibugi (2008) who believed that such approach was expanded the scope of planning theory too much. He argued that this definition is developed over a very broad area of vast boundaries that "could *be at the root of the regretted loss of identity of planning theory itself*" and further stressed that planning theory should exactly be the opposite. Following on the vast

trends of the debate on the planning theory, Archibugi created a logical framework that could guide the way to a better incorporation of the different planning methods or a *unitary methodological scheme*. Looking at planning as a trans-disciplinary activity of various disciplines (urban, economic, social, development and operational), it must be emancipated from the conditions of other disciplines by taking a unified approach to a new discipline of '***planning science'*** or ***Planology***. The logic of this approach among others, are to detailed and build up the unitary procedure scheme in the preparation of the plans, with the relative indication of phenomena (variables) to be measured the various phases of preparation of a typical integrated plan; also to strengthen the define schemes of the systematic inter-relationships between the various levels of planning and thus of the various plans. On the same manner, this method is intended at preparing and implementing the plans, a common procedural framework with distinctive functions that is called ***planning process***, which is based on two main categories of **selection** (or choice of plan) and **implementation** of a plan (Archibugi, 2008).

The selection and implementation was considered a simplified and useful working system that can be used at every level of planning. Archibugi used this working system to model his ***planning system*** with two subsystems: planning selection and planning implementation. The planning selection model is divided into three (3) dimensions to include *aims to utility or welfare* (basic needs, health, etc), *policies and means* and *territorial distribution or which refers to communities, among others*). The implementation planning model, on the other hand, consist also of three (3) dimensions such as the *policy institution* (governmental institutions, agencies by type of services), the *societal or civil institution* (non-governmental institutions, etc) and *territorial institutions* (national agencies, urban agencies, etc). Archibugi used these planning models as a basis to take his approach to the new planning discipline called

'*planological integration'*. This approach concerns about the incorporation between economic, social and technological system, between systems of economic and systems of social accounting; the integration between planning systems and technological forecasting; the integration between socio-economic planning and physical (environmental/spatial) planning; the integration between socio-economic-physical planning and institutional public planning and the integration between institutional public planning and collective bargaining with private and independent planning and projecting.

These areas cover the important areas of societal and environmental systems that are in direct relation with human development.

3.5.2. Principleof Sustainable Development

The publication of *Our Common Future,* a report of the World Commission on Environment and Development (WECD) in 1987, brought the phrase '*sustainable development*' to worldwide recognition. The report defines sustainable development "a *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".[32]

The two concepts in this definitions concern about the essential needs of the world's poor to whom highest priority should be given and the concept of limitations being charged by the state of technology and social organization against the environment's capacity to meet the present and future needs of people.

In pursuit of sustainable development requires:

- A political system that assures the participation of the people in the decision making process;

[32] On Sustainability in Local Energy Planning, Derakshtan, Farhad, Lund University, 2011.

- An economic system that is capable of producing surpluses and technical know-how on a self-reliant and sustained basis;
- A social system that creates solutions for the pressures occurring from disharmonious development;
- A production system that respects the obligation to preserve the ecological for development;
- A technological system that can explore continuously for new solutions;
- An international system that fosters sustainable patterns of trade and finance;
- An administrative system that is flexible has the capacity for self-correction (p.65)[33]

It has already been established the three components of the sustainable development: environment, society and economy. The three aspects were discussed as follows (Harris, 2000):

- **Economic:** An economically sustainable system must be capable to yield goods and services on a continuing basis, to keep up manageable levels of government and external debt, and to avoid extreme sectoral imbalances which damage agricultural or industrial production.
- **Environmental:** An environmentally sustainable system must keep a steady resource base, keeping away from over-exploitation of renewable resource systems or environmental sink functions, and exhausting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity,

33

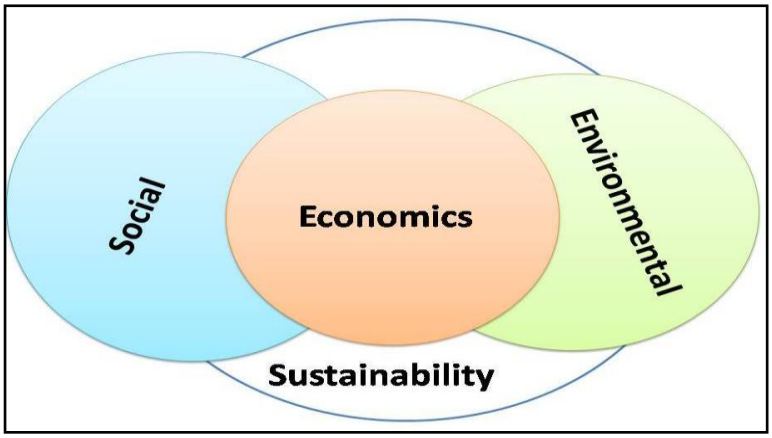
https://books.google.co.kr/books?id=TNx4a4qRb0wC&pg=PA8&lpg=PA8&dq=a+political+system+that+secures+effective+citizen+participation+in+decision+making&source=bl&ots=uoQyPqhM_4&sig=lv_ZCxko0kOMLPDpqokNxFr6u_g&hl=en&sa=X&ved=0ahUKEwiN5LOChpvPAhVGFZQKHanMCmUQ6AEIHTAA#v=onepage&q=a%20political%20system%20that%20secures%20effective%20citizen%20participation%20in%20decision%20making&f=false

atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources.

- **Social**: A socially sustainable system must attain distributional equity, sufficient provision of social services including health and education, gender equity, and political accountability and participation.[34]

The Rio Declaration on Environment and Development provided many list of principles of sustainability that are categorized into social, economic and environmental dimensions. The diagram below shows the three dimensions which represent different principles that help us understand and take hold of the abstract concept or ideas concerning sustainable development and how to implement them. These principles provides us parameters for envisioning locally relevant and culturally appropriate sustainable development for our own countries, local communities or regions. [35]

Figure 6: Schematic drawing of the principles of sustainability



Source: On Sustainability in Local Energy Planning, Farhad D. Rad

These three dimensions of social, economic and environmental are commonly known as systems that possess individual logic. These

[34] http://www.ase.tufts.edu/gdae/publications/working_papers/Sustainable%20Development.PDF

[35] http://www.esdtoolkit.org/discussion/default.htm

three systems cannot be analyzed all at once. They are considered separately and have their own individual indicators that imply measurement; measurement implies the theoretical definition of concepts to measure[36]

3.5.3. Energy Indicators for Sustainable Development

Energy plays a vital role in achieving economic and social development. It is the backbone of economy and very a significant contributor in providing quality of life to all the people. However, on account of the increase in demand for its use, advancement in technologies and some other limitations, much of the world's energy is currently produced and used in unsustainable manner. One of the best ways to determine the development or progress is to have a set of energy indicators that will gauge the progress towards a sustainable energy future.[37]

The Earth Summit in Rio de Janeiro, Brazil, in 1992[38]calls on all countries at the national level and international governmental and non-governmental organizations to develop the concept of indicators of sustainable development. In 1999, IEA revisited the current relevant indicators and developed a provisional set of indicators for sustainable energy development. One of the most comprehensive works on energy indicators was carried out in 2001 by the IAEA with contributions from the United Nations Department of Economic and Social Affairs (UNDESA), the IEA, and other international organizations, and was presented at the 9th session of the Commission on Sustainable Development (CSD-9).

---

[36] http://www.ase.tufts.edu/gdae/publications/working_papers/Sustainable%20Development.PDF

[37] https://www.iaea.org/sites/default/files/indicators.pdf

[38] https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf

It has already been established the significant role of energy in attaining sustainable development. There must be a set of energy indicators to monitor the status and trends of the energy system in the broader or national level and these IAEA's EISD were designed to observe and measure the current energy related trends. This provides a clearer picture of the country's energy system, and the existing challenges that can assist decision-makers and planners to reach the appropriate solutions accurately, and formulate future energy policies.[39] Deciding upon future energy policies for the various sectors of transportation, households, industry, etc. can be done in a more realistic manner based on the picture of an energy system that energy indicators can provide.[40]

Below is the list of the Energy Indicators for Sustainable Development developed by IAEA:

Table 1: List of Indicators Energy for Sustainable Development (IESD)

LIST OF ENERGY INDICATORS FOR SUSTAINABLE DEVELOPMENT	
SOCIAL DIMENSION	
SOC1	Share of households (or population) without electricity or commercial energy, or heavily dependent on non-commercial energy
SOC2	Share of household income spent on fuel and electricity
SOC3	Household energy use for each income group and corresponding fuel mix
SOC4	Accident fatalities per energy produced by fuel chain
ECONOMIC DIMENSION	
ECO1	Energy use per capita
ECO2	Energy use per unit of GDP
ECO3	Efficiency of energy conversion and distribution
ECO4	Reserves-to-production ratio
ECO5	Resources-to-production ratio
ECO6	Industrial energy intensities
ECO7	Agricultural energy intensities
ECO8	Service/commercial energy intensities
ECO9	Household energy intensities

[39] http://www.un.org/earthwatch/about/docs/a21ch40.htm
[40] http://www-pub.iaea.org/MTCD/publications/PDF/Pub1222_web.pdf

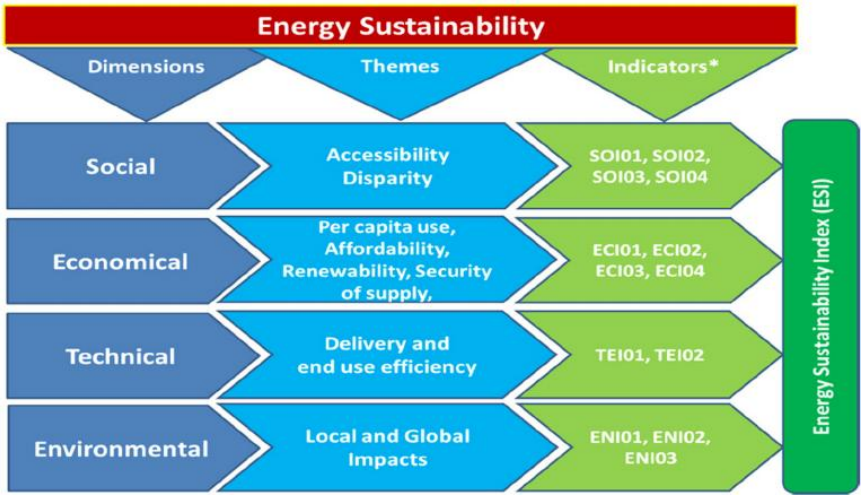
ECO10	Transport energy intensities
ECO11	Fuel shares in energy and electricity
ECO12	Non-carbon energy share in energy and electricity
ECO13	Renewable energy share in energy and electricity
ECO14	End-use energy prices by fuel and by sector
ECO15	Net energy import dependency
ECO16	Stocks of critical fuels per corresponding fuel consumption
ENVIRONMENTAL DIMENSION	
ENV1	Greenhouse gas (GHG) emissions from energy production and use, per capita and per unit of GDP
ENV2	Ambient concentrations of air pollutants in urban areas
ENV3	Air pollutant emissions from energy systems
ENV4-1	Contaminant discharges in liquid effluents from energy systems
ENV4-2	Oil discharges into coastal waters
ENV5	Soil area where acidification exceeds critical load
ENV6	Rate of deforestation attributed to energy use
ENV7	Ratio of solid waste generation to units of energy produced
ENV8	Ratio of solid waste properly disposed of to total generated solid waste
ENV9	Ratio of solid radioactive waste to units of energy produced
ENV10	Ratio of solid radioactive waste awaiting disposal to total generated solid radioactive waste

Source: Energy Indicators for Sustainable Development: Guidelines and Methodologies, IAEA, 2005

The abovementioned indicators were categorized in the following diagram:[41]

[41]https://www.researchgate.net/figure/260304933_fig2_Fig-2-Conceptual-energy-sustainability-framework-Indicator-codes-are-explained-in)

Figure 7: Conceptual Energy Sustainability Framework



Source: Energy Indicators for Sustainable Development, IAEA, 2005

CHAPTER 4 - PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

4.1. Backgrounder of Philippines' outperformance by Korea

For the purpose of this study, a glance on the situation and condition of the Philippines and Korea during the post independence period was presented. Korea and Philippines gained their independence in 1946 and 1948, respectively, during which the two countries shared many similarities in circumstances. However, Korea was a very poor country then whose economy was completely devastated by the war with North Korea. Its economy was lagged far behind the Philippines and was one of the poorest economies in the world. Philippines, on the other hand, was considered one of the richest countries in Asia especially when it comes to average per capita income. Its economy was so impressive that it became a model of development whose economy ranked as the second-most-progressive economy in Asia next to Japan. It was a lot better off than Korea then.

However, in 1960s things changed, Korea's economy soared high rapidly that it left behind other countries with similar situation including the Philippines. Many statistics can prove that Korea outperforms the Philippines in terms of economic development which is now considered the fourth largest economy in Asia.[42]Its economy propelled remarkably after the Korean War by transforming into an industrialized country. In 2000, its GDP per capita made a giant leap by as high as 550 percent making its per capita to be $11,347 USD. In 2015, Korea's GDP per capita stood at$25,022.80 USD which is considered to be equivalent to

[42] http://edition.cnn.com/2013/03/07/world/asia/korean-war-explainer/

198 percent ofthe world's average.[43] With this great leap and exceptional development, Korea's economy was known as the "*Miracle on the Han River*". [44]Several factors were considered to have played significant roles in South Korea's rapid development and the Philippines' relatively slow development which caused a huge gap between the two countries.

4.2. Korea's energy situationer

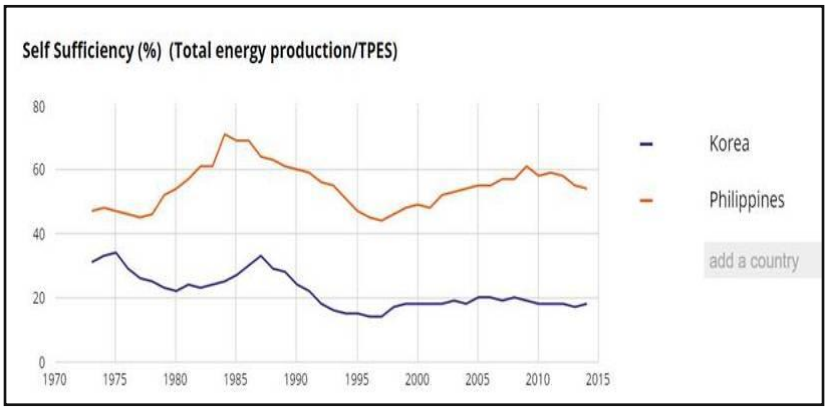
With this remarkable economic development, Korea now has one of the most energy intensive industrial structures in the world. It has a rapidly growing and highly energy intensive economy with its large steel, shipbuilding and petrochemical sectors, among others which cause the intensified use of energy, particularly electricity[45]

However, South Korea has actually limited domestic resource base. It lacks domestic energy resources to fuel its highly energy intensive economy. In fact, it is one of the world's leading energy importers and is dependent on oil as a fuel source and its natural gas requirement coming from the Middle East. [46]

With respect to sufficiency level, Korea has a relatively low level because of lack of domestic natural resources. South Korea mostly depend its fuel requirement on importation. It considered itself as one of the major importers in the world, importing nearly all of its oil needs from other oil producing countries. In the figure below, the trend in the self-sufficiency level is shown where Korea's level stood at 18% in 2014 compared to the Philippines at 54%.

[43] http://www.tradingeconomics.com/south-korea/gdp-per-capita
[44] http://koreajoongangdaily.joins.com/news/article/article.aspx?aid=2914491&ref=mobile
[45] http://www.keia.org/sites/default/files/publications/05Calder.pdf
[46] http://www.keia.org/sites/default/files/publications/05Calder.pdf

Figure 8: Self-Sufficiency (%) (Total energy production/TPES)



Source: IEA, Energy Atlas Statistics

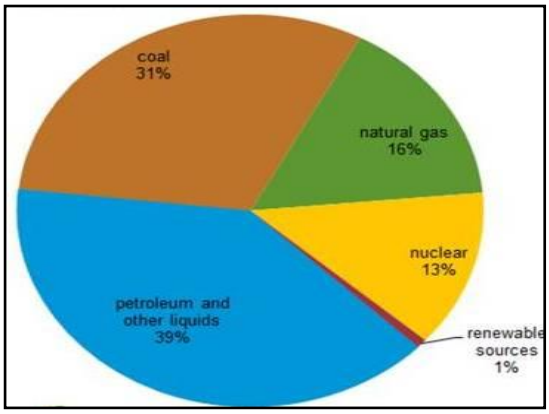
The figure 9 below shows the country's primary energy consumption by fuel type in 2014. Petroleum and other liquids take the biggest chunk of 39% of the total consumption, followed by coal of 31%, natural gas 16% and nuclear about 13%. Renewable sources are so minimal at 1%.

As mentioned above, South Korea is one of the top shipbuilding industries in the world and known for its exports of electronics and semiconductors, thus its highly developed economy drives energy consumption to a higher level. Compared to other developed countries economy, SK's economic growth was relatively resilient as its real gross domestic product increased by 3.3% in 2014 from 2.9% in 2013.[47]

To ensure security of supply, South Korea diversified its sources and relied significantly on nuclear power, refined oil products, LNG and coal to boost its energy mix. The country is one of the largest petroleum product exporters and home to some of the largest and most advanced oil refineries in the world.[48]

[47] U.S. Department of State
[48] http://www.bunkerportsnews.com/News.aspx?ElementId=aad5cdeb-45b5-451c-97ea-15b16f7c40de

Figure 9: South Korea Total Primary Energy Consumption by fuel type, 2014



Source: BP Statistical Review of World Bank, 2015

Table 2: Philippines Status of Electrification, 1990-2014

YEAR	CONNECTIONS			
	POTENTIAL	SERVED	For the year	% to Date
1990	5,686,000	3,025,522	124,937	53%
1991	5,721,000	3,158,745	133,223	55%
1992	6,822,000	3,312,465	153,720	49%
1993	6,944,000	3,467,348	154,883	50%
1994	7,028,000	3,673,718	206,370	52%
1995	7,142,000	3,902,661	228,943	55%
1996	7,247,000	4,131,749	229,088	57%
1997	7,409,000	4,447,991	316,242	60%
1998	7,519,000	4,738,648	290,657	63%
1999	7,686,000	5,013,461	274,813	65%
2000	7,784,000	5,300,056	286,595	68%
2001	7,993,200	5,595,911	295,855	70%
2002	8,461,500	5,930,660	334,749	70%
2003	8,892,100	6,268,763	338,103	70%
2004	9,050,744	6,702,789	434,026	74%
2005	11,141,200	7,095,531	392,742	64%
2006	11,431,400	7,418,733	323,202	65%
2007	11,499,900	7,764,307	345,574	68%
2008	11,582,000	8,113,587	349,280	70%
2009	11,663,500	8,462,605	349,018	73%
2010	11,772,100	8,859,311	396,706	75%

2011	12,160,000	9,250,713	391,402	76%
2012	12,305,500	9,616,786	366,073	78%
2013	12,523,700	10,152,834	461,729	81%
2014	12,858,700	10,636,110	483,276	83%

Source: National Electrification Administration (NEA)

4.3. Sustainable Energy Indicators – Philippines comparison with Korea

One of the ways identified to find the sustainability pathway of the Philippine energy planning process is to compare the historical trends of the energy indicators in both that of the Philippines and Korea which could likewise help planners to identify appropriate strategies for future favourable trends. The energy indicators are enumerated and discussed below:

4.3.1. Social Dimension

As mentioned previously, the IEA identified energy indicators for sustainable development which are divided into three dimensions. Under the social dimension, importance was given to accessibility, affordability and disparity. For accessibility, the data needed are share of households (or population) without electricity or commercial energy, or heavily dependent on commercial energy, or heavily dependent on non-commercial energy. The author believes that one major challenge to these indicators is the lack of data.

For affordability, there is also some difficultly in securing data on the share of household income spent on fuel and electricity. For disparity, data for energy use per household for each income, household income for each income group and corresponding fuel for each income group were also not available both for both countries. On accessibility, according to the World Bank statistics, as of 2012, South Korea is one hundred percent (100%) electrified and this means everyone in the country is given the basic need of access to electrification already. In the Philippines however,

the electrification rate stands at 87.5 per cent. This figure is still significant since many Filipinos are still without access to electricity especially those in the far-flung areas, where poverty is more severe. The table below shows the cumulative electrification record of the Philippines from the period 1990-2014, although this figure only reflects the electric cooperatives covered areas.

4.3.2. Economic Dimension

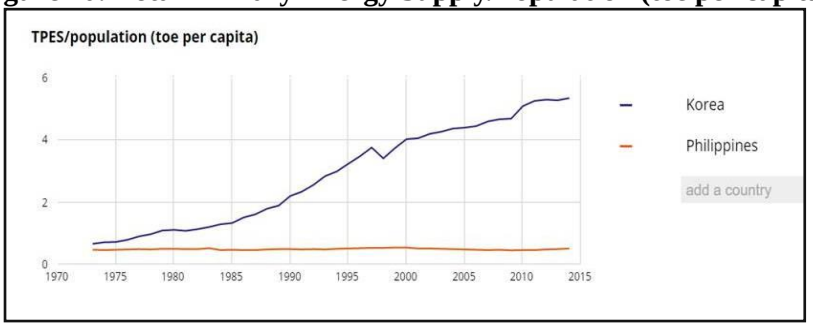
For economic dimension, there are sixteen (16) indicators that were identified by the IEA, some of the indicators available are as follows:

Energy Use per capita – (ECO1)

Total Primary Energy Supply over Population (Energy per Capita)

The total primary energy supply (TPES) per capita for both countries in 1973 had a very minimal difference. For Korea, it was .63 tons of oil equivalent (TOE) while for the Philippines, it stood at .44 toe. For the succeeding years up to 2014, the gap became so huge that Korea's TPES per capita went up to 5.32 toe while Philippines remained almost in the same level at .48 toe. The rapid economic development of South Korea triggered the sharp increased in its energy per capita.

Figure 10: Total Primary Energy Supply/Population (toe per capita)

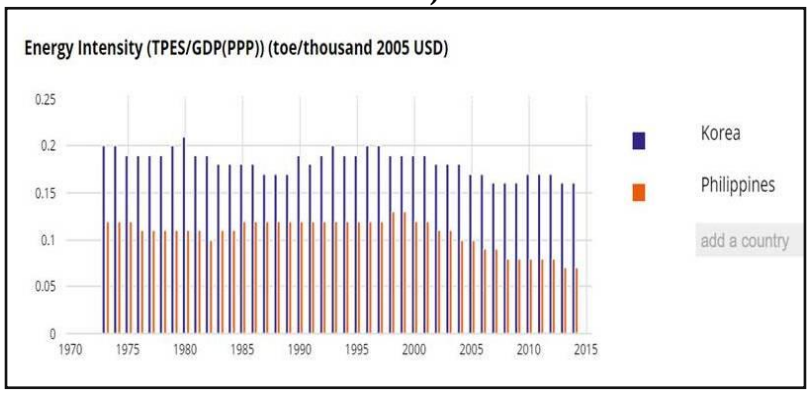


Source: IEA, Energy Atlas Statistics

Energy Intensity per GDP – (ECO2)

This indicator measures the energy efficiency of the country's economy calculated as units of energy per unit of GDP. High energy intensity means high industrial output as portion of GDP[49].For the whole period, Korea's energy intensity has been consistently higher than that of the Philippines because of its energy intensive industries. In 1973, Korea's level of intensity stood at .2 toe while Philippines was .12 toe. In 2014, Korea's stood at .16 toe while Philippines with .07 ktoe. Korea is a highly industrialized country while Philippines is still a predominantly agricultural country.

Figure 11: Energy intensity (TPES/GDP/PPP) (toe/thousand 2005 USD)



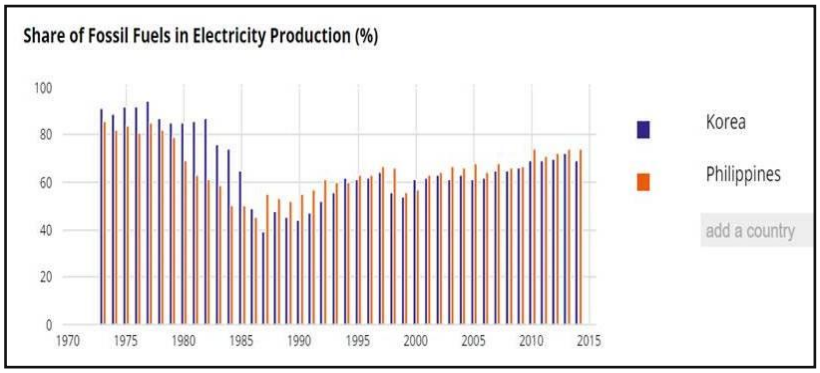
Source: IEA, Energy Atlas Statistics

[49] https://en.wikipedia.org/wiki/Energy_intensity

Fuel Shares in energy and electricity – ECO11

Share of Fossil Fuels in Electricity / Production (%)

Figure 12: Share of Fossil Fuels in Electricity Production (%)



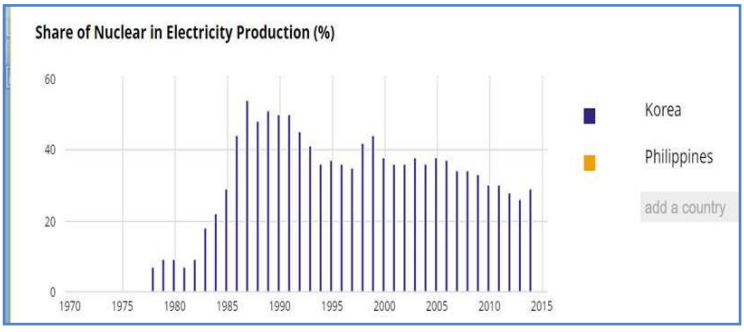
Source: IEA, Energy Atlas Statistics

In 1973, 91% of Korea's electricity production was coming from fossil fuels while Philippines' fossils fuels share stood at 86%. These shares dropped significantly in 1987 for Korea and 1986 in the Philippines. In 2014, fossil fuels still plays an important role in electricity generation with 69 and 74 share for Korea and Philippines, respectively. The use of fossil fuels still dominantly use in both countries.

Non-carbon energy share in electricity – ECO12

Share of Nuclear in Electricity Production (%)

Figure 13: Share of Nuclear in Electricity Production (%)



Source: IEA, Energy Atlas Statistics

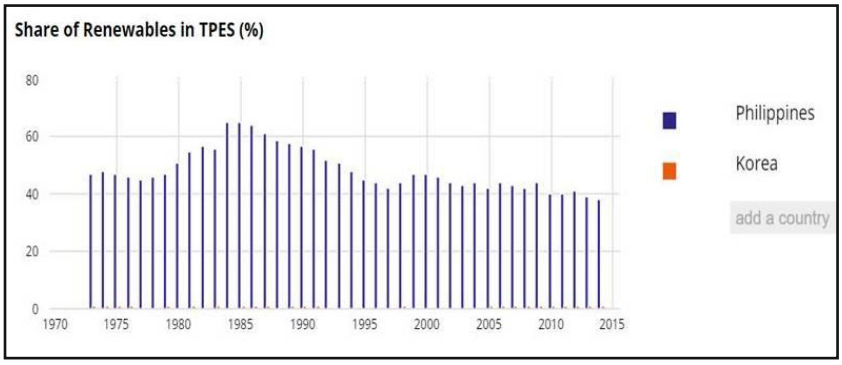
This indicator which requires the share of non-carbon energy in the electricity production is assumed by the author to be a nuclear energy. Nuclear energy has zero carbon emissions during the production of electricity so it regarded as a good fuel source as an essential element of fuel mix. [50] From the figure below, South Korea is abundantly producing nuclear energy while the Philippine is zero production. The Philippines has no nuclear energy resources and no any nuclear policies for its utilization.

Renewable energy share in energy and electricity – (ECO13)

Share of Renewables in TPES (%)

From this figure, it can be seen that Korea almost have no share of renewable energy in its TPES. The share was consistently 1.1% all throughout the period, mostly generated from biofuels and waste. Very small amount of hydro, wind and solar energies and heat also contribute to its total primary energy supply. While in the Philippines, renewable energy have a significant share and the level stood at 35% in 2014.

Figure 14 Share of Renewables in TPES (%)



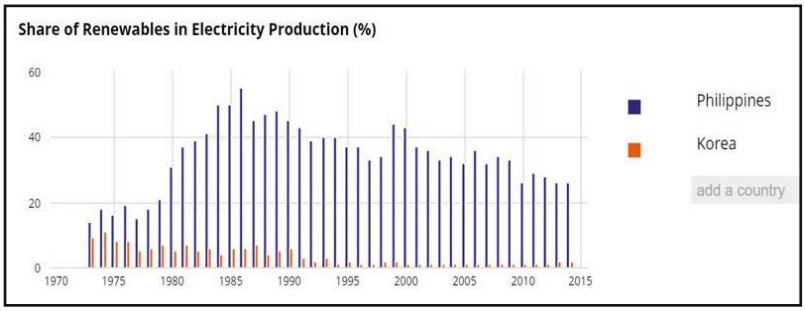
Source: IEA, Energy Atlas Statistics

[50] http://www.nei.org/Master-Document-Folder/Backgrounders/Fact-Sheets/Nuclear-Energy-America-s-Low-Carbon-Electricity-Le

Share of Renewables in Electricity Production (%)

In 1973, Korea's renewable energy's share in electricity production was only 8% which significantly reduced down to 2% in 2014. The Philippines, in contrast, the share of renewable energy significantly increase at 55% level in 1986 and decreased overtime lowering the share to 26% in 2014. The difference is due to the availabilityof renewable energy resources in the Philippines while not much domestic energy resources in Korea.

Figure 15: Share of Renewables in Electricity Production (%)



Source: IEA, Energy Atlas Statistics

4.3.3. Environmental Dimension

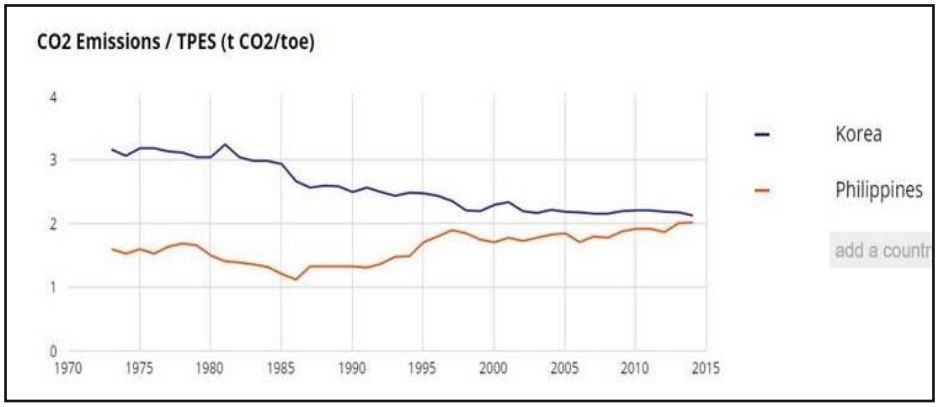
Greenhouse gas (GHG) emissions from energy production and use, per capita and per unit of GDP – ENV1

Carbon Dioxide Emissions per Total Primary Energy Supply

In 1973, Korea's CO2 emission per energy stood at the level of 3.16 toe, while Philippines was at 1.59 toe level. In 2014, the two countries, had almost the same level of 2.01 and 2.12 for Philippines and Korea, respectively.Possible factors that may have caused the decrease in the emission level may be due to decrease in energy intensity of the economy,

decrease in the GDP or either decrease in the carbon intensity of energy supply.[51]

Figure 16: CO2 Emissions/TPES (t CO2/Toe)



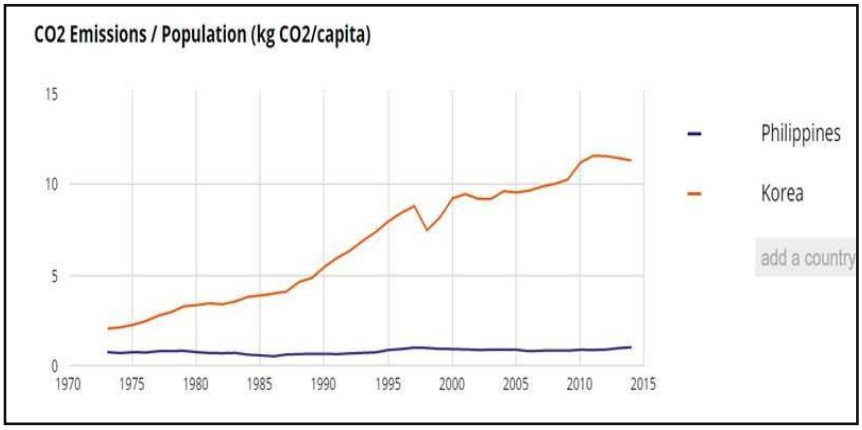
Source: IEA, Energy Atlas Statistics

Carbon Dioxide emissions per population (CO2 per capita)

The CO2 emissions (metric tons per capita) in South Korea stood at 68.23 kg in 1973 while Philippines' stood at 27.25 kg. However, in 2014 Korea had a huge increase in the emissions to as high as 567.81 kg while Philippines remains at the minimal increase of 95.71 kg from its 1973 level. According to the World Bank, emissions from burning of fossil fuels and cement manufacturing are the major contributory to theCarbon Dioxide emissions. This is also includes the emissions during consumption of solid, liquid, and gas fuels and gas flaring.52 The increase in the emissions primarily due to the highly energy intensive industries in Korea being one of the world's most industrialized country.

[51] https://www.eia.gov/environment/emissions/ghg_report/ghg_carbon.cfm
[52] http://www.tradingeconomics.com/south-korea/co2-emissions-metric-tons-per-capita-wb-data.html

Figure 17: CO2 Emissions/Population (kg CO2/capita)

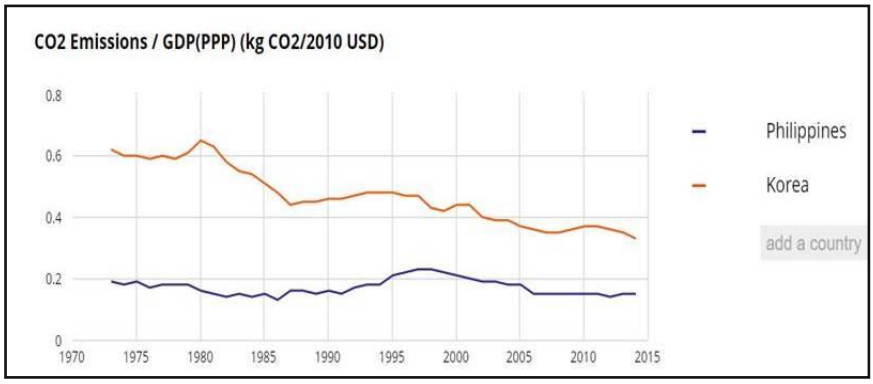


Source: IEA, Energy Atlas Statistics

Carbon Dioxide emissions per GDP (PPP)

In case of the gross domestic product by purchasing power parity to carbon dioxide emissions, in 1973, Korea's emission stood at 0.62 kg but went down to 0.33 kg in 2014. For Philippines, it was 0.19 kg in 1973 and had almost a close level in 2014 which stood at 0.15 kg.

Figure 18: CO2 Emissions/GDP (PPP) (kg CO2/2010 USD)



Source: IEA, Energy Atlas Statistics

4.4. Case study - Philippine Energy Plan in comparison with Korea Energy Master Plan

The comparison of the two plans is intended to evaluate the level of the Philippine energy planning process with respect to energy policies implemented as well as the strategies embodied in the Korea Energy Masterplan. These plans normally provide for policy directions and strategies for the development of the energy industry and provide detailed blueprints of actions. They have different levels of importance based on the government's priority thrust. However, most of the plans are focused on the energy security giving more attention to energy supply and demand.

With reference to the pronounced social, economic and environmental aspects of sustainable development, this paper attempts to show the energy indicators that countries commonly identify for their own respective plans. A simple comparison between the Philippines energy plan for 2012-2030 and the Korean Energy Master Plan Outlook for 2014 to 2035 was discussed in this chapter.

4.4.1. Philippine Energy Plan 2012-2030

The Philippines is officially known as Republic of the Philippines. It is a Southeast Asian country in the Western Pacific and a neighbour to Taiwan (North), Vietnam (West), Indonesia (South), and bounded on the east by the Philippine Sea. The country is prone to earthquakes and typhoons as it is located on the Pacific Ring of Fire. It is an archipelago consisting of 7,107 islands, with a land area of almost three hundred thousand square kilometres (over 115,000 sq mi). It has three main geographical divisions, namely: Luzon, Visayas and Mindanao with Manila in Luzon as capital. The current population of the country stood at 102,614,494 million[53]. The country is endowed with natural resources

[53]http://www.worldometers.info/world-population/philippines-population/

and made is considered as one of the world's mega diverse countries.[54] The Philippines is a developing country and as such the government is striving to progress in all aspects of development. Focusing on thePhilippine energy sector, the government, on its quest to provide and promote better quality of life for the Filipino people, formulates energy policies through the Department of Energy (DOE) to ensure the delivery of secure, sustainable, sufficient, affordable and environment friendly energy to all economic sectors.

For the purpose of this study, the discussion is focused on the Philippine Energy Plan 2012-2030 which is the blueprint of the energy development undertaking of the country. It is a national plan outlining the roadmap of the energy sector highlighting the Energy Reform Agenda (ERA) which outlines the overall pillars as its overall guidepost and direction to ensure energy security, achieve optimal energy price and develop a sustainable energy system. The plan is guided by the overall vision of providing secure, **sustainable**, sufficient, reliable, affordable, and environment-friendly supply of energy. It intends to achieve energy independence, self-sufficiency, full electrification, and full market reforms, among others. It likewise seeks to provide the general populace a reliable and affordable energy necessary for local production and countryside development that is providing energy access for more. To contribute to the realization of the government's broad policy and program frameworks, the implementation of different plans and programs on power, sustainable transportation system, development of indigenous energy resources, renewable energy development, energy efficiency and conservation and natural gas development were given much attention in the plan.

The plan highlighted the Energy Sector's Performance update on the development of electricity market, power/electricity generation, and electrification, among others. The Energy Demand and Supply Outlook

[54]http://globserver.cn/en/philippines/energy

as well as the different plans and programs for different sectors such as Power, Transport, Indigenous Energy, Renewable, Efficiency and Conservation and Natural Gas, among others were highlighted significantly.

4.4.2. Korea Energy Master Plan Outlook and Policies to 2035

The Korean Peninsula is located in East Asia. It includes the countries of North Korea and South Korea. It lies in the middle of Northeast Asia with China to its west and Japan to its east. The peninsula has a total area of 223,405 km^2, of which Republic of Korea occupies about 100,284 km^2. The peninsula is predominantly mountainous, with flat land accounting for only 30% of the entire territory. [55] Part of the Peninsula is the Republic of Korea with Seoul as its Capital City. As of 2013, the total population was 51.33 million. Its form of government is democratic and presidential system. South Korea demonstrated incredible economic growth and is the fourth largest economy in Asia and the 11^{th} largest in the world.[56]

South Korea is a highly industrialized and developed country, it requires much needed energy to answer the high energy demand of its industries. It imports about almost all of its oil needs and the second – largest importer of liquefied natural gas in the world. When it comes to generation of electricity, Korea's generation comes from conventional thermal power accounting for more than two thirds of production, and from nuclear power.[57]

The Korean Energy Master plan was first developed in 2008 to achieve sustainable economic development and energy security while considering environmental impact. In consideration of environmental

[55] https://www.kotra.or.kr/foreign/korea/KHENKO010M.html?TOP_MENU_CD=KOREA

[56] Wikipedia

[57] https://en.wikipedia.org/wiki/Energy_in_South_Korea

changes and changes in energy market supply and demand, the Masterplan is being updated every five years. To address the primary global issue on climate change, there was a need to reduce greenhouse gas emissions and this was identified in 2008 plan where it called for a maximum use of nuclear power and renewable energy and dramatic curb of energy demand. The plan primarily focused on how to provide an affordable and stable supply of power while considering economic growth and industrialization (Ministry of Trade, Industry and Energy (MOTE). As a result of this policy, the cheap electricity brought an increased in the electricity consumption and destabilized the supply power balance due to the significant increase in the renewable and nuclear power generation. And to address the increasing demands, new power plants had to be put in place which also brought negative impacts like an increased in the greenhouse gas emissions, overloaded electricity transmission network and opposition from local residents living near power lines and power plants. Thus, the Korea Energy Master Plan in 2014 focused on addressing these issues like transitioning to demand management, building a distributed generation system, among others (MOTE).[58] So Korea Energy Master Plan is an update of the Korea Basic Energy Plan 2008-2030 which was the Korea's first 20-year unit long-term energy plan. It is founded on the following policy vision: Low-Carbon Green Growth Korea; Sound Growth with Minimum Energy Consumption; Minimize Environmental Pollution from Energy Production & Use; Make Green Energy Industry a Growth Engine; and Realize Energy Independence and a Welfare Society.

4.4.3.Comparing Plans' Basic Characteristics

Despite the similarities in objectives of the energy plans, significant differences exist in plan timescales, mechanisms, and level of

[58] http://db.koreascholar.com/Article?code=271943

detail. Table 2 below provides for the major areas in the plan and their characteristics and summarizes the distinctions.

Table 3: Comparison of the Philippines and Korea Energy Plans

	Philippine Energy Plan 2012-2030	**Korea Energy Masterplan Outlook and Policies to 2035**
Period and Cycle	Long term energy plan for a period of 20 years and updated annually	Revised and re-implemented every five years over a period of 20 years
Approval Process	Department of Energy in Consultation with Stakeholders-> Submitted to Congress every 15th of September	Reviewed and approved by 3 separate entities: National Energy Committee->Presidential Committee on Green Growth -> State Council
Key Features	Energy demand and supply outlook (Domestic)-Energy Situationer 2011 and Philippine Energy Outlook for 2012-2030	Trends and prospects of domestic and (overseas) demand and supply of energy
	Downstream sector development-Oil industry deregulation and natural gas industry development	Measures for stable import, supply, and management of energy
	Energy resource development including fossils fuels and renewable energy	Supply and use of environmentally friendly energy, such as renewable energy
	Power sector development	Measures for the safety control of energy
	Socially responsive programs, International cooperation, investment requirements	Development and diffusion of technology related to energy, the training of professional human resources, international cooperation, the development and use of natural resources of energy, and welfare in energy
Related Plans considered	Power development plans (transmission and distribution Plans), national renewable energy plans,	Supply side plans: power, gas, renewable energy, integrated energy, etc.; Demand management and other low carbon-related plans: rational use of energy, energy technology development, climate change response, etc.
Energy Policy	To achieve energy security; achieve optimal energy price; and develop a sustainable energy system	To achieve sustainable development, simultaneously considering energy security, economic growth, and environmental impact. Pursuing the "3 Es" of Energy Policy: Energy Security, Efficiency, and Environment

Final Energy Consumption by Sector	Average Annual Growth Rate (AAGR) of 2.8% annually from 2011 to 2030 - With transportation as the biggest energy consumer with the average share of 35.5 percent	Average Annual Growth Rate (AAGR) of 2.8% from 2000 to 2012 - With industrial sector steadily increasing and currently exceeds 60% of final energy consumption
Consumption by Energy Source		
Oil/Oil products	The country's major fuel will have an AAGR of 1.4% from 2011-2030	AAGR: Reached 8.0% in the 1990s before decreasing to 1.0% from 2000
Electricity	To grow at an average of 3.8% annually for the entire planning period	The share increased from 10.8% in 1990 to 19.3% in 2012, and electricity consumption increased rapidly at an AAGR of 5.7% from 2000
Coal	Increase by an average of 7.8 % annually for non-power application	The share of bituminous coal in total coal consumption, which was 50.4% in 1990, increased sharply to 91.8% in 2012 due to a decrease in anthracite coal consumption and an increase in the use of bituminous coal for power generation
Renewable Energy	For renewable energy, an annual average rate of 0.8 percent (and with average share of 32.6 percent) by 2030	The renewable energy industry is going through a period of rapid restructuring due to a sluggish global economy and an overabundance of solar PV and wind power manufacturers; Accelerated technology development has continually driven down the generation costs of renewable energy.
Supply Targets		
Total primary energy supply	An annual average of 3.4 percent to reach 73.9 Mtoe in 2030. Oil is expected to be the primary fuel source with an average share of 28.2 percent to the total energy supply. Natural gas is expected to have a 9.0 percent share, while coal is seen to have 30.1 percent share	To increase by 1.3% annually on average from 2011 to 2035.
Energy intensity	Lackluster performance of domestic economy in 2011 caused intensities registered negative growths for the current year. Oil intensity suffered the biggest decline of 9.3 percent to 1.7 barrels per one hundred thousand pesos of	To improve by 30% from 0.255 (toe/million won) in 2011 to 0.180 (toe/million won) in 2035 (1.4% annually on average

	real GDP (*situationer)*	
Demand Target		
Total primary energy demand	The total energy demand level is expected to grow steadily from 23.0 MTOE in 2011 to 39.1 MTOE in 2030 at an annual average growth rate of 2.8 percent	Total primary energy demand will increase by 1.3% annually on average from 2011 to 2035
Final energy consumption and electricity demand	Total final energy consumption will exhibit an annual average growth rate of 2.8 percent; TFEC will reach 39.1 by 2030 ; electricity will contribute an average of 22.9 percent share to the final energy demand	Final energy consumption will increase by 0.9% from 2011 to 2035 due to slowing economic and population growth.
Energy intensity	Intensities registered negative growths in 2007 year	Energy intensity will improve 30% from 0.255 (toe/million won) in 2011 to 0.180 (toe/million won) in 2035 (1.4% annually on average).
Nuclear Energy	No nuclear energy source/plant; no nuclear in the mix	nuclear energy represent 22% to 29% of the energy mix in 2035
Demand Side Management / Energy Efficiency	• Promotion of energy efficient technologiesintheindustrial, commercial, government buildings and household sectors • Promotion of Light Emitting Diode (LED) technology for street lighting • Promotion of Voluntary Agreement with private companies through a Pledge of Commitment, which could result in voluntary reduction of energy consumption • Expansion of the energy standards and labelling program to include other electrical appliances	• Adjust energy tax rates to prevent an imbalance between electricity consumption and non-electric energy consumption • Encourage rational use of electricity by moving away from the existing low price policy • Systematize energy conservation and develop a demand management market based on ICT infrastructure, such as the internet and smart phones • Shift to a less energy-intensive economy by strengthening energy efficiency standards for transportation, buildings, appliances and other sectors up to the levels of advanced countries. • Systematically manage and share information on energy supply, demand and reduction technology to improve the effectiveness of energy policy • The Energy Efficiency Standards and Labeling

		Program, High Efficiency Appliance Certification System, e-Standby Program
Energy Welfare	Under Energy Regulation 1-94,the government, through the DOE , ensuresthatcommunities hosting generating facilities or energy resource development projects are benefited. It is a way of recognizing the contribution of host communities for sharing and using their territory to put up generating facilities to energize the rest of the country. ER 1-94 provides for funds that can be accessed by host communities to further foster progress in their respective areas. Availment of such benefitsrequireshost communitiestosubmi t project proposals which may be under any of the following: EF, development and livelihood fund (DLF) and reforestation, watershedmanagement, health and/environment enhancement fund.	*Reform of the Energy Welfare System*- Address blind spots of the energy welfare system and shift towards a welfare system customized to fit the needs and consumption patterns of recipients Eradicate energy poverty affecting 1.2 million households by 2016 (phase 1); reduce energy costs for near-poverty group by 2030 (phase 2) Energy Welfare - Guarantee basic energy use for low income classes - increase natural gas supply to more than 85% by 2030 from the present 70% level and improve energy facility efficiency from low income classes; addressing all energy-poor [59] classes, which currently stand at the 7.8% level.
GHG emission reduction	To mitigate carbon emission by increasing energy savings on all sectors for electricity and petroleum products: • CNG-fuelled taxis to reach 16,000 units in 2030 • Compressed Natural Gas (CNG)-fuelled buses to increase to 15,000 units by 2030 • Auto-LPG –fed taxis to reach 23,000 units in 2030 • E-vehicles to reach 230,000 units in 2030 • Biodiesel blend to reach 2% (2011-2014), 5% (2015-2019), 10% (2020-2024), 20% (2025-2030) • Bioethanol blend to reach 10% (2011- 2019); 20% (2020-2030)	• Increase clean and renewable energy while reducing reliance on fossil fuels • Improve energy efficiency and promote conservation • Establish a carbon market and promote a voluntary agreement to reduce greenhouse gas emissions • Provide support for research and development pertaining green technologies.
Job creation	No indicator for job creation	On job creation - 950,000 persons by 2030 and also expand the nation's global new

[59]Energy-poor classes refer to those households with energy expenditures, including lighting and heating, that exceed 10% of total household income. In Korea, about 1.2 million households currently belong to energy-poor classes.)

		renewable energy market share to more than 15% by 2030 from 0.7% at present
Energy Technology	No indicator; specific target	energy technology level, including 'green technology,' compared with advanced countries to the world-class level by 2030 from the present 60%;

Source: Philippine Energy Plan/Korea Energy Outlook Master Plan

4.5. Comparison of Philippine Energy Indicators with ASEAN member countries

In this study, the paper used the most appropriate available energy indicators using the IAEA's categorization of EISD which is a versatile analytical tool for countries to track their progress on energy.

Data available for the Association of South East Asian Nations (ASEANs) member countries which were studied and analyzed to track the progress or the trend of the countries' respective energy development on these areas. Several energy indicators categorized into the three (3) dimensions of sustainable development were identified common to all the ASEAN member countries.

Energy consumers and participants in the global markets are confronted with different challenges in energy as countries in Southeast Asia become larger and developed[60]In addressing these issues, especially in the context of the region's fast-rising energy demand, sustainability must be integrated in the development process to support continued economic growth and development. The applicable energy indicators identified based on the availability of data covering 1973 to 2014 are as follows:

[60] World Energy Outlook Special Report, September 2013

4.5.1. Social Dimension

Share of households (or population) without electricity or commercial energy, or heavily dependent on non-commercial energy – (SOC1)

Population without access to electricity

One of the energy indicators for the sustainable development under social dimension is the share of population without access to electricity. Table 3 provides for the list of the numbers of population without electricity in the ASEAN region.

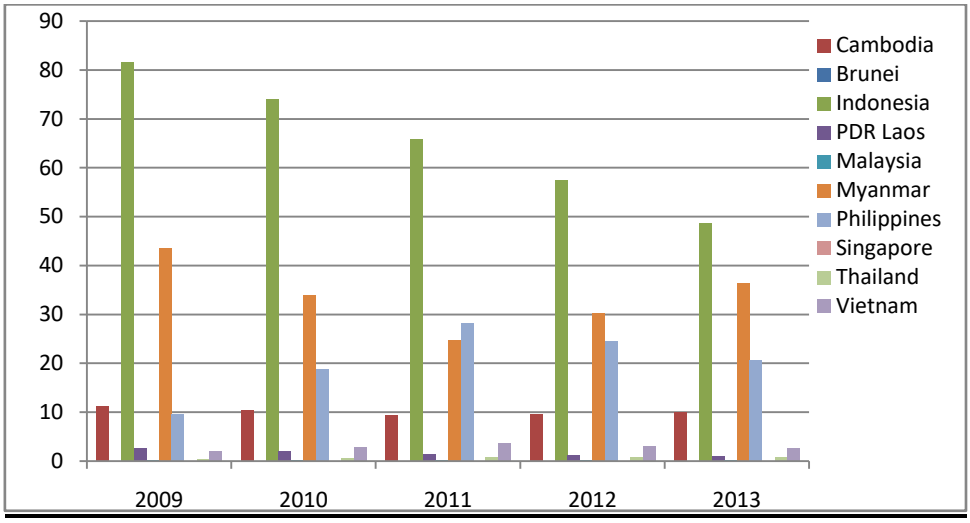
From the list, Indonesia has the highest rate which stood at 81.64 and 48.70 for 2009 and 2013, respectively, the highest for those years. followed by Myanmar, then Philippines. Singapore and Brunei are already one hundred percent electrified. The graph below shows the trend.

Table 4: Population without access to electricity in ASEAN Region millions)

Country	2009	2010	2011	2012	2013
Brunei	0.00	0.00	0.00	0.00	0.00
Cambodia	11.25	10.31	9.40	9.65	9.90
Indonesia	81.64	73.93	65.70	57.34	48.70
PDR Lao	2.64	1.97	1.30	1.12	0.90
Malaysia	0.16	0.13	0.10	0.10	0.10
Myanmar	43.52	33.95	24.70	30.29	36.30
Philippines	9.47	18.74	28.30	24.53	20.60
Singapore	0.00	0.00	0.00	0.00	0.00
Thailand	0.47	0.59	0.70	070	070
Vietnam	2.09	2.79	3.50	3.05	2.60

Source: IEA, 2011, 2013, 2015 (gaps interpolated)

Figure 19: Population without access to electricity in ASEAN Region millions)



Source: World Energy Outlook

4.5.2. Economic Dimension

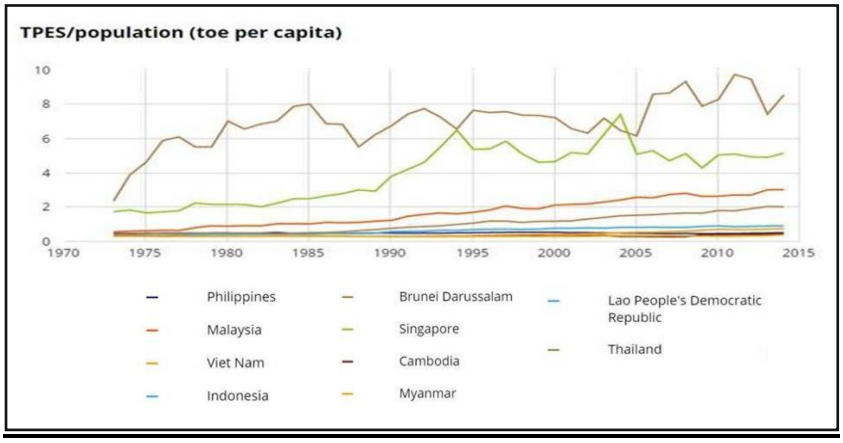
Total Primary Energy Supply over population (toe per capita)

Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous productionplus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.[61]This is not the consumption of end-users but refers to all energy needed as input to produce fuel and electricity.[62]Brunei Darussalam consistently had the highest energy capita among the ASEAN member countries which stood at 8.82 toe in 2014, followed by Singapore at 5.12 toe. Myanmar has the lowest in 2014 which stood at 0.36. Philippines' energy per capita stood at 0.48 in 2014

[61]http://www.economicshelp.org/blog/5988/economics/list-of-countries-energy-use-per-capita/
[62]https://en.wikipedia.org/wiki/List_of_countries_by_energy_consumption_per_capita

from the level in 1973 at .44 taking the 5th place from the highest, that is in the middle place among the neighbouring countries.

Figure 20: TPES/population (toe per capita), ASEAN



Source: IEA, Energy Atlas Statistics

Energy Intensity per GDP – (ECO2)

Energy Intensity (TPES/GDP PPP)

Energy intensity refers to total primary energy supply (TPES) per thousand US dollars of GDP. The ratios are calculated by dividing each country's annual TPES by each country's annual GDP expressed in constant 2005 prices and converted to US dollars using purchasing power parities (PPPs) for the year 2005.[63]

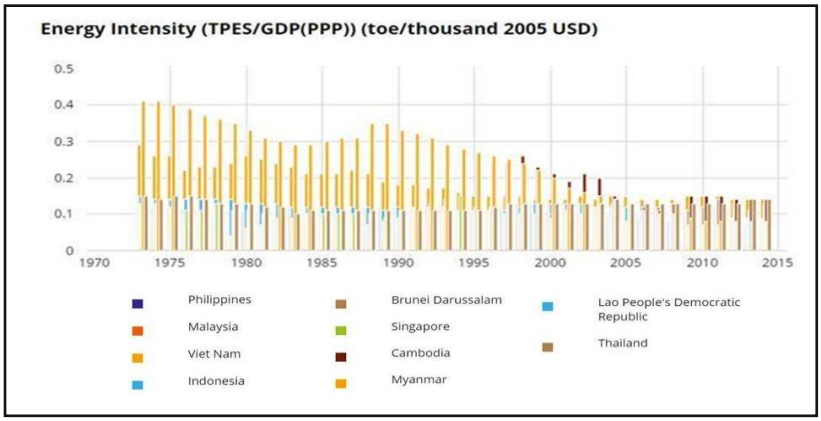
In this graph, Myanmar has the highest intensity level in 1973 which stood at0.41 toe, followed by Vietnam with 0.29 and Thailand. Philippines' intensity level in 2014 stood at 0.07 ktoe from 0.01 in 1973. In general, the improvement of energy intensity in Southeast Asia has been slow as it transformed to more energy-intensive economies, it failed to fully tap available technical potential for energy efficiency.[64] Low

[63] http://www.oecd-ilibrary.org/docserver/download/3015041ec040.pdf?expires=1475555969&id=id&accname=guest&checksum= 2AC95FE659FAD89F194C2D013C96FF0D

[64] https://www.iea.org/publications/freepublications/publication/SoutheastAsiaEnergyOutlook_WEO2013SpecialReport.pdf

energy intensity for Singapore, Philippines and Indonesia may be due to several factors like faster growth of GDP than energy demand, the services sector having a growing share of the economy, energy efficiency programmes, among others.

Figure 21: Energy Intensity (TPES/GDP/PPP), ASEAN



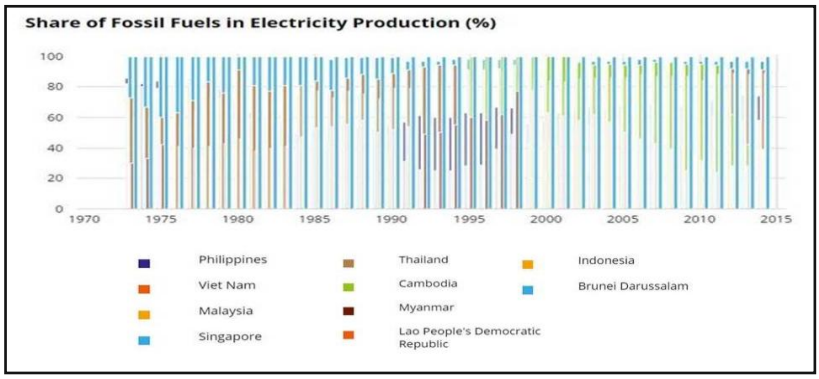
Source: IEA, Energy Atlas Statistics

Fuel Shares in energy and electricity – ECO11

Share of Fossil Fuels in Electricity Production (%)

For the share of the fossil fuels in the electricity production, Brunei Darussalam consistently topped the list of 100%. Also, Singapore at 100% until 1995 where it decreased to 98% but soared high again to reach 97% in 2014.Philippines had 86% in 1973 and lowered down to 74 in 2014 which is the median of the neighbouring countries. Myanmar has the lowest, followed by Cambodia and Vietnam in 2014.

Figure 22: Share of Fossil Fuels in Electricity Production, ASEAN



Source: IEA, Energy Atlas Statistics

Non-carbon energy share in electricity – ECO12

Share of nuclear in Electricity Production (%)

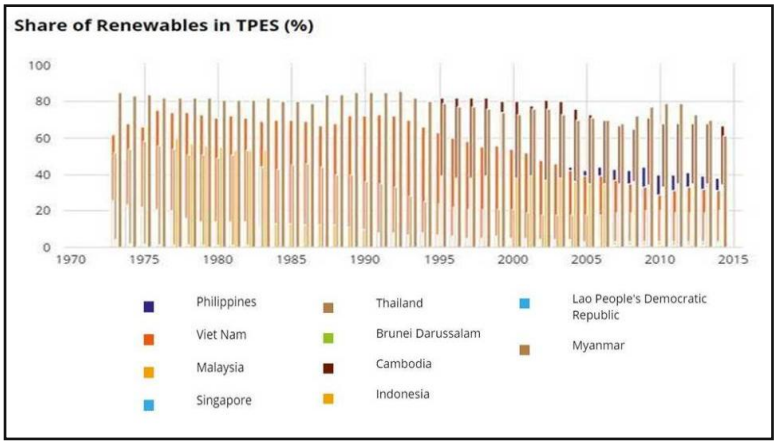
This indicator is not applicable to ASEAN member countries because all of the ASEAN member countries do not have nuclear energy resources.

Renewable energy share in energy and electricity – ECO13)

Share of Renewable in Total Primary Energy Supply (TPES)

In the Philippines**,** the share of renewable energy in the total primary energy supply mix stood at 47% in 1973 and this went down to 38% in 2014. It has the highest share in the mid 80s with around 64% share in the total primary energy supply mix. In comparison with other neighbouring countries, Philippines' share of renewable is almost at the same level. The country is endowed with rich renewable energy resources including hydropower and geothermal.

Figure 23: Share of Renewable in Total Primary Energy Supply

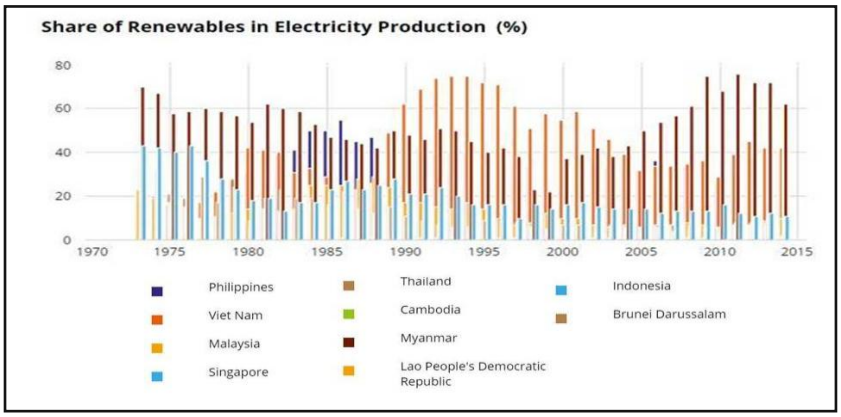


Source: IEA, Energy Atlas Statistics

Share of Renewables in Electricity Production

When it comes to renewable energy in the production of electricity, Myanmar had the highest share in 1973 with70% of renewable and 62% in 2014. Myanmar agricultural sector and its large land mass provide for high potential for biofuels and biogas. Renewable energy's share is significant in their electricity production. The Philippines' share then stood at 14% in 1973, rose to 55% in 1986 but went down to 26% in 2014.

Figure 24: Share of Renewables in Electricity Production (%)



Source: IEA, Energy Atlas Statistics

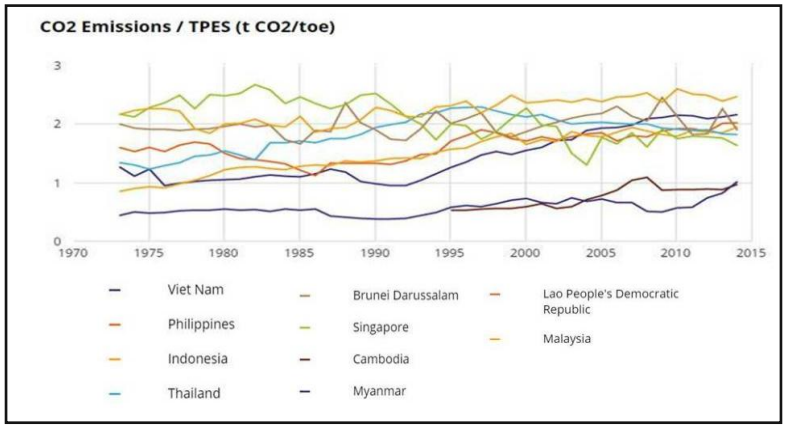
4.5.3. Environmental Dimension

<u>Greenhouse gas (GHG) emissions from energy production and use, per capita, and per unit of GDP – ENV1</u>

Carbon Dioxide Emissions / Total Primary Energy Supply

For the CO2 emissions per energy, Singapore, Brunei and Malaysia are the largest emitters. Cambodia, Myanmar and Philippines are still among the lowest emitters of CO2 with the rate of 1.01 toe for the Philippine in 2014.

Figure 25: CO2 Emissions / TPES (t CO2/toe), ASEAN



Source: IEA, Energy Atlas Statistics

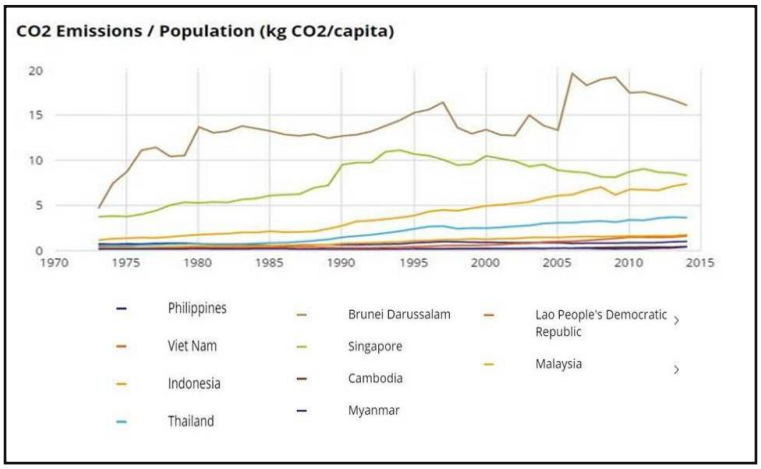
Carbon Dioxide Emissions per population (CO2 per capita)

CO2 emissions(metric tons per capita)or carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.[65]

In 1973, the Philippine level of CO2 emissions per capita stood at 0.7 and reached 0.97 kg in 2014. Per capita CO2 emissions are still almost nil in Myanmar and Cambodia. In the Philippines and Vietnam are very low, while Singapore and Brunei Darussalam are among the largest per capita emitters in ASEAN region.

[65]https://www.google.co.kr/search?q=CO2+emissions+per+capita+defined&oq=CO2+emissions+per+capita+defined&aqs=chrome..69i57j0l3.20928j0j7&sourceid=chrome&ie=UTF-8

Figure 26: CO2 Emissions / Population (kg CO2/capita), ASEAN

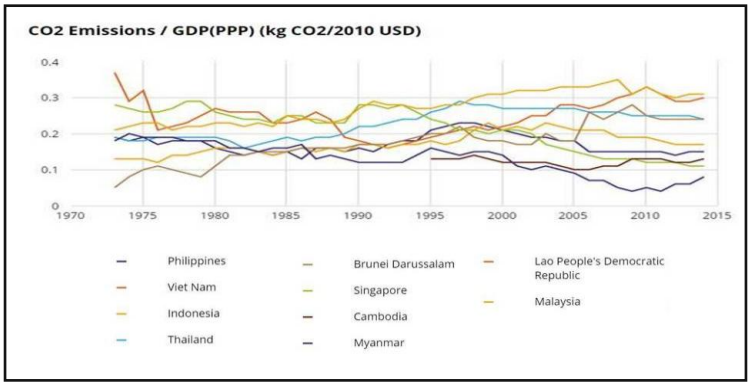


Source: IEA, Energy Atlas Statistics

Carbon Dioxide Emissions per GDP

Figure 27 shows that the share of emissions per GDP by Cambodia and Myanmar are almost zero. While Malaysia is at the top level. From the graph, it can be seen that Vietnam, Malaysia, Singapore, Thailand, Brunei Darussalam and Indonesia have the most intensive economieswith their high energy intensity level which may be due to higher GDP and other factors such as higher electrification rates.

Figure 27: CO2 Emissions / GDP(PPP) (kg CO2/2010 USD), ASEAN



Source: IEA, Energy Atlas Statistics

4.6. Importance of the integration of energy indicators to the Philippine Energy Planning

It is a common saying that good planning produces good output. Something that was well-planned most likely will yield favourable results. The importance of energy in human lives has been emphasized in many literatures. It has been said that it moves the economy, it gives life to the society, it makes people's lives easier and comfortable and most of all, it helps uplift people's life from poverty. To realize all these, the energy must be sufficient not only today but also tomorrow, not only for the present generation but also for the generations to come. However, according to the United Nations (UN, 2001) most current patterns of energy supply and use are not sustainable,[66] and there are many issues and challenges in the energy sector that need to be addressed. This is where the important role of energy planning comes into play.

Planning not only helps assess the development and performance of the energy sector, likewise it determines the level of the country's development. It likewise helps develop strategies to improve the energy of the country by formulating the needed appropriate policies to be pursued by the government. The supply of energy must always be reliable and adequate, and in the process of ensuring its reliability and adequacy, the environment must also be protected so that the future generations could still enjoy such reliability and adequacy of such resources, that is sustainability of resources. When there is sustainability of resources, it will have an impact or affect not only the economic aspect, but to the social and environmental aspects of peoples' lives as well. The three dimensions of sustainability must be integrated in the energy planning process to cope up with the continuous changes and challenges in the energy world. Those issues and challenges that were not able to solve by

[66] http://www.un.org/esa/sustdev/publications/energy_indicators/chapter2.pdf

the conventional energy planning method must be dealt with through the new approaches in the energy planning process.

As mentioned earlier, energy planning is normally conducted in a conventional way which usually focus on the energy supply and use, then formulate a set of policies to meet the future energy needs. This method is not giving room for the integration of all energy-related aspects into the energy planning process. It may address some economic and environmental aspects, but they lack the capacity to cover all energy-related issues simultaneously.

4.7.Data Analysis and Interpretation

4.7.1 On the comparison of Philippine and Korean energy indicators

On social aspect of sustainability, there are four (4) energy indicators that were identified by the IEA, the focus was mainly on affordability, accessibility and disparity of energy resources. Therefore, it should not only be the accessibility but also the affordability and disparity must be considered in the planning process. The sustainability on the social dimension of Korea with respect to accessibility is way better and satisfying than the Philippines because access to energy or electricity is no longer an issue for the country as it is already 100 percent electrified. On the part of the Philippines, the accessibility rate is only 83.5, which means that there are still many Filipinos living in darkness and this is something that government has to work on the soonest time possible to alleviate the life of many Filipino people from poverty. Social dimension likewise concerns about affordability and disparity, however, these two areas were not given much emphasis in the presentation due to unavailability of data. The data needed for sustainability for social dimension are share of household income spent on fuel and electricity, household energy use for

each income group and corresponding fuel mix, the household energy use for each income group and corresponding fuel mix and the number of accident fatalities per energy produced by fuel chain. The lack of data for these indicators will cause some difficulty in assessing the sustainability pathway of the social dimension.

On the economic indicators, Korea‘s trend demonstrated a huge leap from the 1970s to 2014. The total primary energy supply over population or the energy per capita (ECO1), the energy intensity per GDP (ECO2) of South Korea implies a tremendous development. In response to its rapid economic development, Korea’s has to import 97% of its energy requirement to sustain its economic activities. Its economic growth made Korea one of the largest energy consuming nation in the world because of its heavy and energy intensive industries such as steel, petroleum refineries and ship industry. With this growth, Korea government is doing everything to diversify its supply and making the necessary investment overseas to back up the insufficiency of domestic energy resources. Likewise, part of its plan is to boost the nuclear power resources in the country. On the part of the Philippines, it can be seen in the graphs, the trend of the TPES per capita remained at the same level and the energy intensity had just minimal increased, and was just playing around the figures for the entire period.

Another indicator under economic dimension is the fuel shares in energy and electricity (ECO11). The applicable energy indicator is the share of fossil fuels in the electricity generation with 69 and 74 shares, for Korea and Philippines, respectively. This means that both countries still find fossil fuels to be an important fuel in the mix. For non-carbon energy shares in electricity (ECO12) which the author finds to be the share of nuclear in electricity production. South Korea is abundantly producing nuclear energy while the Philippines has no nuclear energy resources.

The difference in the trends among these economic indicators is the share of renewable energy in the total primary energy supply and in the power generation. The share of renewable energy in the TPES of Korea consistently stood at 1.1% generated from biofuels and waste and a very small amount of hydro, wind and solar energies and heat contribute to its total primary energy supply. Korea's TPES primarily dominated by oil and coal and to a lesser extent by nuclear energy and natural gas While the Philippines, renewable have a significant share and the level stood at 35% in 2014 being a country with vast natural resources especially in the production of geothermal energy where the Philippines stands as the second largest producer in the world next to USA.

The self sufficiency level also between the two countries differ, one big difference is the self sufficiency level of the two countries. In 2014, Korea's level went down to 18% and the Philippines rose to 54%. This is because South Korea is a major energy importer, importing nearly all of its oil needs from other oil producing countries. Its own energy resources are not sufficient, like the inadequate supply of coal and its low quality, the limited supply of hydroelectric due high seasonal variations in the weather. But South Korea is a home to nuclear power plants. The government is developing its nuclear power generation which improves energy independence while mitigating carbon emissions.

For economic dimension, among the 16 energy indicators for sustainable development that were identified by the IEA, only four (4) indicators that the author believed to be applicable. There was some kind of difficulty in finding data on the following indicators: efficiency of energy conversion and distribution (ECO3), reserves-to-production ratio (ECO4); resources-to-production ratio (ECO5); sectoral energy intensities (industry, agricultural, service/commercial, household, transport) (ECO6-ECO10), end-use energy prices by fuel and by sector (ECO14), net energy import dependency (ECO15) and stocks of critical fuels per corresponding

fuel consumption (ECO16). These abovementioned indicators should likewise be integrated in the planning process for a sustainable economic pathway for development.

For Environmental dimension, many factors have to be integrated. The following were not presented in this study for lack of data, the ambient concentrations of air pollutants in urban areas (ENV2); Air pollutant emissions from energy systems (ENV3); Contaminant discharges in liquid effluents from energy systems (ENV4-1); Oil discharges into coastal waters (ENV4-2); Soil Area where acidification exceeds critical load (ENV5); Rate of deforestation attributed to energy use (ENV6); Ratio of solid waste generation to units of energy produced (ENV7); Ratio of solid waste properly disposed of to total generated solid waste (ENV8); Ratio of solid radioactive waste to units of energy produced (ENV9); Ratio of solid radioactive waste awaiting disposal to total generated solid radioactive waste (ENV10).

In this study, there is only one indicator that is available for presentation that is Greenhouse gas (GHG) emissions from energy production and use, per capital and per unit of GDP (ENV1). Korea is a highly industrialized country, it imports 97% of its oil requirements overseas. It energy mix is dominated by oil and coal, so that its CO2 emissions is quite significant. In fact, Korea is one of the largest emitters in the World and in 2014 it had a huge increase in the emissions to as high as 567.81 kg.

However, South Korea is very eager to reduce its greenhouse gases emissions or even stopped at least the rise of such emissions. As part of its strategy to achieve this, it plans to invest more in green energies, such as tidal and ocean power, wind and solar power, or hydro. South Korea has become a model for the promotion of renewable energy.

4.7.2. On the comparison of Philippine Energy Plan and Korean Energy Masterplan

Energy plans have different levels of importance based on the government's priority thrust. The summary of the similarities and distinctions of the Philippine Energy Plan and Korea Energy Master Plan are as follows:

Similarities:

- Both Philippine Energy Plan and Korea Energy Master Plan provide for the detailed blueprints of actions and targets that are focused on self-sustainability, attainment of energy security, achievement of sustainable development taking into account economic growth and environmental impact.
- Both were formulated for a 20 year planning horizon in a comprehensive manner detailing the energy sector's policies, goals, demand and supply outlook, accomplishments and plans and programs.
- Both work towards the reduction of reducing fossil fuel use, improving energy efficiency and expanding the supply of renewable energythrough various measures including the Renewable Portfolio Standard (RPS)
- Both have a government-led energy efficiency and conservation programs like the energy efficiency standards for transportation, buildings, appliances and other sectors, deployment of LED lighting and other energy-efficient products as part of the demand side management

However, the two plans have also the unique characteristics of its own. The following are the differences.

Differences:

- Amid world-wide efforts to respond to climate change, greenhouse gas emissions reduction emerged as a major issue for energy policy in Korea. In the Philippines, the major issue is the security, reliability and efficiency of energy supply.

- Korea has high dependence on energy imports (97%) thus innovative efforts are needed to raise the self-development rate for overseas resources, Philippines has indigenous energy resources and only 40% of its total energy supply is imported.
- Energy consumption in the industrial sector in Korea has been increasing faster than forecasted, while the trend is less pronounced in the transportation, household and commercial sectors. In the Philippines, transports sector is the country's most energy-intensive sector followed by residential.
- The plan maximize the use of nuclear energy in the energy mix, which has both environmental benefits, such as Co2 reduction and economic benefits, the Philippines has no nuclear energy policies
- On energy consumption in Korea, demand is focused on electricity due to low electricity rates, destabilized the power supply-demand balance; More and more generation facilities have been constructed to meet growing demand, but this resulted in negative effects, such as increased GHG emissions, an overloaded transmission network and opposition from local residents, in the Philippines, there is high electricity rates which brought a decline in the transport and residential sector in 2011.
- In Korea's plan, there is the establishment of the energy welfare system – that is to eradicate energy poverty affecting 1.2 million households, reduce energy costs for near-poverty group, it guarantees basic energy use for low income classes and improve energy facility efficiency for low income group addressing energy-poor classes. Under the PEP, there are benefits provided to local villages or communities where the generating facilities or energy resource development projects are located. The local communities benefit from these projects to recognize or acknowledge their contribution in energizing the whole country by sharing and allowing their territory to be used in putting up these generating facilities. however this is not a welfare system intended to be provided to all Filipino people

- In Korea, there is a provision of discounts on utilities as well as discounts on electricity, gas and (exemption from basic charges), no such kind of provision or subsidy in the Philippines.
- In Korean's energy plan, civic groups and experts' participation from the initial stage and the plan must be confirmed by the National Energy Committee and Committee on Green Growth, which are composed of the public and private sector. The preparation of the Philippine energy plan is done with consultation with stakeholders and agencies attached to the Department as well as with other government agencies, there is in no Committee, like the National Energy Committee and Presidential Committee on Green Growth and State Council in Korea, to approve the Plan.

Overall, with these similarities and differences, the author believes that each plan has its own good characteristics, while Korea lacks domestic energy resource base, has low energy self sufficiency level and has high CO2 emission level, it made a tremendous leap in its economy that made it now capable to diversify and it can raise its self-development rate for overseas resource. It can engage more innovative efforts to enhance energy security and energy supply stability and has a capacity to invest more in green energies and renewable energy for the environmental sustainability. The Philippines, on the other hand, has abundant energy resources and still working to increase its self-sufficiency level with its diverse energy supply mix. It continues to work on its strategies to realize theoverall goal of energy security and independence.

However, the author believes that both plans still uses a conventional method in energy planning. Both focused on energy supply, energy sector assessment and formulation of policies to meet the future energy needs. The plans contain the economic as well as the environment aspects of sustainability but still some of the the identified sustainable indicators were not yet considered. On social dimension, emphasis was in

the increase or the achievement of full electrification or energization in the household level on the part of PEP, while the establishment of the energy welfare system for energy poor on the part of SKEMP. The planning process must be expanded in such a way that social dimension of the sustainable energy be substantially integrated.

4.7.3. On the comparison of sustainable energy indicators with ASEAN member countries

For social dimension, among the ten member countries of the ASEAN region, only Singapore and Brunei Darussalam have a 100 per cent electrification rate. Indonesia, the most populous country in Southeast Asia has the highest number of population without electricity access. Philippines is the third with the highest number of population without access to electricity, the current electricity level stood at 87.3 only.

When it comes to economic dimension, for energy per capita, Philippines ranks in the middle of all the neighbouring with Brunei having the highest and Myanmar the least. For energy intensity, the Philippines has one of the lowest in 2014 with only .07 ktoe among the ASEAN member countries. When it comes to the fuel shares in energy and electricity, particularly fossil fuels in the electricity production, Brunei Darussalam tops the list with 100% share, followed by Singapore with 97% and then Philippines with 74% share. Another indicator which is the non-carbon share in electricity production which the author believes to be applicable to nuclear power is not available in the ASEAN countries, since no country in the ASEAN has nuclear energy production.

When it comes to the share of renewable energy in TPES and in the share in the electricity production, the Philippines stood 38% and 36%, respectively. In comparison with other neighboring countries, Philippines' share of renewable is almost at the same level. The country is endowed with rich renewable energy resources including hydropower and geothermal.

For environmental dimension, the CO2 emissions per energy, Singapore, Brunei and Malaysia are the largest emitters. Cambodia, Myanmar and Philippines are still among the lowest emitters of CO2 with the rate of 1.01 toe for the Philippine in 2014. When it comes to CO2 emissions per capita, the emissions in Myanmar and Cambodia were insignificant. The emissions for Philippines and Vietnam was very low while Singapore and Brunei Darussalam are among the largest per capita emitters in ASEAN region. With respect to CO2 per GDP, the share of Cambodia and Myanmar are almost zero. Philippines is third to the lowest emitters. While Malaysia is the highest, and with Vietnam, Singapore, Thailand, Brunei Darussalam and Indonesia have the most intensive economies in the ASEAN region.

CHAPTER 5 - ANALYSIS OF DEVELOPMENTAL GAPS

5.1. Introduction

The historical trends of the energy indicators common to Philippines and Korea demonstrated huge gaps especially in the indicators for economic aspect of development. The remarkable gaps evidently indicate the need for improvement in the Philippines' energy economic performance. Although the gaps are so huge and the possibility of being at par with Korea in a short time maybe far beyond possibility, however, the government could formulate appropriate energy policies that could help achieve developmental goals and objectives. This paper identifies several factors that can be considered as hindrances to the energy economic development.

5.2. Factors that cause developmental gaps

Geographic location

The Philippines is an archipelagic country consisting of 7,107 islands. Because of the country's geographical composition, it is difficult and very costly to transmit and distribute power especially to remote islands. To date, a significant number of the country's population that still do not have electricity, especially the communities in the far-flung areas. They are located in off-grid areas or those areas that are not connected to the main transmission grid that powers the country's main islands, so that they remained in the dark despite recent economic growth.

Korea, on the other hand, has no issue on access to electricity as the country is 100 percent electrified according to the World Bank.

Population Explosion

The Philippines with over 100 million population is considered overpopulated[67].Such rapid increase in population also increases energy consumption. The increase in energy consumption likewise increases energy demand which also increases energy requirement of the country. This is a chain reaction, too much population creates energy problem. When the country is too much populated, there will be scarcity of energy to meet the basic human needs of its citizens. Likewise, scarcity of energy supply brings increase in the monetary costs of energy, which has a chain affection the prices of commodities to the detriment of poor Filipino people.

The population is the root cause of all these domestic and global problems. Without too much population, there would no some pressure on the natural resources, no scarcity, no poverty, and no conflict that will trigger the people to commit corruption. Because of this, there will always be a problem on unemployment that could also impact the level of education of the people. More population leads to more competition and then to unemployment, government then would not be able to provide the necessary jobs for its entire people. Too much population likewise has environmental impacts, the more population the more will contribute to all kinds of pollutions and the more it would be difficult for the government to manage environmental preservation

Korea's population is just almost only half of the population of the Philippines. Aside from being a developed country and is capable of providing the basic needs of its citizens, it can give more benefits since the resources do not have to be distributed and divided into too many citizens.

[67] https://www.reference.com/geography/philippines-overpopulated-adf4dd999153f54d

Lack of political will

The lack of political will is one of the main obstacles on the Philippines' road to development. The different directions and different objectives, as well as different interest caused by divided political actors hinders the implementation of energy policies that could give a positive direction to a more strategic and developed sustainable energy system.

In Korea, they successfully realized economic reform and development through the exercise of domestic political will. The officials strived and thrived hard to be able to make such a huge leap in their economic development. With the participation of the citizens and the communities, all work together for the love of nation.

Social Acceptance

Another major factor that causes the slow development of the Philippines is the problem on social acceptance that is the reluctance of the people to accept changes for development. In the Philippines, the putting up of nuclear power plants was not made possible because of the opposition from the people who fear for any possible effects of the presence of nuclear power plants in the country. The public is reluctant to accept changes that could provide additional sources of energy for a possibly more sufficient, reliable and affordable energy supply. Educating the public about energy is very essential. A thorough information, education and communication campaign must be conducted to achieve the purpose.

In Korean environment, through education, the people were made aware of the benefits, advantages and disadvantages of nuclear power plant for the country. Nuclear power plants broaden the source of energy needed to supply the highly energy intensive industries in Korea. It

provides for an affordable, clean and adequate supply of energy to support its booming economy. The country has many nuclear reactors, in spite of the opposition from the people, these power plants were able to put up because the people were educated and made aware of the benefits it could provide to the country.

Corruption

Another point to consider is that too much population paves the way for corruption, especially in developing countries like the Philippines. Because of the lack of financial resources, or insufficiency of income as well as the inability to secure employment which could eventually lead to poverty, people become vulnerable to corrupt. The author believes that this situation is what exactly dominated in the Philippines during the time when Korea was in the process of transformation and progressing in its economy. During these period, while Korea was busy making itself rich, the Philippines was facing enormous corruption and social and economic problems which eventually led to becoming the "sick man of Asia".

National passion

Another factor that hampers the country's development is the lack of strong national passion among the people in general to get even with other's economic progress. The author believes that the absence of enthusiasm and zealousness to thrive as well as to strive to adopt continuous innovation to achieve growth and development not only in the energy sector but for the entire nation's economy as well as lacking in the case of the Philippines.

From the history of Korean development, it can be seen the passion of everyone to transform Korea into a developed country. The people

worked hard and the community villages actually participated in their own ways in the development process.

Patriotism

People's patriotism plays a very significant role in economic development. A good example that can be considered applicable is the situation of the Philippines under the leadership of former President Ferdinand Marcos. History provides much information about the cases and complaints filed against him and his cronies for corruption. This is a clear and unequivocal indication of lack of patriotism. Instead of focusing full attention to economic development for the good of the nation, the focused was on committing corruption for the good of their pockets. Instead of thinking how can the people be elevated from poverty, the leaders took care of their personal interest and enriched themselves at the expense of the nation. This is a clear lack of patriotic values for the love of the country.

The scenario is opposite in the case of Korea during the leadership of President Park Chung Hee. He played a very significant role in making Korea's economy grow rapidly with the help of patriotic Korean people who themselves cooperated and assisted the government in the development process.

CHAPTER 6 – CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

Planning is a continuous improvement and learning from other experiences, considering others' success factor and the adoption of outward looking development strategies is very important to consider in achieving a developed sustainable energy planning process. Although every country has its own unique characteristics, environment and resources, if there is a room or possibility for adoption of other's successful strategies, then it should be well considered by any developing countries.

It can be inferred from the comparison of energy indicators between Philippines and Korea that the Philippines has more energy resources and more self-sufficient. The Philippines is rich in geothermal energy, in fact it is the second geothermal energy producer in the world, next to the United States. Likewise, it is also abundant in hydropower supply resources which are mostly available in Mindanao region. On top of this, the country has also other available renewable energy resources that can be tapped to increase the sufficiency level of the country's supply of energy. However, in spite of this availability of resources, there were times that the country suffered insufficiency of supply or suffered shortages of electricity or brownouts in the past few years. More so, the country has still significant number of households nationwide that do not have access to electricity. There are many factors that hamper the development of the country's economy, and the role of power in the development is extremely significant. With the country's current situation, the author believes that it has to pursue a more strategic policy direction to ensure security and sustainability of energy supply. Although at the

moment, the Philippines power supply for the next few years may be secured, however, sustainability has always been a question. There must be an assurance that the country will be able to supply the basic energy needs of its ever increasing population or for its future generation.

Looking at Korea's case, Korea is a country with less domestic energy resources and it imports about 97% of its oil requirements. However, it made itself highly industrialized and it was able to supply power to its highly energy intensified industries. Korea's focus is on the three (3) E's that is *Energy security*, *Energy efficiency* and *Environmental Protection* which the author believes to be all a component of sustainability. Korea is making a stronger tie with energy partners in securing resource overseas, putting up significant investments in research and development for renewable energy and at the same time strongly powered by its many nuclear power plants. The author believes these are one of the good strategies that Philippines has to emulate to sustain the ever increasing demand for energy in the country. The Philippines' is also an oil importer, it imported 57% of its energy requirement in 2015, however the government's focus is to lesser the dependency on oil importation, so the drive is to promote the production and utilization of renewable energy. On the matter of research and development, the author believes that the focus is not much on this but technology transfer from other countries.

On nuclear energy development, the author believes that nuclear energy production contributed significantly in providing sufficient and affordable energy supply to Korea, which helps provide adequate supply for its power requirements. It has a total of 24 nuclear power reactors and provide about one third of its total electricity. In the previous Philippine Energy Plans, nuclear energy was just a long term option. The government could not and was not able to operate the one and only Bataan Nuclear Power Plant which was built in 1970s due to many issues.

Nuclear energy remains a long term option for the country. Social acceptance and political support are one of the many issues why the government cannot pursue nuclear power projects.

In Korea, the putting up of additional nuclear power plants or other related projects also got opposition from the villagers or common people. However, Korea was able to establish around 24 nuclear power plants in spite of these oppositions. Public supportive attitude is very important in the implementation of any policies and the public can be supportive if they are well-informed and have enough knowledge or information on the importance not only of securing energy supply but as to the effect of fossils fuels in the environment as well. Educating the public and intense information campaign is very critical. They must be well informed of how nuclear power works, its benefits and advantages and everything that they have to know (such addressing climate change and radioactive disposal issues) for them to have a perception of success and effectiveness for its utilization and development. This should likewise be coupled with the political support from the people in the government. There should be a unity in mind, unity in purpose and unity in action for the development of the country. The author believes that Korea has been successful on this respect as it was able to build such number of reactors in spite of challenges and hindrances. This is something that the Philippine government has to seriously work on if it is really considering the idea of achieving further development.

Looking at the comparison of the historical trend of the Philippine energy indicators with Korea, the Philippines is lagged behind tremendously in economic aspect. The big gap accounts for the huge leap on the economy of Korea. On social aspect particularly on the number of population or households that have no access to electricity, Korea is 100% fully electrified while in the Philippines, a significant number of households still have no access to electricity. However, as previously

mentioned, some indicators for social and environmental aspects were not presented due to unavailability of data, something that must be worked on by both countries to keep tract sustainability.

The Philippine energy planning is in accord with the sustainability objectives and it is taking pathway to sustainability as provided in its policy framework. The development of a sustainable energy system is one of the strategic directions of the Plan. It embodied sustainable strategies and projects for the achievement of its goal towards of attaining, secure, affordable, reliable, adequate supply of energy, as well as to ensure security of supply and achieve energy independence in a manner that will promote sustainability. However, the full integration of all the sustainable energy indicators is very important to keep track sustainability and in this area the Philippines has a lot of things to improve.

As for the Philippine indicators historical trend compared to ASEAN member countries, most of the indicators show that Philippines have always been at par with others. However, for social aspect, Philippines are one of the countries with higher unelectrification rate, in fact the third from Indonesia and Myanmar in 2013. For economics aspect, it is most in the middle rank and it goes at par with neighbouring countries. For environmental energy indicators, it shows that Philippines is one of the lowest CO2 emitters in the ASEAN region. However, there are still some identified environmental indicators that must be considered to keep track sustainability, and again the data are unavailable.

6.2. Suggestions and Policy Recommendations

The Philippine energy planning is generally focused more on economic aspects. The social and environmental dimensions were not adequately discussed and presented to give more picture of the sustainability of these two dimensions. One major challenge for this is the insufficiency or unavailability of data. There is a need for the following recommendations to be considered:

- The government should make the involvement of the municipal or provincial governments or the local communities in the energy planning process mandatory. They should be required to prepare their own local energy plans. Such responsibility should be strengthened by the passage of some laws or orders providing a clear cut legal basis for their compliance with administrative sanctions in case of non-compliance. The preparation of the energy plans must be initiated at the bottom level. Local communities know better what their energy requirements are and the energy challenges or problems besetting their community. Moreover, the collection of the necessary data for the local energy plans especially the energy indicators for sustainability for the three dimensions would be easier to collect due to the direct contact with the people and the coverage areas being too manageable to handle. A system that supports energy statistics and integrate all the sustainable indicators at the local level can be created that will also be needed for the national level in formulating the national energy plans.
- The regular collection of energy data must form part of the responsibilities of the local government in cooperation and coordination with concerned agencies in the local communities. Local government should share responsibility in securing the necessary information, identify issues and problems that are necessary in promoting energy sustainability. The collection of data from households on energy use, usage amount, and other data necessary for the preparation of the energy plans maybe collected and coordinated by municipality/province in partnership with local government agencies.
- The government must also have to promote institutional sustainability. The institutions that will play major and significant roles in the planning process needs to be strengthened. The restructuring or the reorganizations of the institutions that have a direct involvement on matters respecting

energy governance and processes is very important. Likewise, to ensure that energy plans are successfully formulated and that all necessary component of a good plan are integrated, and in making sure that the needed appropriate policies and strategies are reflected, the creation of energy committees for the approval of energy plans is equally important just like the existing energy committee that Korea has for its energy plans.

Moreover, since the planning process mostly concerned itself with economic aspects paying inadequate or less attention to institutional issues. Like Korean experience, the author believes that the creation of an agency with a legal basis that is primarily dedicated to energy welfare would be a very useful strategy in pursuing social sustainability. The agency will be primarily responsible in providing the necessary energy needs of the people and ensure the provision of equal opportunity in enjoying energy benefits generated from the energy projects and programs of the government.

- To ensure the sustainability of the energy planning process and its effectiveness to catch up with the ever changing environment and global changes, the government should conduct a recurrent visit of the planning process and make sure that the energy indicators for sustainable development respecting the three dimensions are properly integrated. The regular conduct of consultation with different stakeholders with participation of community leaders or the local government officials is a good strategy to properly identify the issues and challenges surrounding the social, economic and environmental aspect of development both at the local and national level.

- On the national level, the strengthening of relationship with international agencies like IEA, IAEA and similar global institution in promoting and

assisting the development of the social, economic and environmental indicators for adoptability to the world's constant changes is very significant, especially in the developing countries like the Philippines.

- Lastly, sustainability always emphasizes the world's development today without comprising the provision of basic needs for the future generation. The present available resources must be used and managed in a sustainable manner through the proper preservation and protection of the environment. One good strategy is pursuing development with low carbon economy and this may be achieved by promoting green technology, green industries and green jobs. The author believes that going green in every aspect of development is very essential for sustainability. Like in Korea's energy master plan, going green was highly emphasized and given much importance and the implementation of such policies and strategies can be seen all around Korea. This is something that needs to be emulated in the Philippine case, not only giving more spaces for environmental development in the Plan, but the seriousness of the government in making it happen must reflect through the successful implementation of policies and programs as well.

References

Abdalla, Kathleen, Energy Indicators for Sustainable Development Social Dimension, 2015 (https://sustainabledevelopment.un.org/content/documents/13157Social%20Dimensions%20of%20SD_DSD.pdf)

ADB 2015, *RENEWABLE ENERGY DEVELOPMENTS AND POTENTIAL IN THE GREATER MEKONG SUBREGION,* https://www.adb.org/sites/default/files/publication/161898/renewable-energy-developments-gms.pdf

Alexander, Ernest R. (1992), *Approaches to planning: introducing current planning theories, concepts, and issues*, Gordon and Bleach publishers, ISBN: 2-88124-511-0

Allmendinger, Philip (2002), *Towards a Post-Positivist Typology of Planning Theory,* Planning Theory, vol.1, pages 77-99

Alternet, *Global Warming: It's about Energy*, (http://www.alternet.org/story/48089/global_warming%3A_it's_about_energy)

Amulya K.N. Reddy (India), Energy and Social Issues, *WORLD ENERGY ASSESSMENT: ENERGY AND THE CHALLENGE OF SUSTAINABILITY* (http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Sustainable%20Energy/wea%202000/chapter2.pdf)

Antonia Lutteken and Konrad Hagedorn, *Concept of Issues of Sustainability in Countries in Transition – An Institutional Concept of Sustainability as a Basis for the Network*, Humboldt University of Berlin, Department of Agricultural Economics and Social Sciences (ftp://ftp.fao.org/seur/ceesa/concept.htm)

Archibugi, Franco (2008), *Planning Theory, From the Political Debate to the Methodological Reconstruction*, Springer, ISBN: 978-88-470-0695-9

Archibugi, Franco (2005), Initial praises for *"The Planning Theory: from the Political Debate to the Methodological Reconstruction* (http://www.francoarchibugi.it/pdf/%5BE%5D-Planning%20Theory-%20Initial%20Praises.pdf)

Baines J., Morgan B. (2005), *Sustainability Appraisal: A social perspective*, International Institute for Environment and Development, New Zealand

Brinkerhoff, Derick W. and Goldsmith, Arthur A, (1990) *Institutional Sustainability in Agriculture and Rural Development: A Global Perspective*, "*Evaluating institutional sustainability in development programmes: beyond dollars cents*", Brown, Deryck R. (1998), Journal of International Development, Vol. 10, No. 1, pages 55-69

Bryce Hall, et al, *What is Sustainability and Why is it Important?*, Environmental Science

Bunker Ports News Worldwide, *EIA: South Korea Oil Market Overview (*http://www.bunkerportsnews.com/News.aspx?ElementId=aad5cdeb-45b5-451c-97ea-15b16f7c40de)

Campbell, Scott and Fainstein Susan (1996), *Readings in Planning Theory*, Blackwell Publishers, ISBN: 1-55786-613-9

D. Rad, Farhad (2008), *On Sustainability Local Energy Planning*, Licentiate thesis, Lund Institute of Technology, Lund University, ISRN

Denzil, Walton, *SUSTAINABLE ENERGY: DEFINITIONS, FOCUS, AND THE SOCIAL DIMENSION*, Leonardo Energy, 2014 (http://www.leonardo-energy.org/blog/sustainable-energy-definitions-focus-and-social-dimension)

Derakhshan, Farhad, *On Sustainability in Local Energy Planning*, (2011) Lund University

Department of Energy, Philippines

EarthScan: *A common future: A reader's guide, the 'brundtland Report Explained'*, EarthScan Publication, ISBN:1-85383-010-0 (https://books.google.co.kr/books?id=TNx4a4qRb0wC&pg=PA8&lpg=PA8&dq=a+political+system+that+secures+effective+citizen+participation+in+decision+making&source=bl&ots=uoQyPqhM_4&sig=lv_ZCxko0kOMLPDpqokNxFr6u_g&hl=en&sa=X&ved=0ahUKEwiN5LOChpvPAhVGFZQKHanMCmUQ6AEIHTAA#v=onepage&q=a%20political%20system%20that%20secures%20effective%20citizen%20participation%20in%20decision%20making&f=false)

Energypedia, *Philippine Energy Situation,*(https://energypedia.info/wiki/Philippines_Energy_Situation #Energy_Situation)

European Commission, *Energy and Environment,* 2016, (http://ec.europa.eu/environment/integration/ energy/index_en.htm)

Global Policy, *National and Global Energy Governance: Issues, Linkages and Challenges in the Philippines,* (http://www.globalpolicyjournal.com/articles/climate-change-energy-and-sustainability/national-and-global-energy-governance-issues-linka)

Faludi, Andreas, (1973), *The 'Systems View' and Planning Theory*," Socio-Econ Plan. Sci., Vol. 7, pages 67-77

Ferreira, Paula Varandas (2007), Electricity Power Planning in Portugal: *The Role of Wind Energy,* doctoral thesis, University of Minho, Portugal

Friedman, John (1987), *Planning in the public domain: from knowledge to action,* Princeton University Press, ISBN: 0-691-02268-2

Harris, Jonathan M. (2000), Basic Principles of Sustainable Development, Global Development and Environment Institute, Tufts University, Working paper 00-04 (http://www.ase.tufts.edu/gdae/publications/working_papers/Sustainable%20Development.PDF)

HEC Global Learning Centre, *What is sustainability*?Tower Hamlets PDC

Hudson, Barclay M., Galloway, Thomas D, and Kaufman, Jerome L. (1979), *Comparison of Current Planning Theories: Counterparts and Contradictions,* Journal of the American Planning Association, vol. 45, issue 4, pages 387-398

I.Vera, L. Langlois, H.-H. Rogner, *INDICATORS FOR SUSTAINABLE ENERGY DEVELOPMENT,* International Atomic Energy Agency, (http://www.un.org/esa/sustdev/publications/energy_indicators/chapter2.pdf)

Ilho Yoo, *Korea's Economic Development: Lessons and Suggestions for Developing Countries* (KDI School of Public Policy and Management)
(http://www.kossrec.org/wp-content/uploads/2015/04/KSSJ_200806_2_ _ %EC%9C%A0%EC%9D%BC%ED%98%B8.pdf)

IEA, World Energy Outlook 2015, and 2011 and 2013

IEA, *World Energy Outlook Special Report 2013: Southeast Asia Energy Outlook*
(https://www.iea.org/publications/freepublications/publication/weo-2013-special-report-southeast-asia-energy-outlook.html)

International Energy Agency, IEA Energy Atlas, IEA Statistics
(http://energyatlas.iea.org/#!/tellmap/-1002896040/1)

International Energy Agency, CO2 EMISSIONS FROM FUEL COMBUSTION IEA Statistics Highlight,
IEA Statistics 2015 Edition,
(https://www.iea.org/publications/freepublications/publication/CO2EmissionsFromFuelCombustionHighlights2015.pdf)

International Atomic Energy Agency (IAEA), *Energy Indicators for Sustainable Development: Guidelines and Methodologies, 2005*
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1222_web.pdf

International Atomic Energy Agency (IAEA), *Indicators for Sustainable Development*, Information Series Division of Public Information
(https://www.iaea.org/sites/default/files/indicators.pdf)

International Energy Agency (IEA), Key World Energy Statistics 2016
(https://www.iea.org/publications/freepublications/publication/key-world-energy-statistics.html)

Kent E. Calder, *KOREA'S ENERGY INSECURITIES COMPARATIVE AND REGIONAL PERSPECTIVES*, Korea Economic Institute,
(http://www.keia.org/sites/default/files/publications/05Calder.pdf)

Key world energy statistics, 2016, International Energy Agency

KEPCO, *Nuclear Power*,
(https://home.kepco.co.kr/kepco/EN/B/htmlView/ENBBHP001.do?menuCd=EN020201)

Korea Basic Energy Plan 2008-2030

Korea Energy Masterplan Outlook and Policies to 2035

Korea's Green Growth Experience, Process, Outcomes and Lessons Learned by Global Green Growth Institute , 2015

Korea JOongang Daily,*[Viewpoint] Explaining the Korea-Philippine gap* (http://koreajoongangdaily.joins.com/news/article/article.aspx?aid=2914491&ref=mobile)

Korea Management Corporation, *Energy Review in Korea*, (http://www.kemco.or.kr/new_eng/pg02/pg02040400.asp)

Korea Scholar, Journal Information Service System, *Global Marketing Conference 2014 Global Marketing Conference at Singapore , 2014 Global Marketing Conference at Singapore* (http://db.koreascholar.com/Article?code=271943)

KOTRA, About Korea, (https://www.kotra.or.kr/foreign/korea/KHENKO010M.html?TOP_MENU_CD=KOREA)

Letycja Sołoducho-Pelc, *Planning Horizon as a Key Element of a Competitive Strategy*, Journal of Economics, Business and Management, Vol. 3, No. 2, February 2015 (http://www.joebm.com/papers/174-W00011.pdf)

Mason, Matthew, Environmental Science.org, *What is sustainability and why it is important?*, (http://www.environmentalscience.org/sustainability)

Metropolitan Planning Council, *Create a Local Energy Plan*, Smart Growth and Regional Collaboration, September 2013 (http://www.mapc.org/system/files/bids/Create%20a%20Local%20Energy%20Plan.pdf)

Michael T. Klare, *Global Warming: It's About Energy*, Foreign Policy in Focus, Alternet

OECDiLibrary, *Energy Intensity*, (http://www.oecd-ilibrary.org/economics/oecd-factbook-2015-2016/energy-intensity_factbook-2015-40-en)

OECD Green Growth Studies, *Towards Green Growth in Southeast Asia*, published 2014 (https://books.google.co.kr/books?id=QehNBQAAQBAJ&pg=PT27&lpg=PT27&dq=CO2+GDP+PPP+(kg+CO2/2005+USD)&source=bl&ots=GaNQ-4-CV5&sig=LzzNB5eLuDpV5M8edJKsZSE4kuA&hl=en&sa=X&ved=0ahUKEwif4OmXi8DPAhVBJ5QKHSmgA3QQ6AEIOzAF#v=onepage&q=CO2%20GDP%20PPP%20(kg%20CO2%2F2005%20USD)&f=false)

Ockwell, David G., (2008), *Energy and economic growth; Grounding our understanding in physical reality*, Energy Policy, Vol. 36, Issue 12, pages 4600-4604

Pearce, Annie R., (1999), The Dimensions of Sustainability: A Primer, Virginia Polytechnic
Institute and State University, from:
(http://maven.gtri.gatech.edu/sfi/gtsfi/pdf/pearce.pdf)

Policies for a Sustainable Energy System – South Korea, Background report to PM 2014:05, Dnr: 2013/164 Myndigheten för tillväxtpolitiska utvärderingar och analyser Studentplan 3, 831 40 Östersund
(https://www.tillvaxtanalys.se/download/18.201965214d8715afd113cc8/1432548902487/Energisystem%2Bbortom%2B2020%2BSydkorea.pdf)

Polvorosa, Cesar Jr, *TAKING THE LONG VIEW :The Philippine economy in the next 30 year*s, InterAksyon, (http://interaksyon.com/business/125948/taking-the-long-view--the-philippine-economy-in-the-next-30-years)

The Philippine Department of Energy, Philippine Energy Plan 2012-2030

Rachel Emas, *The Concept of Sustainable Development: Definition and Defining Principles*, Brief for GSDR 2015 (https://sustainabledevelopment.un.org/content/documents/5839GSDR%202015_SD_concept_definiton_rev.pdf)

Spangenberg, Joachim H. (2005), *Economic sustainability of the economy: concepts and indicators*, International Journal of Sustainable Development, Vol. 8, No. 1-2, pages 47-64

SSRN, Causal Relationship between Energy Consumption and GDP Growth Revisited: A Dynamic Panel Data Approach, 2014 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2484437)

Susan Campbell and Susan S. Fainstein, *Introduction: The Structure and Debates of Planning Theory*, Campbell, Scott and Susan S. Fainstein, eds. 1996. *Readings in Planning Theory.* Cambridge, MA: Blackwell

Sustainable Development Knowledge Platform, *Energy for Sustainable Development,* Department of Economic and Social Affairs, UN DESA
(https://sustainabledevelopment.un.org/topics/energy)

UNIDO UN Women, *Sustainable energy for all: the gender dimension,* (https://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Women_and_Youth/GUIDANCENOTE_FINAL_WEB.pdf)

United Nations, *Energy for Sustainable Development*, Sustainable Knowledge Platform, United Nations, Department of Economic and Social Affairs

Thornqvist Lennart (1980), Kommunal Planering (Municipal Planning) in *"Det Oljelosa samhallet, (Municipal energy planning, in "the oil-free society")*

Tsikot.com, *Thread: Explaining Philippines-South Korean (Economic) Gap*
https://www.tsikot.com/forums/politics-economy-religion-talk-100/explaining-philippines-south-korean-economic-gap-66458/

Twink.org, Finding *and Resolving the Root Causes of Sustainability problem: Sustainability*
(http://thwink.org/sustain/glossary/Sustainability.htm)

Scott Campbell and Susan S. Fainstein, *Introduction: The Structure and Debates of Planning Theory*, (http://www-personal.umich.edu/~sdcamp/up540/theoryintro.html)

Sim, Chi Kyu, *A Comparison of the Economic Development of the Republic of Korea and the Philippines since Independence* ,Korean Minjok Leadership Academy
International Program, Research Paper, AP European History Class, Winter 2007/2008

(https://www.zum.de/whkmla/sp/0708/chikyu/chikyu2.html#I)

Soapboxie, *The Environmental, Economic, and Social Components of Sustainability*, 2014
(https://soapboxie.com/social-issues/The-Environmental-Economic-and-Social-Components-of-Sustainability)

Researchgate, *Conceptual energy sustainability framework*,
https://www.researchgate.net/figure/260304933_fig2_Fig-2-Conceptual-energy-sustainability-framework-Indicator-codes-are-explained-in

The World Bank Database,
(http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?start=1991&view=chart)

United Nations, UN Documents: Gathering a Body of Global Agreements**,** *Our Common Future, Chapter 7: Energy: Choices for Environment and Development*
(http://www.un-documents.net/ocf-07.htm)

United Nations Statistics Division: . Energy Indicators for Sustainable Development. Vienna, IAEA. IAEA, UN DESA, IEA, Eurostat and EEA, 2005, (http://unstats.un.org/unsd/energy/default.htm)

United States Sustainable Development, *AGENDA 21 United Nations Conference on Environment & Development Rio de Janerio, Brazil, 3 to 14 June 1992*
(https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf)

United Nations System-Wide Earthwatch, *United Nations Conference on Environment & Development Rio de Janeiro, 3-14 June 1992 AGENDA 21, CHAPTER 40, INFORMATION FOR DECISION-MAKING*
(http://www.un.org/earthwatch/about/docs/a21ch40.htm)

UNEP, 21 Issues for the 21st Century, *Results of the UNEP Foresight Process on Emerging Environmental Issues*
(http://www.unep.org/pdf/Foresight_Report-21_Issues_for_the_21st_Century.pdf)

UNDP, *Sustainable Energy,*
*(*http://www.undp.org/content/undp/en/home/ourwork/climate-and-

disaster-resilience/sustainable-energy.html)

Wiley Online Library,
(http://onlinelibrary.wiley.com/doi/10.1002/sd.184/abstract)

Wikipedia, Energy
Planning,(https://en.wikipedia.org/wiki/Energy_planning)

Wikipedia, Energy in South Korea
(https://en.wikipedia.org/wiki/Energy_in_South_Korea)

World Bank Indicators, *South Korea Emissions*,
(http://www.tradingeconomics.com/south-korea/co2-emissions-metric-tons-per-capita-wb-data.html)

World Economic Forum, ASEAN – Analysis of EAPI Performance
(http://reports.weforum.org/global-energy-architecture-performance-index-2014/asean-analysis-of-eapi-performance/)

World Commission on Environment and Development,*Our Common Future*, 1987, p. 43.

Worldometers, *Philippine Data*; (http://www.worldometers.info/world-population/philippines-population/)

Vecht Mee Tegen Onrecht, *Philippines in focus: Energy and Climate Change*
(http://www.11.be/en/wat-doet-11-11-11/item/philippines-in-focus-energy-and-climate-change)

2020 climate & energy package, European Commission Climate Action
(http://ec.europa.eu/clima/policies/strategies/2020/index_en.htm)

For more information:
https://www.google.co.kr/search?q=CO2+emissions+per+capita+defined&oq=CO2+emissions+per+capita+defined&aqs=chrome..69i57j0l3.20928j0j7&sourceid=chrome&ie=UTF-8

For more information:
http://www.nationmaster.com/country-info/stats/Energy/Electric-power-consumption/KWh-per-capita

For more information:
http://www.globalfootprints.org/page/id/0/5/

For more information:
https://www.researchgate.net/publication/303445576_Stefanie_Pfahl_Institutional_Sustainability

For more information:
http://www.esdtoolkit.org/discussion/default.htm

For more information:
http://www.oecd-ilibrary.org/economics/oecd-factbook-2015-2016/energy-intensity_factbook-2015-40-en

For more information:
http://www.ifitweremyhome.com/compare/KR/PH

For more information:
http://www.bunkerportsnews.com/News.aspx?ElementId=aad5cdeb-45b5-451c-97ea-15b16f7c40de

For more information:
http://www.power-technology.com/features/featurespotlight-on-south-korea-energy-security-through-diversity-4287627/

For more information:
http://http://globserver.cn/en/philippines/energy

For more information:
http://gulfnews.com/news/asia/philippines/nine-out-of-ten-philippine-households-to-have-electricity-by-2017-1.1661577

For more information:
http://www.redorbit.com/news/science/413360/the_relationship_between_population_and_economic_growth_in_asian_economies/

For more information:
https://books.google.co.kr/books?id=Rq4PBgAAQBAJ&pg=PA64&lpg=PA64&dq=Causal+link+between+different+situation+in+the+philippines+and+korea&source=bl&ots=pVedPG1WEB&sig=pgIRsaydbPaJedLbiDsn7AD5vL4&hl=en&sa=X&ved=0ahUKEwjdt7bWwuPPAhUpwVQKHcslBrYQ6AEISzAI#v=onepage&q=Causal%20link%20between%20different%20situation%20in%20the%20philippines%20and%20korea&f=false

For more information:
https://www.boundless.com/sociology/textbooks/boundless-sociology-

textbook/population-and-urbanization-17/population-growth-122/implications-of-different-rates-of-growth-686-10354/

For more information:https://www.reference.com/geography/philippines-overpopulated-adf4dd999153f54d

For more information: tp://edition.cnn.com/2013/03/07/world/asia/korean-war-explainer/

For more information:
https://www.zum.de/whkmla/sp/0708/chikyu/chikyu2.html

For more information:
http://koreajoongangdaily.joins.com/news/article/article.aspx?aid=3002354

For more information:
http://link.springer.com/article/10.1007/BF01357916

국문초록

에너지 계획에서의 지속 가능성:
필리핀 사례를 중심으로

Codillo Rosalinda Gatongay

서울대학교 행정대학원

글로벌행정전공

사회적·경제적·환경적 차원은 지속가능한 발전의 중요한 도구가 되므로 에너지 계획 과정에서 통합적으로 고려될 필요가 있다. 이를 확인하기 위해 본 논문은 필리핀 에너지 계획의 지속가능성에 관한 묘사적 연구를 목표로 한다. 따라서 본 논문에서는 국제에너지기구에서 제공하는 지속가능 발전 지표를 사용하여 국가적 에너지 시스템의 흐름을 확인하고, 발전과정을 측정하고자 한다. 이를 통해 국가적 에너지 시스템의 성과를 평가하고, 국가의 지속가능한 발전이라는 목표를 달성하기에 효과적이고 적절한 정책을 확인하고자 한다.

이 연구에서는 한국과 같은 선진국에서 추진 되었던 지속가능성을 촉진하기 위한 성공적인 전략의 적용 가능성을 제고하기 위하여 양 국가의 에너지 지표의 추이를 측정하였다. 측정 결과, 발전의의 경제적 차원에서 큰 격차를 보이고 있음을

확인하였다. 그리고 그러한 격차를 발생시킬 가능성이 있는 원인들을 제시하였다. 이러한 비교를 통해 필리핀 에너지 계획의 강점과 약점 및 국가의 발전을 저해하는 요인들을 확인할 수 있었다.

1973 년-2014 년 사이의 필리핀 에너지 시스템의 성과를 확인하기 위해 세 가지 차원을 측정하였다. 우선 선진국 사례로서 한국의 에너지 지표를 측정하였으며, 한편으로는 범위를 넓혀 필리핀과 비슷한 상황에 놓여 있는 개발도상국들인 동남아시아국가연합(ASEAN)의 지표 또한 고려하였다. 이러한 비교를 통해 에너지 지표를 현재의 에너지 계획 과정에 얼마나 통합시켰는가를 확인하였으며, 에너지 정책 관련 종사자가 지속가능한 발전을 촉진하기 위한 적절한 정책을 형성할 수 있도록 하였다.

마지막으로, 필리핀의 지속가능한 에너지 계획을 현실화 시킴으로써 지속가능한 에너지 발전이라는 목적을 달성하기 위해 몇 가지 정책적 제언을 제시하였다. 본 연구의 결과는 정부 정책의 효과성 검토 및 전략 형성에 도움을 준다는 점에 함의가 있다.

주요어: 에너지 계획, 지속가능한 발전, 에너지 지표, 필리핀 에너지 계획, 한국 에너지 마스터플랜

학번: 2015-24455