Czech University of Life Sciences Prague

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Diploma Thesis

Consumption pattern of natural resources worldwide and its solutions

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Consumption Pattern of Natural Resources Worldwide and Its Solutions

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Objectives of thesis

The aim of the thesis is to identify the consumption patterns of the natural resources. It also includes the process of handling the consumption through the development of alternate sources of natural resources which are non-exhaustible. The time period till which the natural resources would last with the current rate of consumption has also been determined through projecting the use of the natural resources across the globe in the future. The proposed use of the alternate or substitute energy is also studied in the research. The development of alternate sources of energy through developing means for its generation and its impact on the consumption patterns of natural resources is derived across the research.

Methodology

The research approach in the study consists of evaluating the consumption patterns of exhaustible natural resources like coal, oil and natural gas and the impact of it is obtained. It also involves deriving measures and recommending appropriate actions that would help in reducing the pressure on exhaustible natural resources. Hence, there is a mix of deductive as well as an inductive research approach adopted in the study. With the help of deductive approach, the validity of the hypothesis or assumptions made is obtained and through the inductive approach, a new theory or strategy is devised. Deductive approach involves considering different reports and journal articles that provide information about the consumption patterns of coal, natural gas and oil throughout the world. It also involves deriving the factors that are responsible for this high consumption across the globe. The impact of the current consumption patterns is also derived. Alternate sources of energy are evaluated which helps in developing appropriate strategies, technologies and solutions for increasing its contribution across the globe.

The proposed extent of the thesis

60 – 80

Keywords

Natural Resources, Consumption, Renewable energy

Recommended information sources

COOPER, J. *Global agricultural policy reform and trade : environmental gains and losses.* Cheltenham ; North Hampton: E. Elgar, 2005. ISBN 1-84376-887-9.

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Declaration

I declare that I have worked on my diploma thesis titled "Consumption pattern of natural resources worldwide and its solutions" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague 31.03.17 _____

Nastassia Makarava

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Consumption pattern of natural resources worldwide and its solutions

Abstract

The thesis aims at obtaining the consumption pattern of exhaustible natural resources across the globe. It also aims at deriving the potential of alternate in-exhaustible natural resources for the future. The global consumption of natural resources is increasing at an alarming rate and hence, it is very important to derive the consumption patterns of these resources. The consumption as well as production of coal, oil and natural gas, the three widely used exhaustible natural resources across the globe is discussed in the thesis. The sustainability of these resources at the current rate of consumption is obtained and projections for its future availability are derived. The impact on the environment by using exhaustible natural resources like coal, oil and natural gas is obtained in the thesis.

The habits of the young people are evaluated by obtaining data from them and its impact on the consumption pattern of these resources is derived. The daily usage of these resources through the consumption of energy obtained from it is derived in the thesis. An alternate use of other resources that are in-exhaustible is provided with the purpose of reducing the hazardous impact on the environment and increase the sustainability of the exhaustible natural resources.

Keywords: Exhaustible natural resources, consumption pattern, in-exhaustible natural resources, renewable energy, sustainability, electricity generation, energy production, energy consumption, future potential, energy efficiency, greenhouse gas emissions.

Spotřeba vzor přírodních zdrojů po celém světě a jeho řešení

Abstrakt

Práce se zaměřuje na získání struktury spotřeby neobnovitelných přírodních zdrojů po celém světě. Jeho cílem je také odvození potenciál alternativních přírodních zdrojů in-vyčerpatelné pro budoucnost. Globální spotřeba přírodních zdrojů se zvyšuje alarmujícím tempem, a proto je velmi důležité k odvození vzorce spotřeby těchto zdrojů. Spotřeba stejně jako produkce uhlí, ropy a zemního plynu, tři široce používané neobnovitelných přírodních zdrojů po celém světě je diskutována v práci. Udržitelnost těchto zdrojů při současném tempu spotřeby je dosaženo i projekce pro jeho budoucí dostupnosti jsou odvozeny. Dopad na životní prostředí pomocí neobnovitelných přírodních zdrojů, jako je uhlí, ropy a zemního plynu se získává v práci.

Zvyky mladých lidí jsou hodnoceny získávání dat z nich a její dopad na spotřebu vzorem těchto prostředků je odvozen. Denní využití těchto zdrojů prostřednictvím spotřebu energie získané z ní vychází v práci. Střídavá použití jiných zdrojů, které jsou in-vyčerpatelné je poskytována s cílem snížit nebezpečné dopady na životní prostředí a zvýšit udržitelnost neobnovitelných přírodních zdrojů.

Klíčová slova: Neobnovitelných přírodních zdrojů, spotřeba vzor, in-neobnovitelných přírodních zdrojů, obnovitelné zdroje energie, udržitelnosti, výrobu elektřiny, výrobu energie, spotřebu elektrické energie, budoucí potenciální, v oblasti energetické účinnosti, emise skleníkových plynů.

Table of Content

List of Figures

List of charts

List of tables

1. Introduction

I have chosen the topic to derive the global consumption of exhaustible natural resources like natural gas, coal and oil and provide a solution for reducing its consumption. I have chosen this topic because it is one of the most common and threatening problem encountered by humans. With the advancement of technology, there are several techniques and instruments developed which help in energy consumption through using the natural resources. A majority of the energy generated comes from coal and natural gas. The global consumption of energy has increased which has led to the increase in the consumption of the natural resources like coal, natural gas and other sources of energy (Lesage & Van de Graaf, 2016). There are many scientific inventions which aid the development of energy from the resources like wind, thermal, tidal, solar and other such renewable sources that reduce the pressure on the exhaustible energy resources.

The pressure on the natural resources is continuously increasing at an alarming rate. As a result of which the ecological balance is disturbed. The production of energy and its consumption should be carried out simultaneously to ensure that there is a positive relationship between the generation of energy and its consumption across the different industrial and commercial sectors across the globe. It involves deriving the consumer culture across the globe which is necessary for practical application of the theories developed for promoting sustainable consumption of these resources worldwide (Sahakian & Wilhite, 2014).

However, it is observed that there is a negative relationship between the two factors mentioned above. It can be seen that there is a huge imbalance in the energy consumed and the energy produced across the globe. This has led to rapid depletion of natural resources like coal, crude oil and natural gas. The demand for energy resources increase with the development of the country. It has also resulted in an unsustainable environmental footprint across the nature (Hoekstra & Wiedmann, 2014). Hence, it is a global necessity to increase the sources of generating energy as well as develop techniques for maximizing the output obtained from them.

The potential of in-exhaustible sources of energy is to be considered while deriving sustainable measures for reducing the pressure on the exhaustible natural resources like coal, oil and natural gas. At the same time, it is also very important to understand the importance of using energy effectively so as to reduce the wastage of energy and as a result, the consumption of the natural resources that are responsible for generating it is reduced.

1.1 Background and Context

The primary natural resources that are used extensively across the globe are coal, crude oil and natural gas. They constitute a major portion of the energy generated for commercial, industrial as well as household purpose across the globe. The consumption pattern of using these natural resources along with its production over a period of years is to be derived in the research. The potential of the other substitutable sources of energy is also explored and its impact on the future availability of the currently used natural resources is obtained. The background of the research is developed by obtaining the production as well as consumption of crude oil, coal and natural gas across the globe. The current scenarios observed across the consumption of oil, natural gas and coal throughout the globe are to be considered. The depletion of these reserves is a major threat to humanity and its sustenance is one of the most significant concern across the globe. The current rate of consumption would make these resources to last only for some fifty- hundred years from now. Hence, it is very important to understand the impact of using these resources and its sustainability has to be retained.

There is a gradual transition from the exhaustible natural resources to renewable energy resources through managing environment economics across the consumption of these resources (Tietenberg & Lewis, 2016). The research involves studying the different substitute energy resources which are available across the globe. The suitability of the renewable sources of energy and its feasibility for future application is determined. The excessive dependency on coal, natural gas and crude oil will lead to the breakdown of most of the industries when there will be a shortage in the production of these natural resources. The carbon emissions that are emitted out of the industries where the fossil fuels are used as the primary energy producing unit are a major threat to the environment sustainability (Acar & Lindmark, 2016). It leads to environmental degradation and hence, the consumption of fossil

fuels is to be restricted and alternate sources are to be developed and implemented on a greater scale across the globe.

In order to reduce the dependency on coal, natural gas and crude oil, greater amount of energy should be developed from alternate source of natural resources which are in-exhaustible. There is a huge potential that the renewable energy resources possess in reducing the pressure on the exhaustible natural resources which are currently been used on a large scale. Hence, the future scope of the inexhaustible sources of energy is to be determined in the study. It also involves deriving the impact of developing these resources on the consumption patterns of exhaustible natural resources used across the globe.

1.2 Aim of the research

The aim of the thesis is to identify the consumption patterns of the natural resources. It also includes the process of handling the consumption through the development of alternate sources of natural resources which are non-exhaustible. The time period till which the natural resources would last with the current rate of consumption has also been determined through projecting the use of the natural resources across the globe in the future. The proposed use of the alternate or substitute energy is also studied in the research. The development of alternate sources of energy through developing means for its generation and its impact on the consumption patterns of natural resources is derived across the research.

2. Objective and Methodology

This will section comprises of the major objectives which are supposed to discussed and analysed with the help of the Methodology used to analyse the consumption of natural resources in the present and forecast the sustainability of the resources is evaluated.

2.1. Objectives

The main objectives of the thesis are:

- To identify the time period for which the natural resources would be lasting at the current rate of consumption.
- To derive the consumption patterns of usage of these resources.
- To derive appropriate methods to increase its efficiency.
- To identify different methods for increasing the use of renewable and alternate source of energy and measure its impact on the consumption patterns of natural resources.

2.1.1 Sub-objectives:

The sub-objectives are the sub-elements which are to be derived from the main objective. The sub-objectives of the thesis are as follows:

- To derive the consumption patterns of current use of natural resources across the globe.
- To obtain the potential of the alternate energy sources for producing energy (electricity).
- To identify the estimated reserves of coal, natural gas and crude oil through the current rate of consumption.

- To derive measures through which the efficiency across the use of the natural resources can be increased.

- To measure the impact of increasing the use of alternate substitutable sources of energy on the consumption patterns of the use of natural resources throughout the globe.

2.1.2 Significance of the research

The research is very significant as it helps in deriving the future availability of the exhaustible natural resources and also estimate the potential of alternate renewable energy resources. It is carried out with the help of evaluating the consumption patterns of the exhaustible natural resources which are used on a large scale across the globe. The global issue of imbalance in the consumption of natural resources is discussed along with a suitable recommendation for the problems identified. While obtaining the consumption patterns of the exhaustible natural resources like coal, oil and natural, the potential of renewable and in-exhaustible natural resources is derived along with the future scope of its utilization. The future scope of developing these resources and reducing the impact on the exhaustible natural resources is very important for deriving appropriate strategies that will help in higher sustainability of the exhaustible natural resources.

The current rate of consumption of these exhaustible natural resources like coal, oil and natural poses a major threat to its sustainability in the coming future. Along with it, the impact the consumption of these resources has on the environment leading to its degradation is also to be considered for evaluating the impact of consuming these resources. The future potential of in-exhaustible natural resources like solar, hydro-power is to be explored and measures to increase the consumption of these resources for various purposes are to be developed. The impact of developing measures to use these resources is also important as it has a significant impact on the consumption patterns of exhaustible natural resources like coal, oil and natural gas.

2.1.3 Problem Statement

The consumption of natural resources that are exhaustible like coal, oil and natural gas is the major concern to be discussed in the research. The issues related to the ever increasing usage of these resources are discussed. Inexhaustible natural resources have a great potential in reducing the dependency on exhaustible natural resources and hence its scope is to be considered.

2.1.4 Research Questions

The thesis is based on the following research questions which are discussed in it:

- What are the current consumption patterns of natural resources like coal, oil and natural gas?
- What is the potential of alternate sources of energy across the globe?
- How can the current consumption pattern of coal, oil and natural gas be changed and its dependency be reduced in the future?
- What is the impact of increasing the use of alternate sources of inexhaustible energy on the usage of exhaustible natural resources?

2.2 Methodology

Methodology refers to the method of collecting the data from a specific source related to the subject taken into consideration. There are different research methods that are available for carrying the research (Tharenou, Donohue, & Cooper, 2007). It involves considering the significant parameters affecting the results generated by the research. In this research, the research philosophy that is taken into consideration for achieving the aim of the thesis is provided below along with the research approach, research design and type.

2.2.1 Research philosophy

Research philosophy adopted in this study requires relevancy and should be able to consider significant factors related to the consumption patterns of natural resources across the

globe. A pragmatic research philosophy helps in deriving concepts that supports action that are relevant as it involves considering different ways of interpreting the subject. Hence, in this study, pragmatic research philosophy will be suitable as it has the characteristics of deriving the result on the basis of the research question. It combines the positivist and interpretivist research philosophy in terms of the outcome obtained from the research. It provides the feature of integrating the various factors that are responsible for the current consumption patterns of natural resources observed across the globe. The potential solutions for reducing the consumption of exhaustible natural resources like coal, oil and natural gas are also discussed in the paper.

Pragmatic research philosophy is adopted in the study to derive the factors that are responsible for the current rate of consumption of natural resources like coal, oil and natural gas. It is obtained through the reports and other articles and the same is evaluated through obtaining the responses from the participants. It helps to obtain the benefits of both the study, qualitative as well as quantitative research corresponding to the respective positivist and interpretivist philosophy.

2.2.2 Research Approach

The research approach in the study consists of evaluating the consumption patterns of exhaustible natural resources like coal, oil and natural gas and the impact of it is obtained. It also involves deriving measures and recommending appropriate actions that would help in reducing the pressure on exhaustible natural resources. Hence, there is a mix of deductive as well as an inductive research approach adopted in the study. With the help of deductive approach, the validity of the hypothesis or assumptions made is obtained and through the inductive approach, a new theory or strategy is devised. Deductive approach involves considering different reports and journal articles that provide information about the consumption patterns of coal, natural gas and oil throughout the world. It also involves deriving the factors that are responsible for this high consumption across the globe. The impact of the current consumption patterns is also derived. Alternate sources of energy are evaluated which helps in developing appropriate strategies, technologies and solutions for increasing its contribution across the globe.

2.2.3 Research type

In the research, there is a mixed research methodology used where the characteristics of both, qualitative as well as quantitative research paradigms. A mixed methodology provides a detailed information about the subject taken into consideration in the research. It provides the depth of a qualitative research and the reliability of a quantitative research (Bazeley, 2015). The important variables which are obtained through the qualitative research paradigm are evaluated through obtaining first-hand responses from the participants with the help of a survey. A mixed methodology research method used is used in the study that provides the benefits of both, quantitative as well as a qualitative research method (Creswell, 2014). The factors obtained which are not derived through qualitative research are obtained through the quantitative research method adopted in the study.

Qualitative research is carried out by reviewing literatures, research papers and journals related to the consumption patterns of using the natural resources across the globe. There are many variables which are determined through the qualitative research paradigm and these variables are evaluated through obtaining data using quantitative research paradigm (Marshall & Rossman, 2014). With the help of qualitative research, one can obtain a detailed information about the subject. There are different means of carrying qualitative research. In this study, it is carried out with the help of evaluating the literatures, reports, articles and papers related to the consumption patterns of exhaustible natural resources like coal, oil and natural gas along with its impact on the future availability. It helps in obtaining the problems that are caused due to the consumption of exhaustible natural resources on a large scale.

Quantitative research is carried with the help of online surveys formed on the basis of a questionnaire. The questionnaire is developed on the basis of the variables that are identified through the qualitative research paradigm. Quantitative research methodology would help the research to obtain a quantifiable outcome on the basis of which certain measures and steps would be suggested for increasing the efficiency of using the natural resources through evaluating its consumption as well as its production. The data collected with the help of quantitative research methodology is then evaluated with the help of a cumulative frequency distribution method that helps in deriving a specific variable through the questionnaire developed. The consumption of the natural resources is derived by evaluating the habits of

young people across the globe. It is then compared with the current consumption patterns of these exhaustible and in-exhaustible natural sources.

2.2.4 Research Design

Primary research design is carried through the quantitative research paradigm where the data is personally collected from the respondents. Numerical data is obtained through collecting data from the participants using the quantitative method and this numerical data is analysed with the help of statistical evaluation. While carrying statistical evaluation, the mean and standard deviation of the responses obtained across the quantitative method is calculated (Flaherty, Honeycutt Jr, & Powers, 2015).

Secondary research design is carried in the research through analysing and reviewing different reports, studies and articles pertaining to the consumption patterns of exhaustible natural resources and potential of the in-exhaustible natural resources in the future. With the help of it, significant variables are derived and these variables are evaluated and analysed in primary research carried through online survey. The variables considered in the questionnaire framed for carrying primary research are obtained from the secondary research design.

2.2.5 Research data

Research is carried out on the basis of data that contains information and other characteristics related to the research topic. The research data is of two types and they are, primary data and secondary data, respectively. Data is collected in the research to provide a basis and valid background on the basis of which evaluation is carried out and conclusions are derived. Primary data is the data collected by primary research design through collecting responses from the participants on first-hand basis. Secondary data refers to collection of data through different available sources that are very well accredited and acknowledged by experts and scholars.

In this study, primary data is collected by obtaining responses from the participants taken into consideration. The participants that are taken into consideration are the students studying in different universities across the globe. They are in the age group of 18-25 years.

The data is obtained with the help of surveys that are conducted online. The survey is developed on the basis of a questionnaire shown in Appendix A.

In this study, secondary data is also used. It is obtained in the form of variables that indicate specific characteristics of the consumption of exhaustible natural resources like col, oil and natural gas across the globe. Secondary research involves studying research papers, energy reports, journal articles, conference publications and proceedings and other such well-acclaimed and credited wok by research scholars pertaining to the subject. After studying, the data obtained from these sources is evaluated and analysed with respect to its impact on the consumption of exhaustible natural resources. The potential of in-exhaustible natural resources is taken into consideration through obtaining its current utilization across the globe.

3. Literature Review

This section will give us insight of the status of the natural resources i.e. exhaustible and in exhaustible it will be depicted with data from various consumption pattern analysis, current impact of the this resources on environment and other alternatives which are efficient.

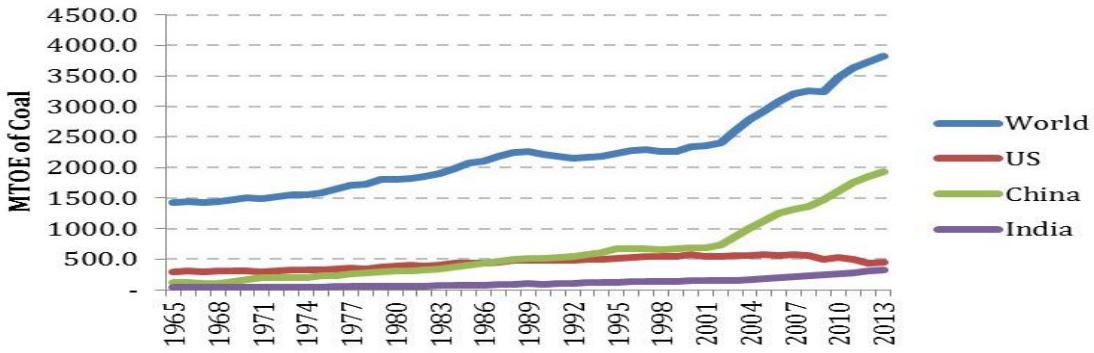
3.1. Exhaustible natural resources

This are the resources which are formed within nature by various geo-chemical changes in environment for millions of years in earth atmosphere and it will be discussed thoroughly in this section we will focus upon Coal, Crude Oil and Natural gas respectively. The individual analysis of natural resource will be taken into notice as well.

3.1.1 Coal

There is an increase in the import of coal throughout the world where the rate of consumption is continuously surpassing the rate of production. Hence, there is a need to identify the important aspects of coal consumption through which the efficiency of using it as a natural resources in different forms can be evaluated (Hacker, 2014). The consumption of coal across the different countries worldwide from the year 1965 to 2013 is shown in figure no. 1 provided below.

Figure 1: Information about the global consumption of coal across different countries



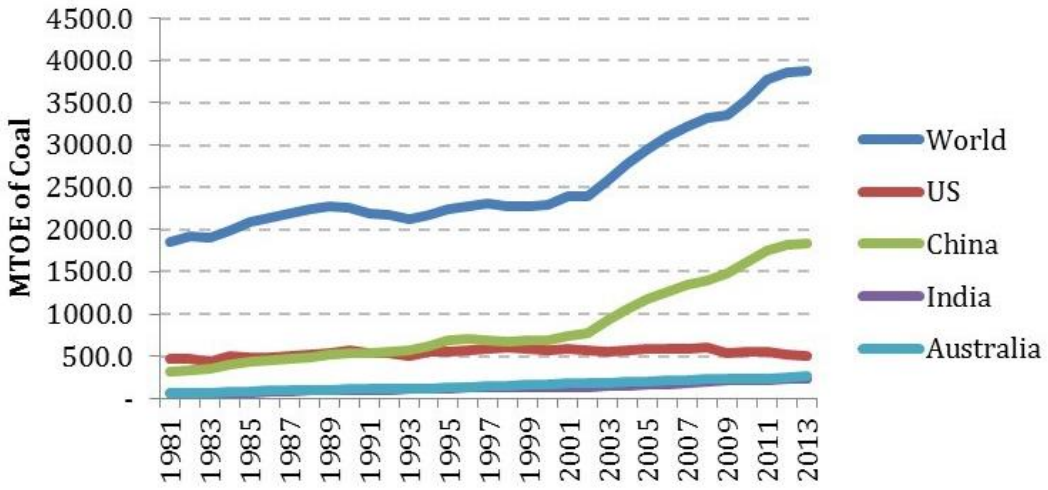
(Hacker, 2014)

It is seen from the above provided chart that the consumption of coal has increased tremendously since the last decade, that is, after 2001. This increase is majorly due to the industrialization observed among the developed as well as developing countries across the globe. As a result of the increasing pressure from the industries and transportation purpose, there is a steep increase in the global consumption of coal.

To accommodate the above consumption of coal, a correspondingly high coal production is required across the globe. The global consumption of coal has increased by 0.4% only, in 2014. However, the current rate of consumption has to be controlled to increase the life of the existing reserves across the globe. For example, the increase in the consumption of coal in India is the highest across the globe with a growth rate of about 11.1% in 2014 (Soni, Singh, & Banwet, 2016). Hence, it is a matter of great concern for the future generations of India. They need to derive better technologies and develop equipment for reducing the consumption of coal in most of the industries.

The deposits of coal are limited and the reserves would last within the next four hundred years. It is a matter of great concern for other countries across the globe too as the rate of increase in production is slow as compared to the rate of increase in consumption. The production of coal is to be increased owing to the tremendous advancements in technology leading to greater number of industries that are dependent on coal for its primary energy. However, there are limited coal reserves across the globe. For increasing environmental sustainability, controlling the exploitation of coal reserves is a major concern which is to be handled across the globe. The production of coal across the majorly contributing countries across the globe from the time period between 1981 and 2013 is shown in the figure no. 2 given below:

Figure 2: Information about the Global production of coal across different countries



(Hacker, 2014)

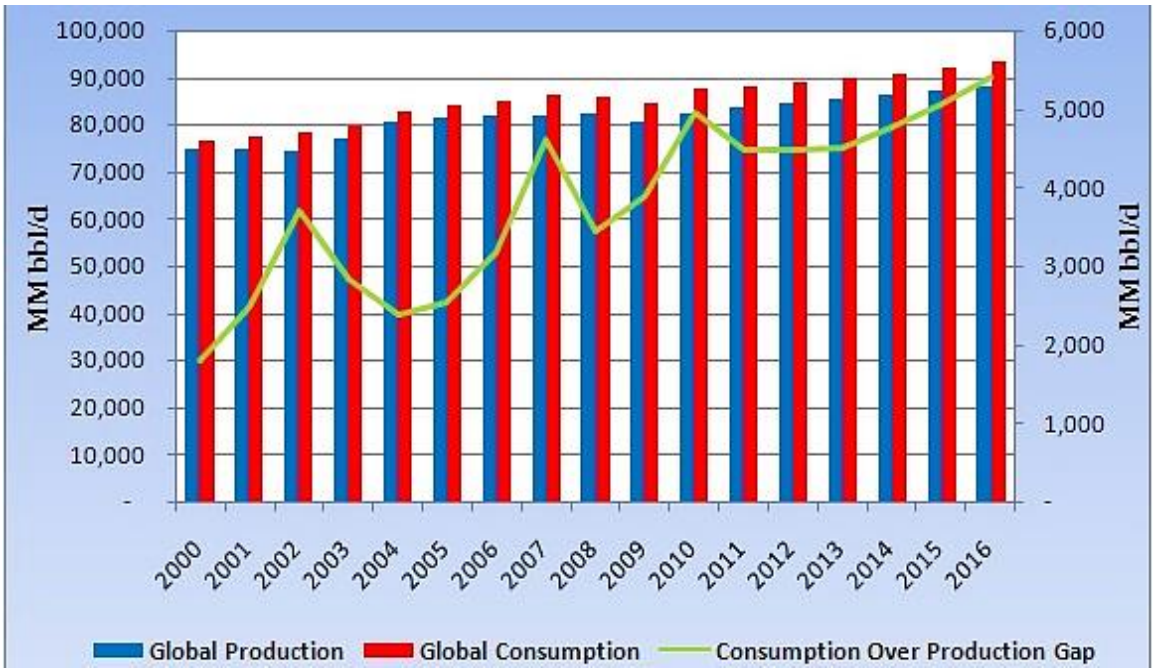
With the development of technology and wide scale industrialization, the use of coal for various production plants have been increasing mainly to feed the power plants for increasing the energy generated through them. There are different techniques developed for increasing the output of coal obtained and increase its efficiency. It includes the development of the dry separation technology for production of coal worldwide. The energy obtained from coal is aimed at meeting the increasing demands of the industries as well as other departments across the globe. Thus, the research includes deriving the current trends in the production and consumption of coal and crude oil throughout the globe and predicting its potential availability in the coming future. The research also involves deriving the impact of the use of other renewable sources of energy on the usage of the natural resources that are exhaustible.

3.1.2 Crude-Oil

Crude-oil is basically used as a fuel in vehicles in the form of petroleum. It is also used in many industries for running of machines. There is a huge scale increase in the number of automobiles across the globe. Hence, there is an increasing pressure developed on the production of crude oil. However, the consumption of crude oil in vehicles causes adverse effects on the environment and results in its degradation. Hence, for sustaining the current reserves of oil across the globe and also to reduce the environmental degradation, it is very important to reduce the consumption of oil. For this purpose, the production as well as

consumption of crude oil is to be studied. The production and consumption of oil across the globe provided in the figure given below. There is a gap observed between the consumption and the production of oil across the globe. This gap is shown in the following fig. no.3 with the help of a green line.

Figure 3: Information about the production and consumption of crude oil across the globe



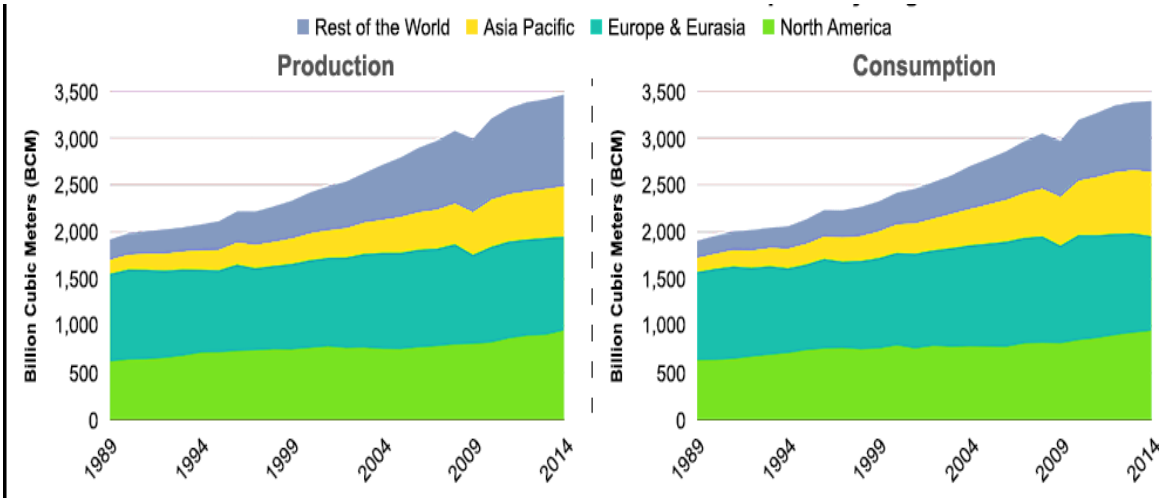
(Gagliardi, 2016)

It can be seen that there is a huge difference between the rate of production and the rate of consumption of crude oil across the world. The consumption pattern indicates that there is a need to develop alternate sources of energy which can help in reducing the consumption of oil throughout the world (Cashin, Mohaddes, Raissi, & Raissi, 2014). Owing to the differences in the consumption and production of crude oil, the balance across the oil supply is disturbed and it develops a pressure on the natural resources to be consumed even more over a period of time (Gagliardi, 2016). Obtaining the difference in the production and consumption of crude oil is carried out through the research and its consumption pattern is developed so as to estimate the future availability of the crude oil as a source of energy among the other natural resources.

3.1.3 Natural gas

Natural gas is utilized on a large scale across the globe for various household as well as commercial purposes. It contributes significantly to the generation of electricity across the globe. There is a tremendous increase in the consumption of natural gas observed worldwide. There has been a huge increase in the demands of natural gas after 2009 owing to the blooming of industrialization. The increase in population has also contributed to significant increase in the consumption of natural gas across the globe owing to its use for household purposes like cooking, as well as for public transportation. The production and consumption of natural gas on the basis of different regions is shown in the following figure.

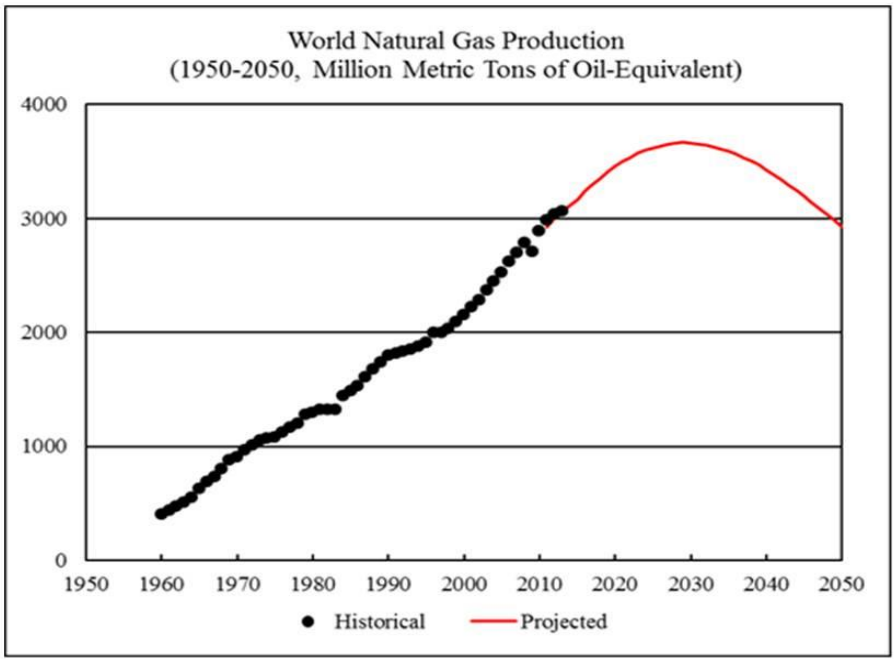
Figure 4: ***"World-wide Natural Gas Production and Consumption by region"***



(BP p.l.c., 2015)

The production as well as the consumption of natural gas is high in the countries near the Asia-Pacific regions. It is due to this that they urgently require a substitute alternate energy resource. The consumption of natural gas is way beyond its production. As a result, there is an increasing pressure on the current reserves of natural gas across the globe. With the current rate of consumption of natural gas across the globe, the existing reserves are about to fall considerably by 2035. After 2035, the production of natural gas is going to decline by a huge margin as shown in the chart given below. In the chart, the natural gas production across the globe are projected along with its history.

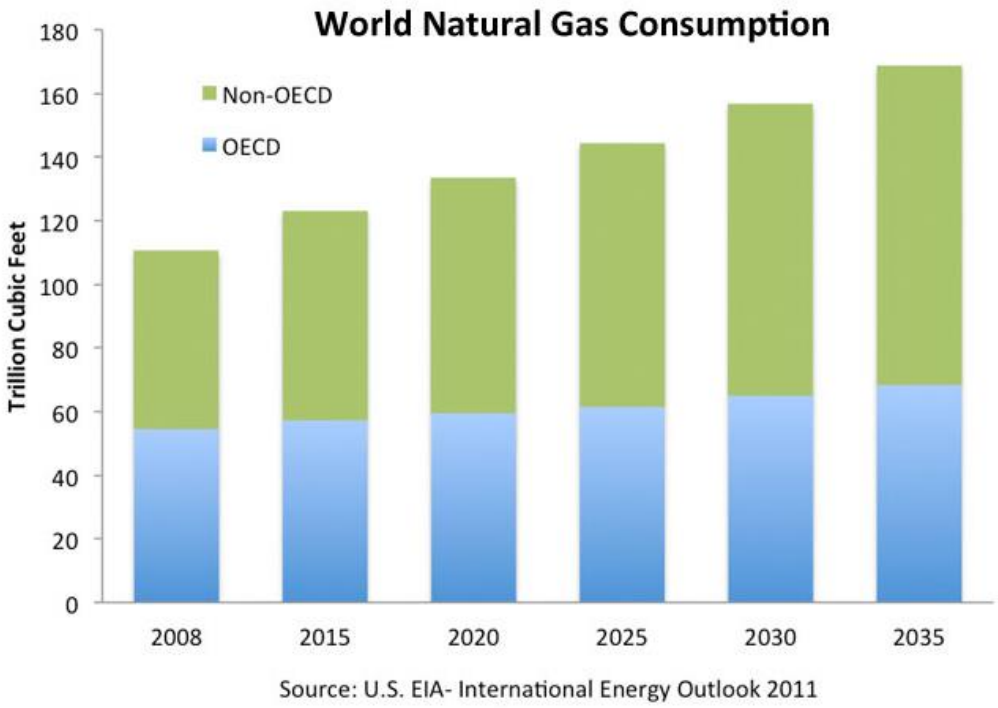
Figure 5: Future projection of global natural gas production



(Political Economist, 2014)

The global consumption of natural gas is divided into two categories, OECD countries and Non-OECD countries. OECD stands for *"Organization for Economic Cooperation and Development"* and there are thirty four nations that are members of OECD. The projection of the consumption of natural in these OECD and Non-OECD countries between the time periods of 2008 to 2035 is provided in the following chart. Currently, the natural gas consumption OECD and Non-OECD countries does not have any significant difference. However, by 2035, there will be a huge difference in their consumption. It is shown in the chart given below that the natural gas consumption among Non-OECD countries would almost become 65% of the total natural gas consumption across the globe.

Figure 6: Future projection of global natural gas consumption



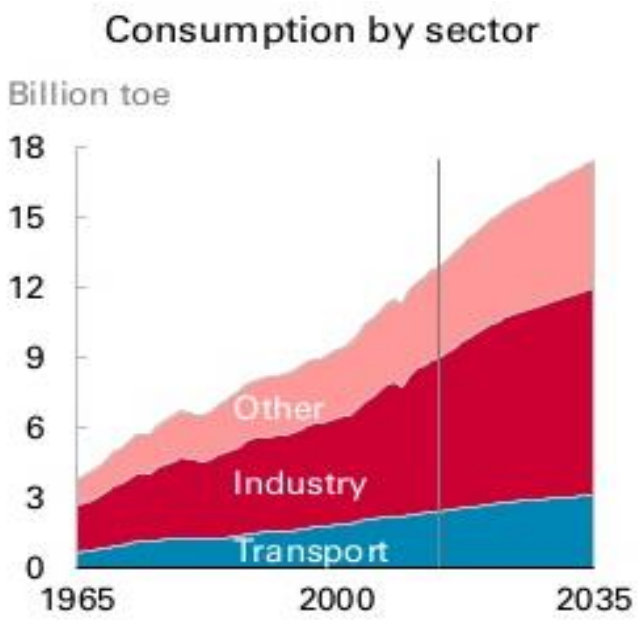
(International Energy Agency (IEA), 2011)

There is a huge difference in the natural gas consumption among the OECD and the Non-OECD countries owing to the development of alternate sources of energy in OECD countries. It results in reduction in the growth of consumption of natural gas in OECD countries.

3.2 Causes of increase in the usage of exhaustible natural resources

The usage of exhaustible natural resources has increased due to a steep increase in its demand across different sectors. This increase in the demand of energy derived from the exhaustible natural resources like coal, oil and natural gas has resulted in increasing of pressure on these resources. It has thereby increased the usage of these exhaustible natural resources across the globe. The consumption of natural resources on the basis of sector is provided in the chart given below. It is observed that the industries have been consuming a higher portion in the consumption of natural resources across the globe. The consumption of natural resources for transport is increasing steadily.

Figure 7: Global Consumption of natural resources by sector

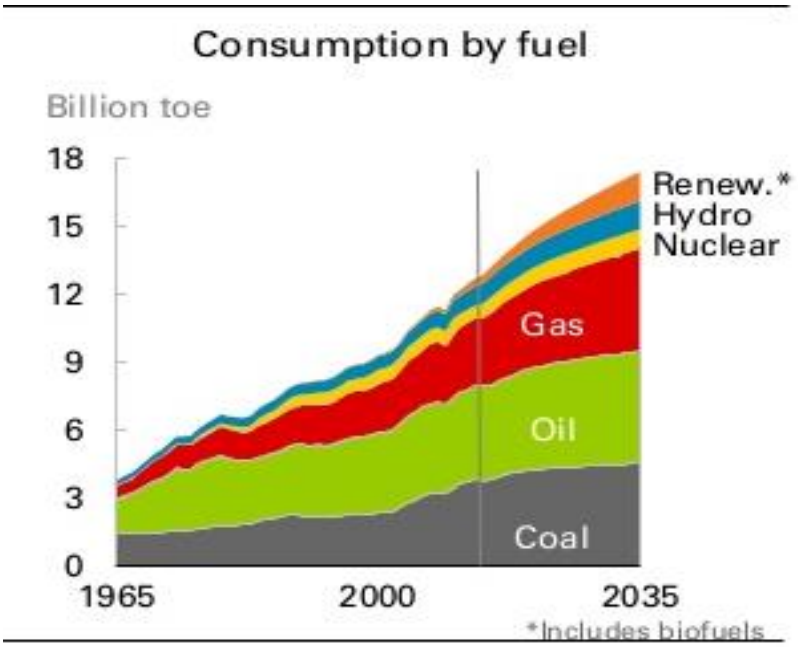


(BP p.l.c., 2015)

The ever increasing global population has resulted in tremendous growth in the consumption of different resources that are based on exhaustible natural resources for its energy. It is obvious through the power sector as well as the transportation. Due to the fewer number of people going by public transportation and majority of them using their personal vehicle, the per capita consumption of fuel is increased by a huge margin. It also contributes immensely to the carbon emissions which are led into the atmosphere across the globe.

Similarly, there is an increase in the consumption of natural resources on the basis of the fuel. The increase in the growth and consumption of natural resources as per fuel is provided in the chart given below. The consumption of natural resources as fuel increases steadily for natural gas, oil and coal over a period of years after 2015. There is a steep increase in the consumption by fuel for renewable sources of energy, hydroelectricity as well as energy from nuclear sources. Thus, consumption by fuel is observed to be one of the most significant reason for increase in the usage of natural resources.

Figure 8: Global Consumption of natural resources by fuel



(BP p.l.c., 2015)

It can be stated that the consumption by fuel is continuously increasing for coal, oil and natural gas. Thus, owing to the increasing demands of different sectors, there is a steep increase in the production as well as consumption of exhaustible natural resources like coal, natural gas and oil.

3.2.1 Development of technology

The widespread development of technology has resulted in better modes of production and extraction of natural resources from their reserves. At the same time, it has boosted the production of these resources and as a result of it, the consumption of these resources has increased tremendously across the world. The development of technology has also increased the consumption of energy on a large scale. As a result, the sources from which the energy is generated are exploited on a greater level (Chakravarthi & Babu, 2013). The development of technology has resulted in better and faster means to utilize these resources and this has resulted in greater consumption of these resources. The advancements in technology has also increased the requirement of these resources for energy (power) for supporting the high end technological applications developed with the help of the improvements in technology. The

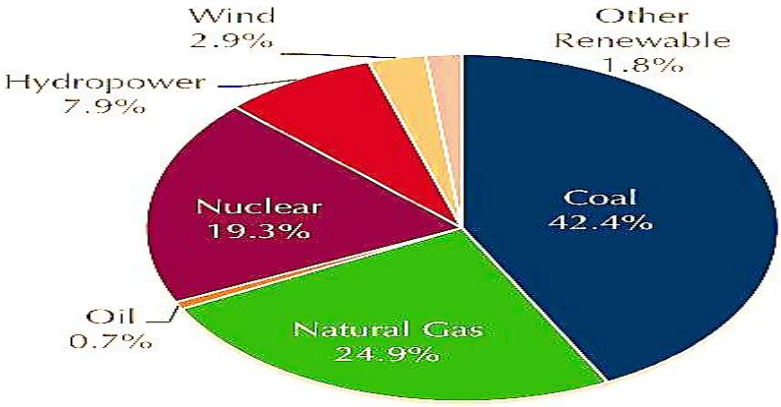
overall power consumption has increased and this increases the dependency on the natural resources like coal, oil and natural which are the major contributors in the generation of power.

3.2.2 Reliability of energy obtained from these resources

The increase in the usage of exhaustible natural resources is due to industrialization observed across the globe. The tremendous increase in the number of industries result in a large scale increment in the consumption of electricity. As a result, the exhaustible natural resources which are majorly used for producing energy are utilized on a large scale. It increases the pressure on the production of the resources like coal, oil and natural gas. The increase in population has also tremendously increased the reliability on the exhaustible natural resources like coal, oil and natural gas. The increase in the energy demands due to increase in population has boosted the depletion of these resources owing to its unsustainable extraction from the reserves.

For obtaining the usage of the natural resources for generation of electricity, the different sources used for the same are evaluated. The electricity generation pattern is shown with the help of a pie diagram in the following figure. It shows the percentage of electricity generated through different sources like wind, coal, hydro power, nuclear, oil, natural gas and other renewable sources of energy. About 68% of the total energy generated comes from exhaustible natural resources like coal, natural gas and oil (Chakravarthi & Babu, 2013). This indicates the reliability on these resources for energy generation across the globe.

Figure 9: Different sources of energy (electricity) production



(Chakravarthi & Babu, 2013)

It is observed that a majority of the energy produced, accounting to about 42% of the energy is from coal and as a result, there is a continuous increase in the consumption of coal across the globe. About 67% of the electricity produced comes from coal and natural gas across the globe (Chakravarthi & Babu, 2013). It can be seen that the contribution of wind power to the total electricity generated worldwide is comparatively very low, that is about, 2.9% of the total electricity generated. Hence, there are major steps required to be taken through the development of technology which will help in increase of energy production through the wind power. It will help in reducing the consumption of crude oil, coal and natural gas; thereby, their consumption pattern will be impacted. Hydro power has a good contribution of about 7.9% in the generation of electricity across the globe. However, there is a huge scope of increment in its contribution to the total amount of electricity generated across the globe.

3.2.3 Wastage of energy generated from these resources

The energy that is generated from the exhaustible resources is largely used for commercial and household purpose. There is a large scale consumption of electricity at these places and a considerable amount of energy is wasted over a period of time. The wastage of energy in the household use is carried out by leaving the lights on, unnecessary lighting system that consumes high energy, large scale use of the devices that consume high amounts of electricity (Martin, 2013). The energy that is consumed for commercial purpose in industries and other such installations involves wastage of energy through improper arrangement of the machines and power loss in different processes carried out in the industries.

There are a large number of devices developed that make living comfortable for the humans. However, this comfortable living comes with a cost. The cost if paid by the natural resources which are exploited for supporting the requirements of this comfortable living. There is a large scale increase in the dependency on the natural resources for generating electricity to accomplish the requirements of the ever increasing population. (Chakravarthi & Babu, 2013). As a result, there is a wide-scale increase in the wastage of energy through the irresponsible behaviour of the population across the globe.

Thus, due to the increase in the wastage of energy, there is a huge pressure developed on the exhaustible natural resources that are currently used on a large scale across the globe. There is unnecessary pressure developed on these resources across the globe which is then absorbed through higher level of exploitation of the reserves of these natural resources.

3.3 Impact of using exhaustible natural resources

There is a huge gap created between the production of exhaustible natural resources and the consumption of natural resources. Thus has resulted in the depletion of the reserves of these natural resources and the sustainability of these resources is reducing considerably. (Ecotricity, 2016). There is a significant impact of using these exhaustible natural resources on the future availability of these resources. As a result of which, it is necessary to identify the impact of the current usage of these exhaustible natural resources which are used on a wide scale across the globe.

The impact of using the natural resources is discussed in the following chart where the consumption of fuel across the globe is determined. The impact of using natural resources can be derived on the basis of its consumption across the globe. The consumption of fuel across the globe helps in determining the future availability and sustainability of these resources. The impact of using the energy obtained from the fossil fuels is provided in the table given below:

Table 1: Impact of using fossil fuels

	Direct impacts of extraction and distribution	Disturbance to material cycles	Other relevant environmental impacts
Use of fossil fuels	Large local/regional impacts on the landscape and ecotoxicological pollution	Carbon cycle is greatly enlarged (greenhouse effect) Metal fluxes are increased (metals are present as contaminants) Sulphur cycle is enlarged	Greatest cause of acidification, important source of acidifying compounds in Western countries Calamities during extraction and distribution with large impacts on nature

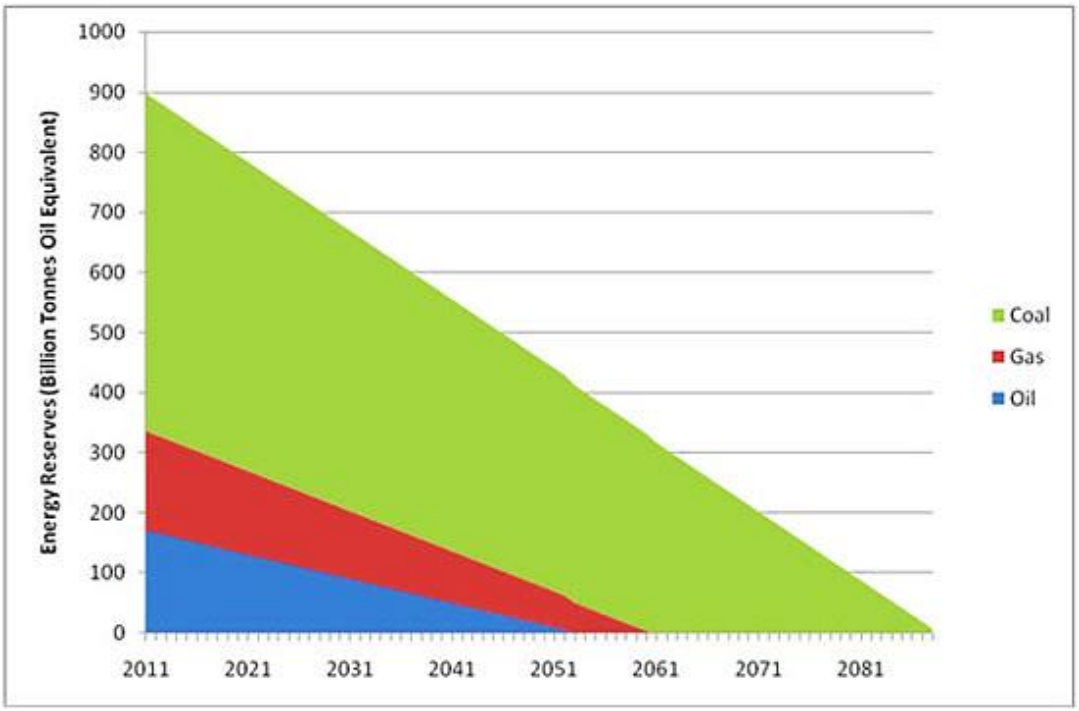
(Muilerman & Blonk, 2001)

There is a huge increase in the consumption of oil, coal and natural gas over a period of years and the current rate of consumption is alarming for the future sustainability of these resources.

3.3.1 Depletion of the reserves

The biggest threat due to the high end consumption of exhaustible natural resources is of depletion of its reserves. There are limited reserves of the natural resources across the globe and over a period of years, they are bound to end. The depletion of these resources is very close owing to the current rate of consumption of these resources. The depletion of the reserves occurs when the consumption of the resource is faster than its replenishment. As a result, the reserves of these resources are depleting owing to the extraction of these natural resources from their reserves. On the other hand there is a huge impact of globalization on the consumption of these resources. The projected depletion of coal, oil and gas reserves of the current existing sources is provided in the chart given below.

Figure 10: Global depletion of coal, oil and gas reserves



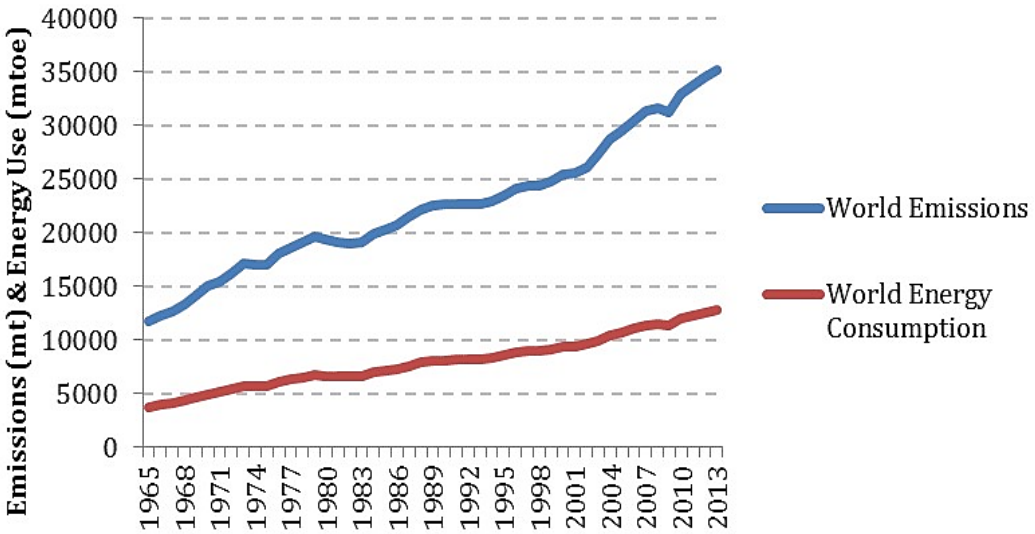
(Ecotricity, 2016)

At the current rate of consumption, the reserves are going to end by 2088 when the production is carried out from the reserves that are existing currently. However, with the advancements in technology and other inventions, few new reserves would be developed and the time period of depletion of these resources can be extended (Ecotricity, 2016). However, it can be extended only for some years indicating that the depletion of the resources is certain after that. It is because the rate of replacement of these natural resources is lower than the rate of consumption and hence, they are tend to deplete in the coming future. To reduce the rate of depletion of the resources, they should be consumed effectively and alternate sources of energy are to be developed and implemented on a greater scale.

3.3.2 Environmental problems and Greenhouse emissions

There is a degradation of the environment observed due to the large scale consumption of the exhaustible natural resources constituting of coal, natural gas and crude oil. One of the most significant problem witnessed due to the increase in the consumption of natural resource like coal, oil and natural gas is the greenhouse emissions (Hacker, 2014). The greenhouse gas emissions across the globe for a period between 1965 and 2013 is shown in the following chart. The consumption of energy across the globe is also provided in the chart given below.

Figure 11: Global Energy Consumption and greenhouse emissions for 1965-2013.

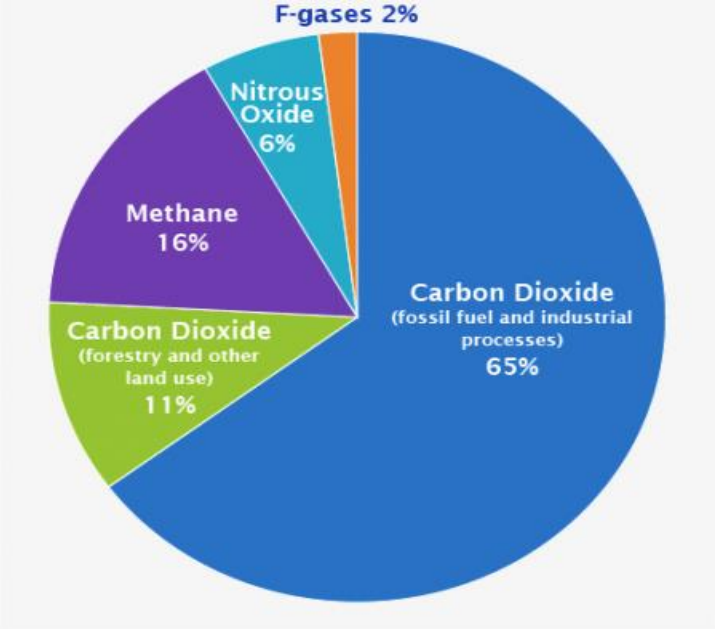


(Hacker, 2014)

There is a huge difference observed in the increase of world greenhouse emissions and world energy consumption. The increase in world emissions is high as compared to the increase in world energy consumption. The widespread increase in world emissions reflects the increasing use of exhaustible natural resources like coal, oil and natural gas for production of electricity (Hacker, 2014).

A significant portion of the greenhouse emissions across the globe comes from carbon dioxide. Carbon dioxide is produced in large quantities by the vehicles and industries. Both of this application are based on utilizing energy from fossil fuels like coal, oil and natural gas. The impact of different greenhouse gases on greenhouse emissions is provided in the following pie-diagram.

Figure 12: "Global Greenhouse Gas Emissions by Gas"

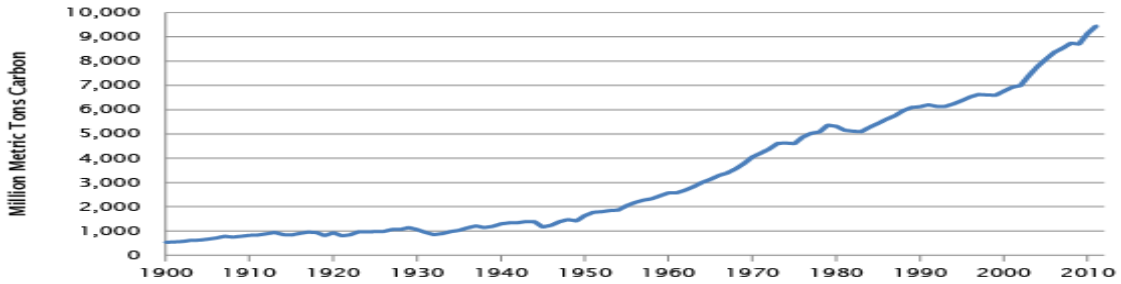


(ipcc (Intergovernmental Panel on Climate Change), 2014)

The global carbon emissions from fossil fuels has increased significantly after 1960 (ipcc (Intergovernmental Panel on Climate Change), 2014). It is through these years that fossils are consumed on a large scale across the globe. The environmental problems that are generated due to the carbon emissions from fossil fuels results intoxication of the atmosphere.

It disturbs the ecological cycle and the balance across the eco-system is affected. The increase in the global carbon emissions from the year 1900 is provided in the chart given below:

Figure 13*:* "Global Carbon emissions from fossil fuels"

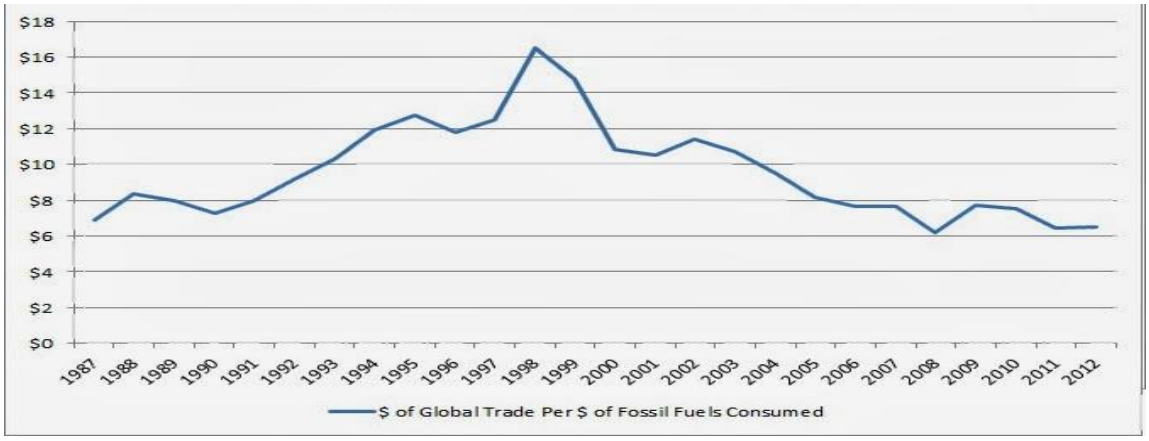


(ipcc (Intergovernmental Panel on Climate Change), 2014)

3.3.3 Sustainability concern

Sustainability of these exhaustible natural resources is one of the most significant threat posing the world owing to the current consumption pattern of these resources. The efficiency of using the energy refers to the usage of energy for a specific region over a period of years (Martin, 2013). This efficiency has reduced significantly due to the tremendous increase in the consumption of energy per capita and per sq. kilometre. Hence, the global trade related to the efficiency of the fossil fuels is affected. It is reduced by a great margin as shown in the chart given below.

Figure 14: Energy Efficiency of global trade



(Martin, 2013)

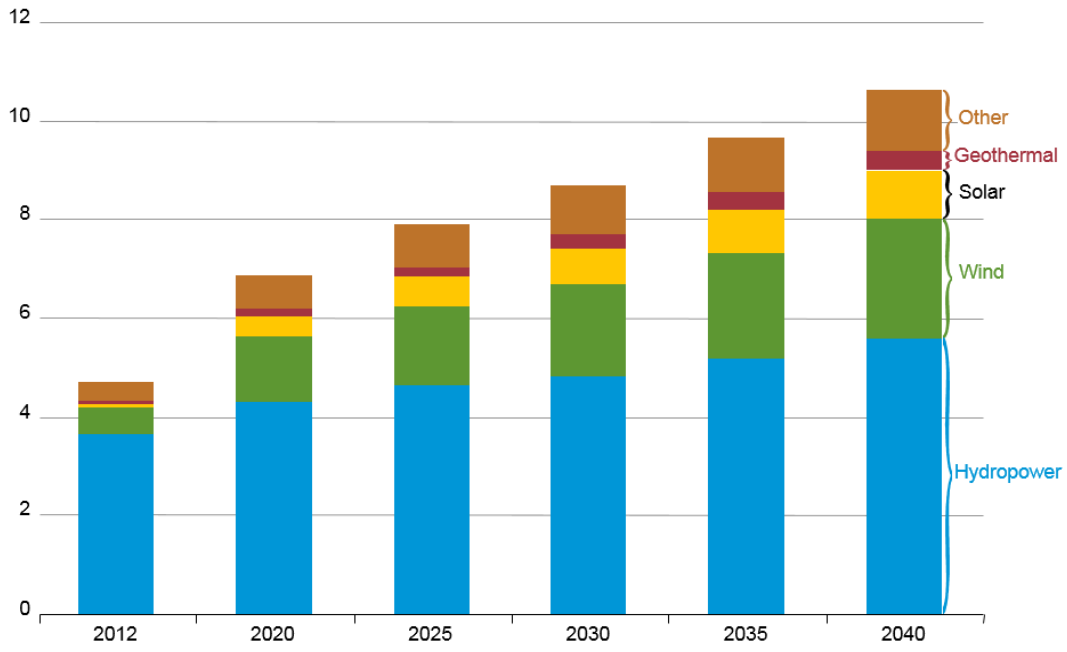
3.4 Renewable or non-exhaustible natural resources

The best way to reduce the consumption of non-exhaustible natural resources like coal, oil and natural gas is to develop non-exhaustible and renewable natural resources on a large scale. The non-exhaustible natural resources include solar, hydropower, wind, tidal energy, Geothermal and other such sources of energy (REN 21, 2016). These resources are currently utilized on a very small scale. Its implications at a commercial level are very limited.

3.5 Potential of renewable energy sources

Renewable energy resources have a huge potential in terms of generating electricity (Energy Information Administration, 2016). The potential of using different forms of renewable energy sources to generate electricity across the globe is provided in the chart given below. There is a significant increase in the development of hydropower sources and hence, a considerably large amount of electricity is generated from it.

Figure 15: Potential of renewable energy resources for generating power from 2012 to 2040 (in trillion kilowatt-hours)



(Energy Information Administration, 2016)

There is a huge scope of developing the wind as well as solar sources for generation of electricity on the basis of the chart provided above. The current use of the renewable source of energy along with its technical potential is provided in the below table. It also provides the theoretical potential of these natural resources across the globe.

Table 2: Global Renewable Energy current statistics and potential (Exa joules a year)

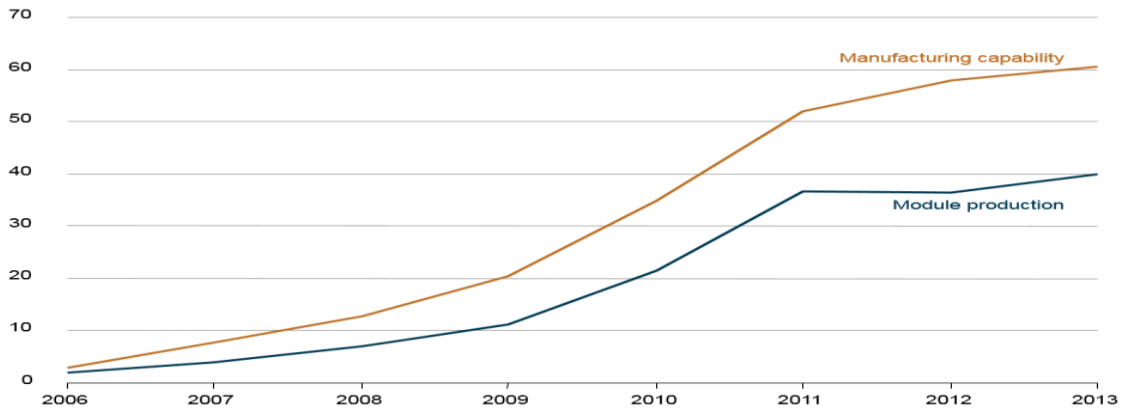
Resource	Current use[a]	Technical potential	Theoretical potential
Hydropower	10.0	50	150
Biomass energy	50.0	>250	2,900
Solar energy	0.2	>1,600	3,900,000
Wind energy	0.2	600	6,000
Geothermal energy	2.0	5,000	140,000,000
Ocean energy	-	-	7,400
TOTAL	**62.4**	**>7,500**	**>143,000,000**

(Goldemberg, 2000)

The current usage of solar, wind and geothermal is much less as compared to its technical potential. Its theoretical potential is immense as it cannot be calculated due to its large scale availability across all the countries worldwide. The total current use of all the renewables is much less than it's potential. There is a huge potential that is to be tapped across the globe pertaining to the development of energy from renewable natural sources.

The scope of renewable energy is discussed with the help of production of solar photovoltaics across the globe. Solar photovoltaics help in conversion of solar energy into electricity. The current production along with the actual manufacturing capability of solar photovoltaics is provided in the chart given below.

Figure 16: World Solar Photovoltaics manufacturing production and capability (gigawatts)



(Energy Information Administration, 2016)

The current production of solar photovoltaics is very low as compared to the manufacturing capability of the producing units. There is a restricted growth in the number of photovoltaics produced from the time period after 2011. The gap between the current module production and the manufacturing capability has increased significantly after 2011 as observed in the chart given above.

4. Practical Part

This section will provide all the necessary data collection methods and instruments used to analyse the facts and figures which are used to show the evaluation of my research, it will give the type of data sampling methods and questionnaire analysis published in results.

4.1 Data Collection method

Data is collected through two means as it involves a mixed methodology to be carried out in the research. It involves collecting primary data through surveys from the participants that are taken into consideration. The questionnaire for collecting the primary data is developed with the help of the variables derived through secondary data (Rea & Parker, 2014). Secondary data is collected in the research through evaluating and studying different literatures consisting of reports, conference publications and journal articles relevant to the research topic. The secondary data is then categorized into specific variables. These variables provide the consumption pattern of exhaustible natural resources along with its impact on the future availability. The potential of alternate sources of energy that can reduce the pressure on coal, oil and natural gas is also derived by considering its future availability and sustainability.

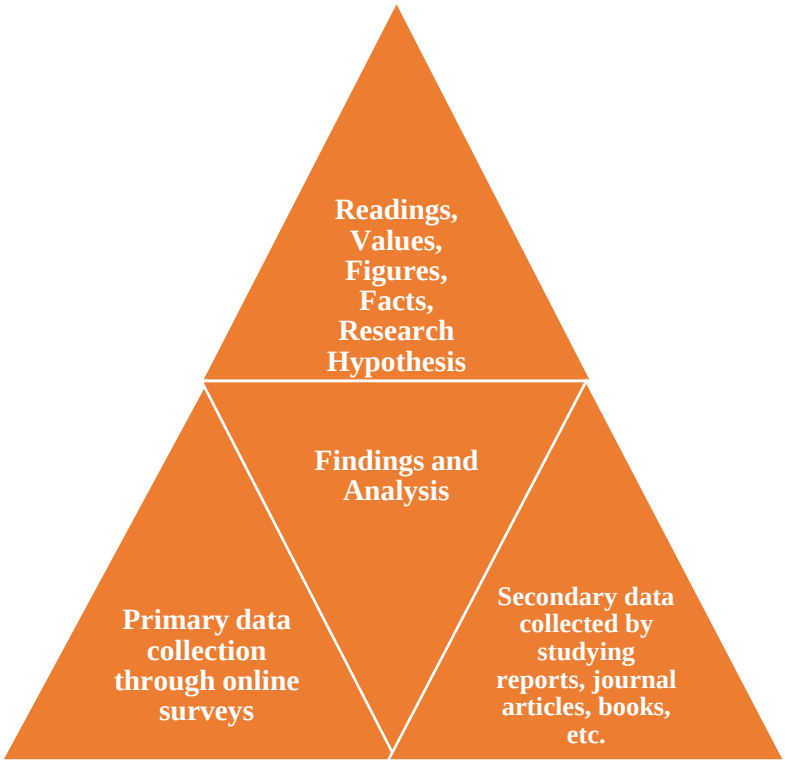
4.1.1 Data collection instrument

Data is collected through different mediums due to the mixed methodology nature of the research. The data collection instruments used for collecting secondary data are the reports, periodic articles, journals and books that reflect the consumption pattern of using natural resources like coal, oil and natural gas. The potential of the in-exhaustible sources of energy for future availability is also derived through the secondary data referring to the qualitative type of research approach. Data collection instrument used for collecting primary data is online survey. With the help of it, data for evaluation and analysis is obtained. Primary data is collected in the research among the participants who are students studying in universities across different countries worldwide.

4.1.2 Triangulation of data

The compilation of different sources through which the data is collected in the research is termed as triangulation of data. It provides preciseness to the data collected as it merges the facts and figures with the current scenario and then helps in deriving a solution for the same through the research. The data that is collected in the research is based on the following triangulation of data across its methodology. The triangulation of data in the research methodology is provided in the following figure:

Figure 17: Triangulation of data in research methodology



(Source: Author, 2017)

- The research starts with identifying the aim of the research and developing a research hypothesis. It involves deriving the research questions, research objectives, sub-objectives and problem statement. It is derived on the basis of certain readings, values, facts and figures pertaining to the subject taken into consideration.

- Secondary data is collected in the research where the variables pertaining to the different characteristics that indicate the consumption pattern of exhaustible natural resources like coal, oil and natural gas are derived. International reports, conference proceedings, books and other journal articles are used for it. With the help of secondary data collected, primary research is carried out.

- Primary data is carried out in the research which uses the characteristics that are derived with the help of secondary research across the study. It provides a first-hand data which is then evaluated for achieving the objectives of the research.

- The data collected through both the research methods are evaluated and analysed in the findings section. In this way, the data is assimilated across the research.

4.2 Data Sampling

The process of selection of participants for carrying research about a certain subject is termed as data sampling. Data sampling helps in deriving important aspects of the research by specifying the participants that are to be taken into consideration (Babin & Zikmund, 2015). The research is carried out on the basis of data obtained from the samples that are taken into consideration related to the subject considered. For carrying data sampling in the research there are few factors which are to be considered and they are provided as follows:

- *" Participants to be surveyed,*

- *Method of collecting the sample,*

- *Selection of respondents and the number of respondents in the research"* (Cooper, Schindler, & Sun, 2003).

The sampling of data is carried out through two main means and they are probabilistic sampling and non-probabilistic sampling respectively.

4.2.1 Probability Sampling

Probability sampling involves sampling that has random selection of the participants for the research study. Different units of the sampling are chosen without specific emphasis on

their details (Tyrer & Heyman, 2016). It is observed that all the units are considered irrespective of their age, economic and political background, race, ethnicity, culture and other such factors that differentiate them. Different types of probability sampling can be carried out. They are provided as follows:

1. *" Simple random sampling*
2. *Stratified sampling*
3. *Cluster sampling*
4. *Systematic sampling*
5. *Multi-stage sampling"* (Tille & Wilhelm, 2016).

4.2.2 Non-Probability sampling:

Non-probability sampling refers to the sampling where the samples are formed through partial judgement of the researcher and it is carried out on the basis of certain predefined characteristics (Baker, et al., 2013). There are different types of non-probability sampling that can be carried out across the research and they are as follows:

1. *"Convenience sampling*
2. *Consecutive sampling*
3. *Quota sampling*
4. *Judgmental sampling*
5. *Snowball sampling"* (Baker, Brick, Bates, Battaglia, & Couper, 2013)

In this research, convenience and judgemental sampling is carried out. Convenience sampling helps in selecting participants for sampling on the base of their ease of availability. On the other hand, judgemental sampling helps in selecting participants on the basis of their knowledge and other characteristics of their living. Hence, in the research, the participants that are selected are within the age group of 18-25 years and are easily available through

online sources and their way of living along with their knowledge is taken into consideration. They are studying in different universities across the globe. By obtaining their responses, data regarding the consumption pattern of people across the globe is derived. The sampling of data is carried out such that the responses of the participants is accurate and precise pertaining to their consumption patterns that impact the use of exhaustible natural resources.

4.3 Questionnaire design

The survey is carried on the basis of the questionnaire developed. A survey questionnaire comprises of different types of questions that help in collecting relevant and adequate information about the subject (Burgess, 2001). Different types of questions used in the research are provided below:

4.3.1 Type of questions

Open ended questions:

The questions whose answers are not in the form of options are termed as open ended questions.

Close ended questions:

The questions which has answers in the form of options and are very simple in nature are termed as close ended questions. In the survey questionnaire provided in Appendix A, the questions 1, 2, 4 and 11 are close ended questions.

Dichotomous questions:

Dichotomous questions are the type of questions that are answered only by two options and they are yes or no, respectively. In this research, questions from 5-8 in the survey questionnaire provided in Appendix A are dichotomous questions.

Rating questions:

Rating questions are the questions in which the participants have to answer in the form of ratings that they have to give for a specific opinion, characteristic or argument. The

intensity of the options provided in answers is derived through these questions. In the survey questionnaire, question no. 3, 9 and 10 are rating type of questions.

4.3.2 Data Scaling

Data Scaling refers to the means by which the data collected through different type of questions are scaled on a general basis for the research topic taken into consideration (Buja, et al., 2008). There are different basis on which data scaling is carried out. Different types of data scaling are described below:

Rank order Scaling:

Rank order scaling is the type of scaling where the answers are to be provided in the form of ranks to the options provided in the question.

Rating scale:

Rating scale refers to the intensity of the opinion where the agreement or disagreement of the participants about the question is derived. In the survey questionnaire developed in the research, question no. 9 and 10 are scaled on the basis of rating scale.

Differential scale:

There is a point scale which corresponds to the two extreme opinion related to the liking or practice of the participants. In the survey questionnaire provided in Appendix A. question no. 3 is scaled on the basis of differential scale.

4.4 Ethical Considerations

The ethical considerations which are made in the research include that the identity of the participants will not be disclosed to any external source or database. The information provided by the students would be kept extremely confidential. The habits of the students taken into consideration as the participants in the research will not be disclosed to any external sources. Personal information of the participants would be kept intact throughout the research. There is a considerable amount of implementation of the code of ethics exercised

through the research study. The responses of the participants are obtained through online surveys without sharing of their personal information in the research.

5. Results and Discussion

The results that are derived from the methodology carried out in the thesis consists of deriving the responses from the participants and plotting them in charts and pie diagrams. It also involves considering the impact of using in-exhaustible natural resources on the current consumption patterns of exhaustible natural resources. It involves deriving the importance of the research and discussing them with the variables taken into consideration. The personal habits and preference of the students studying in universities across the globe are determined with respect to their utilization of renewable sources of energy as well as the non-renewable sources of energy.

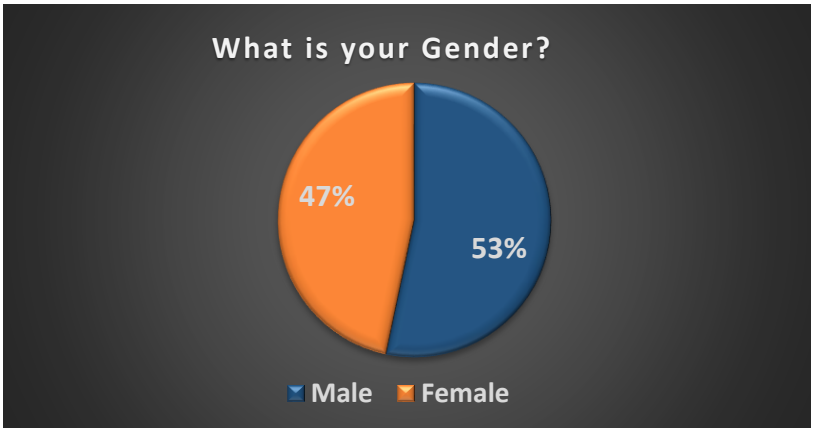
5.1 Results of Data Analysis

The results obtained from the data collected is analysed with the help of charts statistical evaluation. The results are discussed as follows:

Gender Demographics

It is obtained through the first question of the survey. Gender demographics refers to the number of males and females taken into consideration in the thesis. It is obtained through the participants who are taken into consideration in the research. It is formulated in the following pie diagram.

Chart 1: Gender Demographics among the participants (pie-diagram)



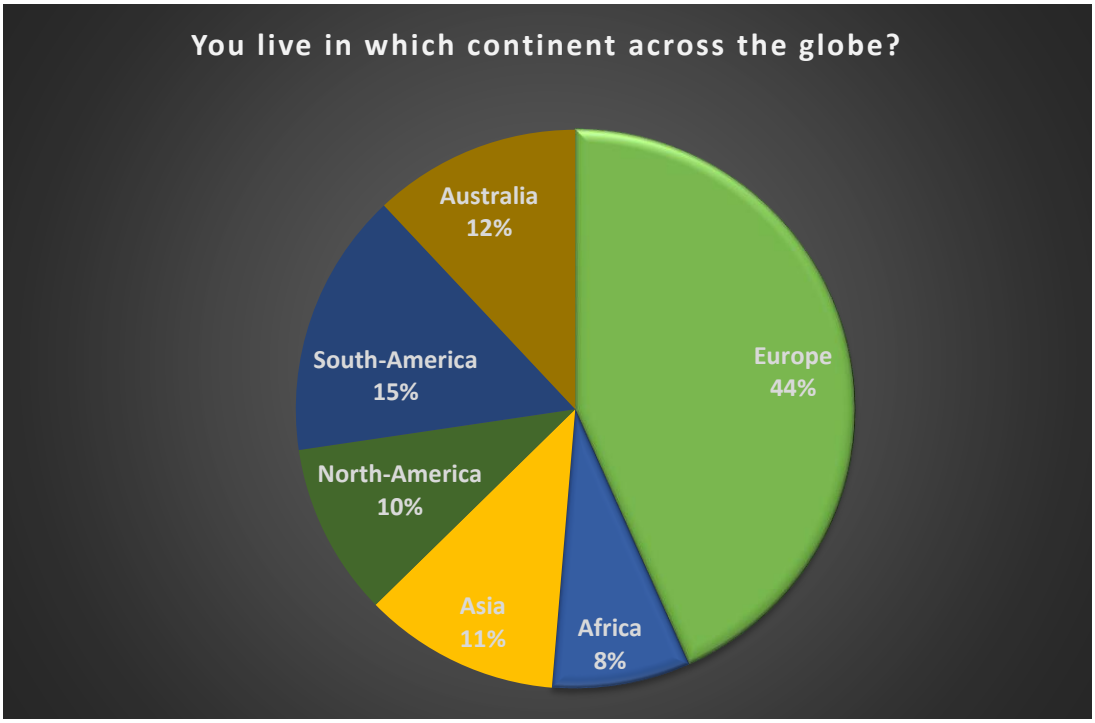
(Source: Author, 2017)

It is observed from the results obtained that 47% of the participants in the survey are males and the remaining 53% are females. Hence, there is an equal consideration of both the genders in the thesis which ensures that specific habits of a particular gender are not highlighted.

Location Demographics

It refers to obtaining the details of the location from where the participants belong in the thesis. The participants are categorized on the basis of their continents and the results obtained are shown in the following diagram no. 2.

Chart 2: Location Demographics of the participants (pie-diagram)



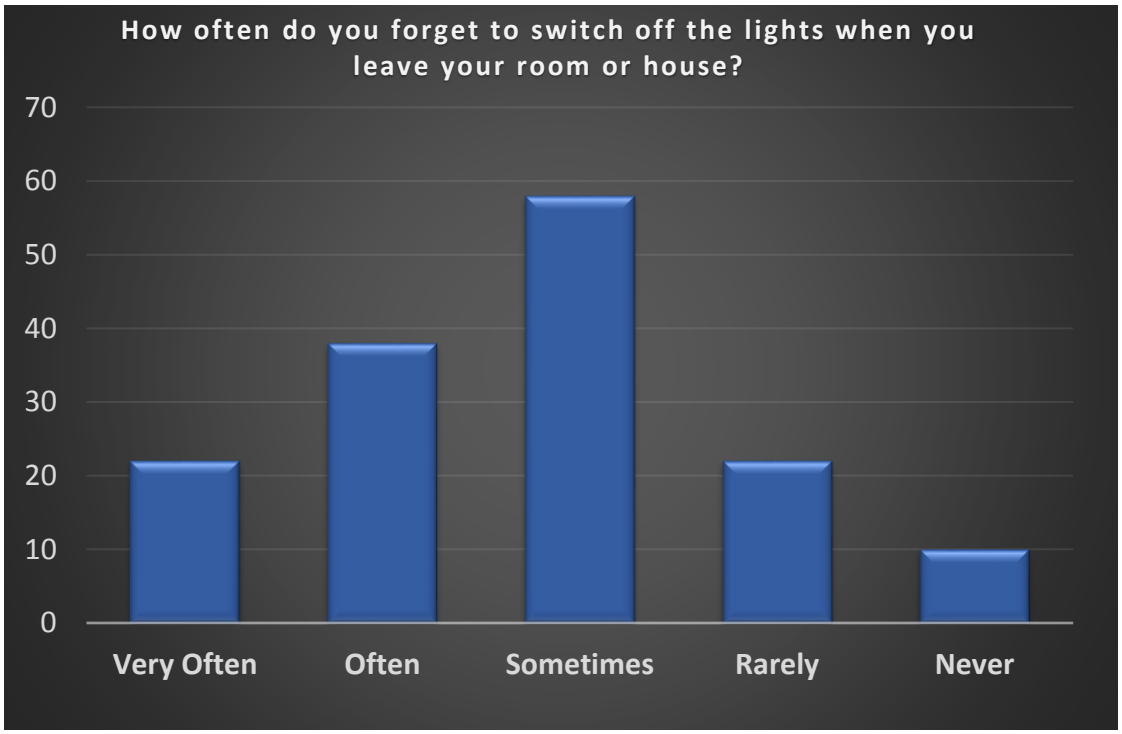
(Source: Author, 2017)

Since, I am studying in Europe, 44% of the participants were students studying in Europe. It is because of the ease of availability of participants in the same university that accounts for higher participation of students from Europe. Other participants are studying in Australia, South-America, North-America, Asia and Africa and are almost evenly considered in the thesis. Though, lowest percentage of participants were from Africa.

Personal Electricity consumption patterns

The electricity consumption patterns of the participants with respect to their habit of leaving the lights on or switching them off is obtained through Question no. 3 in the survey. The results are shown in the following chart. It is very important to consider the personal habits related to electricity consumption of the students as it helps in deriving the consumption patterns of power derived from exhaustible sources of energy. Controlling the wastage of power is the easiest way of reducing the consumption of electricity and it can be done by taking few precautions at the global level. Hence, the personal habits of the students pertaining to the usage of electricity is derived.

Chart 3: Personal Electricity Consumption patterns among the participants



(Source: Author, 2017)

The above chart is developed on the basis of the information collected in Q.3 and shown in the following table. Along with it, the standard deviation and mean of the responses is also shown in table no. 3.

Table 3: Details of responses related to the electricity consumption among the participants

Responses	Number of responses	Percentage
Very Often	22	15%
Often	38	25%
Sometimes	58	36.66%
Rarely	22	17%
Never	10	6.33%
Mean	2.15	
Standard Deviation	0.81	

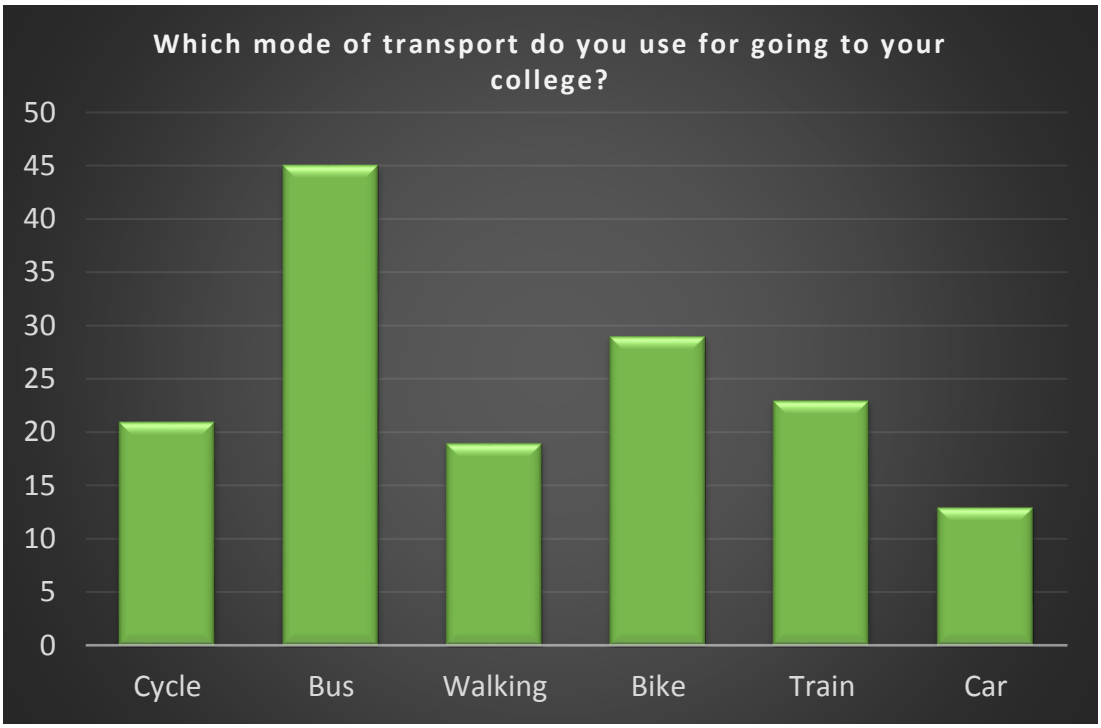
(Source: Author, 2017)

As seen in the above table, it can be seen that the mean of the responses is at 2.15, where 1 is provided to first option, 2 to the second and so on. Hence, the response is widely divided into the first three options. It indicates that the students sometime tend to forget to switch off the lights when they leave their room or their house. This helps in identifying the consumption pattern of electricity among the students which are considered as participants in the research.

Mode of transport

The mode of transport that is used by the students for going to their College is derived through question no. 4 of the survey. Its results are shown in the following chart. It is very important to identify the mode of transport used by the students for reaching their college as it helps in deriving the consumption pattern of fossil fuel through the option selected by them.

Chart 4: Mode of Transport among the participants

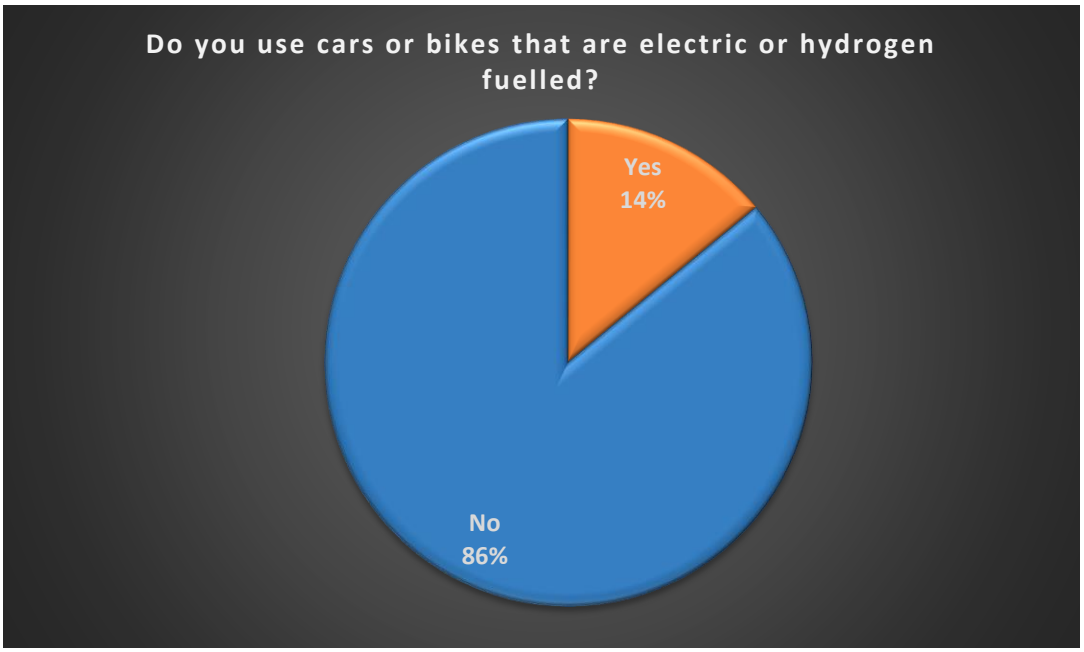


(Source: Author, 2017)

As seen in the above chart, the number of students that use bus for reaching their college is the highest. About, 30% of the participants use bus to reach their college. On the other hand, the lowest percentage obtained is the number of students using car as a mode of transport to reach their college which is less than 1% of the students. However, the number of students using bike is quite high accounting to about 20%. It is aimed that maximum of the students who are using personal vehicles like car and bike should be using public transportation system for reaching their college. It helps in reducing the fuel consumption at a global level.

The use of electric or hydrogen fuelled cars and a bike is evaluated through Question 5. The scope of using alternate in-exhaustible sources of energy for transportation purpose is derived with the aim of reducing or controlling the consumption of exhaustible sources of energy. The result obtained from the students is shown in chart no. 5.

Chart 5: Usage of electrically or hydrogen fuelled cars

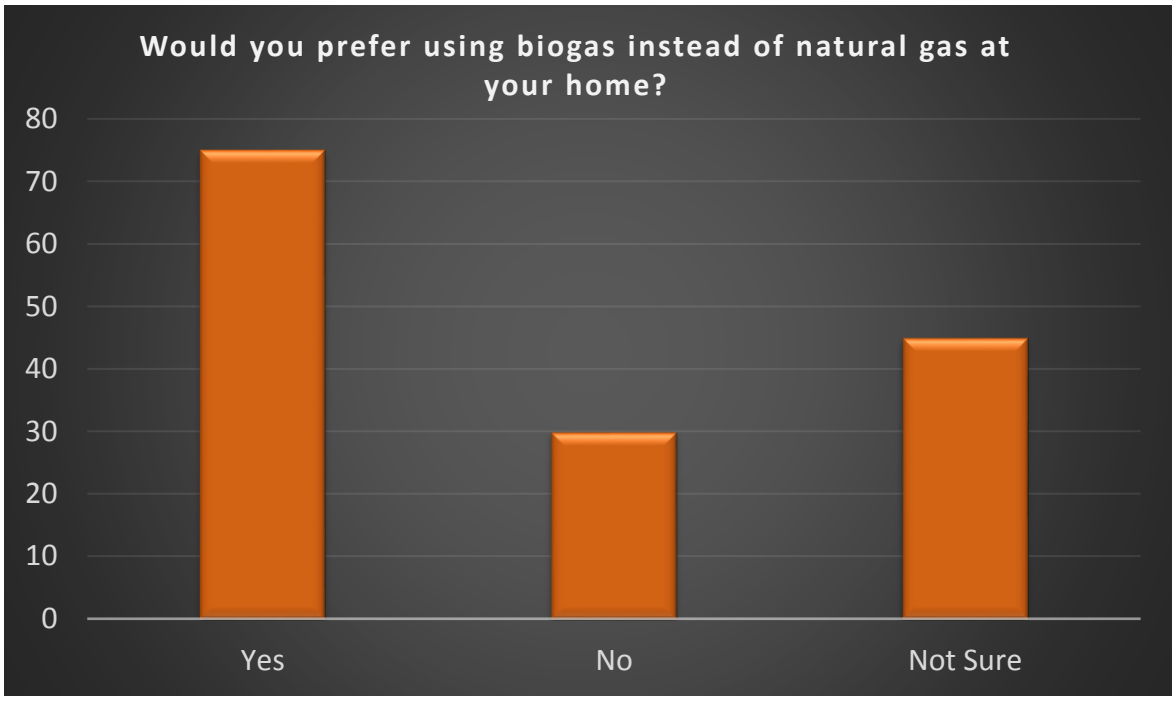


(Source: Author, 2017)

Only 14% of the students were found to be using electric or hydrogen fuelled car and this shows that there is a need to increase the usage of these cars. For this purpose, it is required to develop a technology that helps in easy and cost effective implementation of alternate sources of energy for running vehicles.

In the households, it is possible to reduce the consumption of natural gas by using biogas. Hence, the preference of the students in terms of using biogas instead of natural gas in their houses is derived through Question no. 6 in the survey. The results obtained in it are shown in the following chart no 6.

Chart 6: Preference among the participants of using biogas instead of natural gas



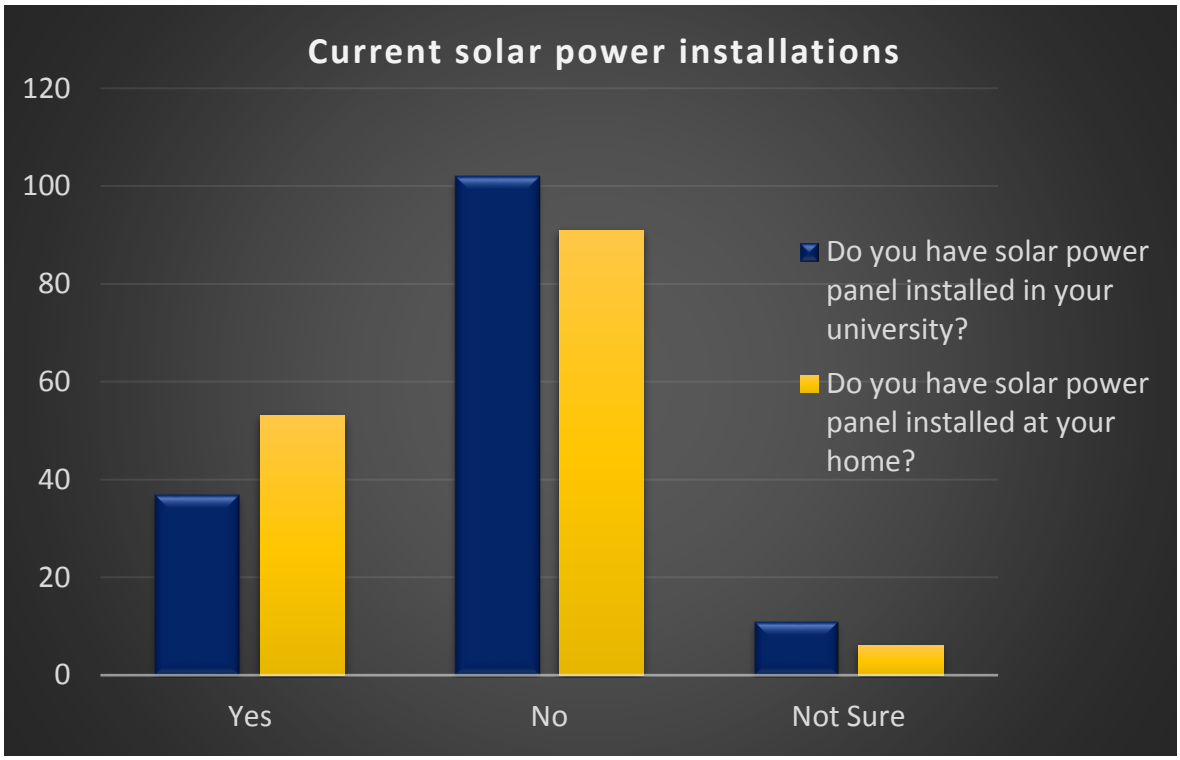
(Source: Author, 2017)

It can be seen that about 50% of the students supported the motive of using biogas instead of natural gas in their houses. About 20% of the students refused from using biogas in their houses; whereas, about 30% were not sure if they would use biogas instead of natural gas in their houses. Hence, there is a need to increase awareness among the students about the use of biogas and its benefits over consuming natural gas in their houses.

Impact of solar energy consumption

The impact of solar energy consumption is derived by first obtaining the current installations of solar power in the home as well as the University of the Students. It is derived with the help of question no. 7 and 8 in the survey. The results of these questions is shown in the chart no. 7 given below.

Chart 7: Current Solar Power installation in the university and homes of participants



(Source: Author, 2017)

In the above chart, the blue bar shows the solar power panel installed in the University of the Students, while, the yellow bar shows the solar power panel installed at their homes. The above result is obtained from the following table showing the responses of the students.

Table 4: Information about the installation of solar power in the university and homes of participants

7. Do you have solar power panel installed in your university?		**8. Do you have solar power panel installed at your home?**	
Responses	**Number of responses**	**Responses**	**Number of responses**
Yes	37	Yes	53
No	102	No	91
Not Sure	6	Not Sure	6

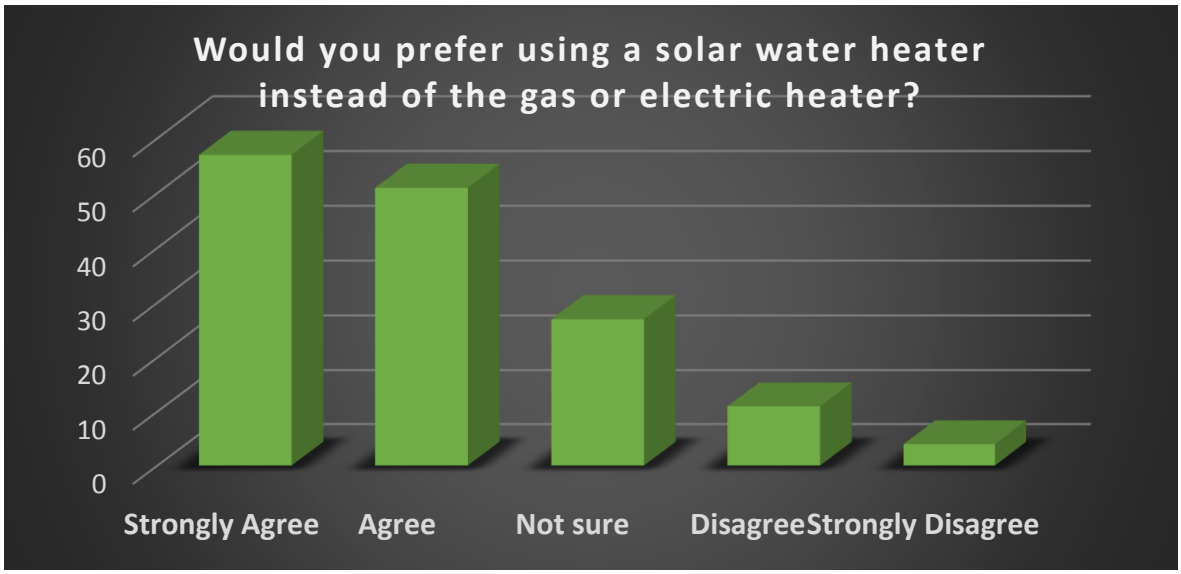
Mean	1.8	Mean	1.5
Standard Deviation	0.75	Standard Deviation	0.72

(Source: Author, 2017)

It can be seen that about 25% of the students had solar power panel installed in their university. Similarly, about 35% of the students were having solar power panel installed in their homes. It shows that there is a need to explore the installation of solar power panel across different buildings. The mean is high for Q.7 which is about 1.8 and this shows excessive inclination towards the second option. The mean for Q.8 is 1. Which shows that there is a moderate inclination towards option no. 2 in the question. Thus, it is needed to increase the installations of solar power panel to reduce the consumption of energy derived from exhaustible sources of energy.

The preference among the students regarding the use of solar heater against electric heater is obtained through Q.9. The results are shown as follows in chart no. 8.

Chart 8: Preference of the participants of using solar water heater over electric heater



(Source: Author, 2017)

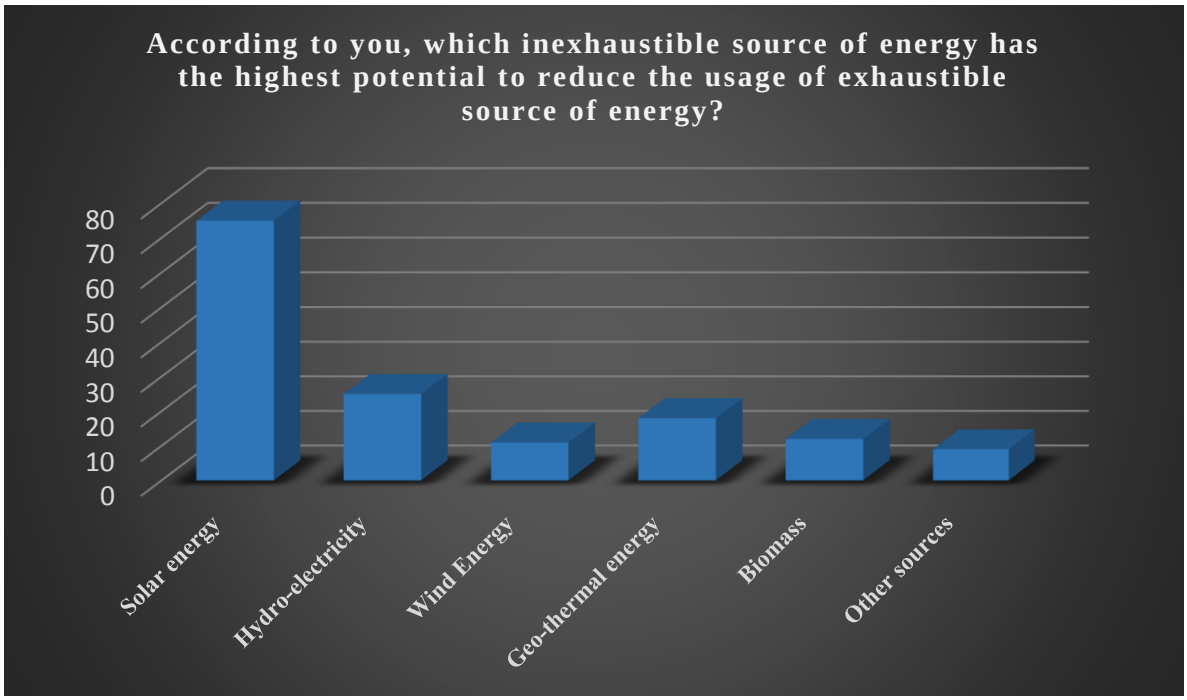
It is observed that about 72% of the students agreed or strongly agreed to the idea of using solar water heater instead of electric water heater. About 18% were not sure about and

10% of the students disagreed to using solar water heater instead of electric water heater in their houses. Hence, the potential of solar energy is yet to be tapped for different appliances which primarily work on power obtained from electricity. The consumption of electricity has an important role in the consumption of natural gas, oil and coal as they are used for generating this electricity. Hence, it is necessary to reduce the stress of generating electricity on these resources and produce it from other in-exhaustible sources like solar, hydro, wind and geothermal.

Potential in-exhaustible energy

The potential of in-exhaustible source of energy is derived from the students through Q.11 in the survey. The different sources of energy that are inexhaustible are provided to the students and its potential to reduce the usage of exhaustible sources of energy is obtained. The results obtained are shown as follows in chart no.9.

Chart 9: Potential of inexhaustible source of energy according to the participants



(Source: Author, 2017)

It can be stated that according to the students, solar energy has the highest potential to reduce the consumption of exhaustible source of energy across the globe. About 505 of the

students have voted for solar energy having the highest potential among the other renewable sources of energy. About, 17% of the students voted for hydro power having the highest potential for the same. The results on the basis of which the above chart is obtained are shown in the following table along with the mean and standard deviation.

Table 5: Information about the potential of inexhaustible sources of energy according to participants

Responses	Number of responses	Percentage
Solar energy	75	50%
Hydro-electricity	25	17%
Wind Energy	11	0.8%
Geo-thermal energy	18	1.2%
Biomass	12	0.8%
Other sources	9	6%
Mean	1.25	
Standard Deviation	0.68	

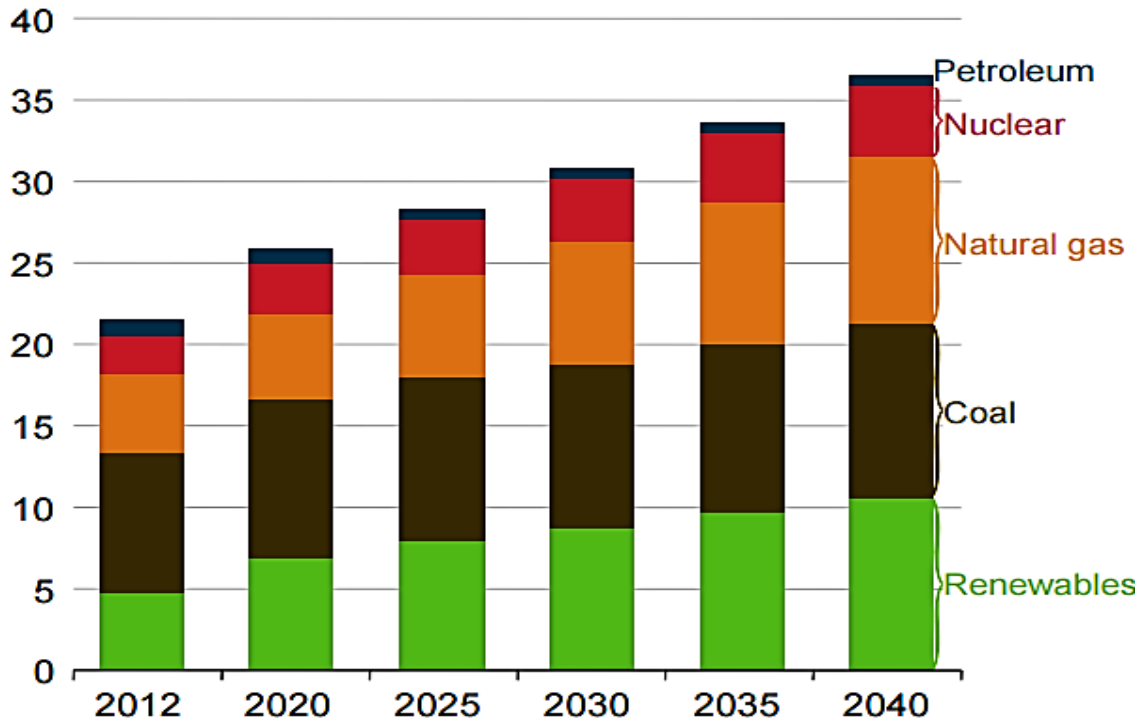
(Source: Author, 2017)

The standard deviation for the question is 0.68 and the mean is about 1.25. It shows that about 67% of the responses of the students are for solar energy and hydro power and the remaining is distributed across the other sources of energy. Hence, it can be seen that solar energy is bound to have the highest potential in reducing the consumption of exhaustible natural resources.

5.2 Discussion about the impact of developing inexhaustible natural resources on the consumption of natural resources

For reducing the pressure on exhaustible natural resources like coal, oil and natural gas, it is necessary to develop inexhaustible sources of energy like solar, wind, geothermal, hydro, etc. it helps in decreasing the consumption of coal, oil and natural gas across the globe. The net electricity generated from both of these resources is shown in the chart given below.

Figure 18: Projection of world net electricity generation by fuel for 2012-2040 (trillion kilowatt hours)



(Energy Information Administration, 2016)

The increase in the generation of electricity from renewables has resulted in reduction in the pressure on exhaustible natural resources like coal, natural gas, petroleum and nuclear energy. Hence, on the basis of the literatures reviewed and the results of the survey, it is observed that solar energy has the highest scope of reducing the consumption of pattern of exhaustible natural resources like coal, natural gas and oil. It is necessary to reduce the current consumption of these resources so as to slower the rate of its depletion and also reduce the number of environmental problems developed due to their use.

6. Conclusion

The thesis achieves its aim of obtaining the consumption patterns of exhaustible natural resources with the help of studying and evaluating research papers, journal articles, books and conference publications. It is observed that the current consumption of the exhaustible natural resources is increasing tremendously and the most feasible way to reduce it is to increase the usage of in-exhaustible natural resources. The consumption of natural resources like coal, natural gas and oil is mostly for generating and in the form of fuel. Hence, in order to reduce its usage as observed from its consumption patterns, developing means to increase the use of energy derived from solar, hydro, wind, geo-thermal and other such in-exhaustible sources of energy. People in the young age between the age-groups of 18-25 years are considered as they are the major players in the present to deicide this choice of sustainable development and prevent future ecological imbalances.

The consumption pattern of electricity and fuel that constitute to be the major contributing areas in the usage of exhaustible resources is derived. The link between the consumption of electricity and fuel is derived by collecting information from the students through an online survey. It helped in obtaining the habits of the students that impact the consumption of electricity and fuel. Along with, their knowledge and preference about the use of alternate sources of energy which hare in-exhaustible in nature is also derived. Solar Energy and Hydro power is observed to have the highest potential in the future along with other in-exhaustible sources like wind, geo-thermal and biomass.

6.1 Recommendations

I have derived my recommendations about the current consumption patterns of using natural resources on the basis of the research carried out in the thesis. The use of hydrogen fuelled car is preferred owing to its benefit in terms of saving the consumption of fuels as well as its environmental benefits in reducing the emissions through the vehicles. It is a great option to reduce the consumption of fuel and help in obtaining sustainable environment. However, it is dependent on the development of technology that increases the production of vehicles that work on alternative fuels. But, the consumption of fuel can also be reduced

currently by reducing the number of personal vehicles and opting for using public transportation instead. It has the potential to reduce the consumption of fuel used for the vehicles. Hence, my recommendation would be to increase the facilities provided through public transportation and make sure that a greater percentage of the population is using it.

Due to globalisation, people are in pace with the moving world, but initiatives for green environment need to be considered by using recent technology to reduce energy consumption which is obtained from coal, natural gas and oil. This can be explained by providing adequate support from the governments across the different countries for providing subsidised energy sources such as bio-fuels, solar panels, windmill can be provided used by people especially in all countries across the world. 3. World forums needs to take upon adequate action on making guidelines and regulations on emissions from natural resources and also advocating the sustainable development for the future generation.

Similarly, the consumption of electricity has to be managed by saving it and also by developing alternate means of production other than the exhaustible sources of energy like coal, oil and natural gas. For this purpose, the potential of solar energy, hydro power, wind energy, geothermal energy, biomass and other such in-exhaustible sources of natural resources is to be utilized to its maximum. The current usage of solar energy is derived with the help of its installation in the surroundings around the students belonging to different countries which are taken into consideration as participants in the study.

Hence, I would recommend to derive greater number of devices that make the consumption of in-exhaustible sources of energy to be feasible and help in reducing the consumption of exhaustible natural resources like coal, natural gas and oil.

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8. Appendix

List of Supplements

Appendix A: Survey Questionnaire

Cover Letter for the survey

Dear Respondents,

"This is a survey regarding the consumption patterns of natural resources among the people across the globe. The data and information that will be provided by you will be kept confidential and will not be disclosed to anyone or anywhere. Kindly fill in the questionnaire that is given below":

1. What is your Gender?
    a. Male
    b. Female
2. You live in which continent across the globe?
    a. Europe
    b. Africa
    c. Asia
    d. North-America
    e. South-America
    f. Australia
3. How often do you forget to switch off the lights when you leave your room or house?
    a. Very often
    b. Often
    c. Sometimes

d. Rarely

e. Never

4. Which mode of transport do you use for going to your college?

    a. Cycle

    b. Bus

    c. Walking

    d. Bike

    e. Train

    f. Car

5. Do you use cars or bikes that are electric or hydrogen fuelled?

    a. Yes

    b. No

6. Would you prefer using biogas instead of natural gas at your home?

    a. Yes
    b. No
    c. Not sure

7. Do you have solar power panel installed in your university?

    a. Yes

    b. No

    c. Not sure

8. Do you have solar power panel installed at your home?

    a. Yes

    b. No

    c. Not sure

9. Would you prefer using a solar water heater instead of the gas or electric heater?
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
10. Do you think that solar power needs to be installed at a greater level?
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
11. According to you, which inexhaustible source of energy has the highest potential to reduce the usage of exhaustible source of energy?
    a. Solar energy
    b. Hydro-electricity
    c. Wind Energy
    d. Geo-thermal energy
    e. Biomass
    f. Other sources