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POLITICAL ECONOMY OF ENERGY IN TURKEY

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İSTANBUL, JUNE, 2020

I, AYÇA TUBA ALP;

Hereby declare that this Master of Arts thesis is my own original work and that due references have been appropriately provided on all supporting literature and resources.

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June, 2020

ACCEPTANCE AND APPROVAL

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ABSTRACT

Turkey's energy needs and dependence on imported energy resources have increased in the 2000s, as the economy rapidly grew, leading to an increased focus on energy policies aiming to increase domestic energy production. However, the energy policies implemented fell short of solving Turkey's energy problems, even though energy investments have increased and new firms entered into the energy markets. The dependency on imported energy sources continued, while new environmental problems arose. In this thesis, after examining Turkey's energy needs and sources, I analyze the energy policies implemented and their consequences.

Key Words:

ÖZET

Ekonomi hızla büyüdükçe Türkiye'nin enerji ihtiyaçları ve ithal edilen enerji kaynaklarına bağımlılığı 2000'li yıllar itibari ile artmış, bu da yerli enerji üretimini arttırmayı amaçlayan enerji politikalarına daha fazla odaklanmaya yol açmıştır. Ancak, enerji yatırımları artmış ve enerji piyasalarına yeni firmalar gitmiş olsa da, uygulanan enerji politikaları Türkiye'nin enerji sorunlarını çözmekte yetersiz kalmıştır. İthal edilen enerji kaynaklarına bağımlılık devam ederken, yeni çevresel sorunlar ortaya çıkmıştır. Bu tezde, Türkiye'nin enerji ihtiyaçlarını ve kaynaklarını inceledikten sonra, uygulanan enerji politikaları ve sonuçlarını analiz ediyorum.

Anahtar Kelimeler:

CHAPTER 1: INTRODUCTION

I examine the evolution of Turkey's energy needs in the 2000s and 2010s and show that Turkey's energy needs have increased over time as the economy rapidly expanded, but Turkey remained dependent on energy imports. A number of policies were designed and implemented to deal with this issue; however, they seem not to have solved the dependency problem while leading to environmental concerns and financial problems at the end of the 2010s. A literature review follows this introduction and focuses on the primary discussion points on energy policies. The study of empirical trends in the following chapter will provide guidance in understanding the actual situation that Turkey has been in. Energy policies relating to the issues will be discussed thoroughly, and finally, the literature, empirical facts, and energy policies will all be evaluated together in the conclusion part.

The critical role of energy in economic growth has been widely discussed. An economy's energy consumption is affected by several factors, including the size and composition of the economy, population growth, the level of industrialization and the technological state of production. While energy seems to be one of the most critical factors in economic production, dependency on foreign energy sources has always been an important concern for energy importer economies. Concerns about the increasing trend of energy consumption and its adverse effects on the environment have drawn the attention of many researchers and policy makers to investigate the issue further. Especially for a country like Turkey, which is highly dependent on imports for its energy needs, increasing energy consumption not only harms nature but also puts a burden on the country's trade balance. These are the main reasons why the subjects of energy and sustainable development have attracted so much attention in the last few years.

The world's main energy sources are coal, natural gas, and oil, and their consumption has a drastic effect on the environment. The significant problem is that the increasing consumption of non-renewable energy sources leads to disasters and catastrophic damage to the environment by also increasing GHG emissions (G. S. Mihaela Sterpu 2018). Moreover, those energy sources are non-renewable, which means that countries cannot

keep using those types of energy sources forever. As these energy sources are used up, it is expected that they will be more and more expensive. Rising energy prices have significant implications for the Turkish economy, as close to 80% of total energy consumption comes from imported sources.

Turkey is dependent on imports for its energy supply. Over the last few decades, 75% of Turkey's primary energy supply was provided through imported sources. Natural gas has the highest share of Turkey's primary energy sources, with 33.4%, and this natural gas is used for 26% of residential and commercial consumption, 18% of that in industry and the rest of it is used in electricity generation. Natural gas consumption is followed by coal, which composes 32% of primary energy supply and coal is used mainly in the electric sector at 58% and consumed as 29% by the industrial sector, which constitutes cement, steel, and iron. The third preferential energy source is petroleum, which holds 24% of the primary energy supply. Petroleum is 79% of energy used for transportation purposes. As of 2018, Turkey's primary energy supply consists of 32% of oil, 28% of coal, 26% of natural gas, 9% of hydro, and 5% of renewables. According to these numbers, 86.6% of our energy is still supplied by non-renewable sources, whereas renewables supply only 13.4%. Also, in 2018 our energy bill increased by almost 15.6% compared to 2017, and energy import was almost 20% of the import bill. To sum up, 75% of Turkey's energy depends on foreigners and 87% on non-renewable energy sources.

The energy security issue has gained more attention since the 2000s. The reason for the interest in the concept was the increasing demand for energy, and as a consequence the decline in reserves, fluctuations in energy prices, rising concern about the environment and climate change, and sustainability issues in individual countries (Biresselioglu, et al., 2017). This energy security problem was a mutual problem in both supplier countries and energy deficit countries, since both parties will be affected by the results. But for the deficit countries, there was a chance of growth in alternative energy sectors such as the renewable energy sector. Since renewable energy sources can be found in any country with a variable potential, all countries have the potential to grow in this sector. As technological improvements accelerate, so do the improvements in renewable energy resource technologies as well. Technological improvements in the renewable energy

sector have a vital influence on climate change, as they can change the costs and ease of installation of renewable energy plants and can contribute to the diffusion of the usage of the new technologies, which have lower emissions (Felix Groba 2013). It can be beneficial to use renewable energy sources to decrease Turkey's energy dependency, and also to decrease our carbon dioxide emission and so as not to damage the environment.

Turkey has a vast potential for growth in renewable energy usage, as it is stated in numerous studies that Turkey has one of the highest potentials in hydropower, wind, and geothermal energy among European countries (Baris & Kucukali, 2012). However, those potentials have not been fully realized. Turkey has also attempted to establish nuclear power plants on several occasions over the years since the 1960s, but none of those attempts have been successful enough to produce energy yet. As a renewable energy, nuclear power is a particular case because of the tremendous risks that come with its installation. So even though nuclear energy has gained attention because of its potential to provide energy security, demand for it declined because of the safety issues made evident by the cases of Chernobyl and Fukushima (Jewell & Ates, 2015). Another concern about the nuclear power plants established in Turkey is that one of the main reasons for considering nuclear power plants was to decrease energy dependency. However, these nuclear plant plants are financed by Russia, a country that Turkey depends on because of natural gas consumption.

1.1 FOSSIL FUELS AND CARBON EMISSIONS

Fossil fuels include coal, petroleum, natural gas, and heavy oils that all contain carbon (Kopp, 2019). Nevertheless, there has been a rising concern in recent years related to fossil fuels, due to increasing air pollution and rising carbon dioxide and greenhouse gas emissions. Throughout the economic growth process, countries face many difficulties, and one of the major problems is the adverse environmental effect and environmental pollution caused by this process. The consumption of these energy sources increases the amount of carbon dioxide which harms the atmosphere and leads to climate change, resulting in floods, drought, rising sea levels, tornadoes, and melting glaciers (Bozkurt & Akan, 2014).

Carbon dioxide is a gas produced by transportation, electricity, industry, commercial and residential use, and agricultural production. It is evident that human activities are responsible for most of the carbon dioxide emission increment. If we think about the origin of carbon dioxide emissions, humans and animals also produce carbon dioxide whenever they breathe out, but the critical point is the rapid increase in carbon dioxide emission through massive production. Evidently, we could not eliminate carbon dioxide emission once and for all, since it is part of nature; the point is to keep it in at a sustainable level that does not threaten the atmosphere and human lives. Carbon dioxide is crucial to plant life and also helps keep the earth warm, but too much carbon dioxide emission causes global warming (Lamb, 2018). The reason that increasing carbon dioxide emissions cause climate change is that carbon dioxide is a greenhouse gas that retains the heat in the atmosphere. Global warming is accompanied by climate change, which has a drastic effect on most parts of the world. Moreover, it is not a surprise that the poorest countries of the world, which lack resources to fight the effects of climate change will suffer the most. Besides global warming, carbon dioxide contributes to air pollution, causes acid rain, and affects human health severely. The consequences of the carbon emission or carbon footprint on the environment and human beings are drastic. For example, it will affect the water supply; if carbon emission continues to increase, so does the global temperature and this consequently causes an increase in rain in some areas, and it will affect the supply of drinking water, by bringing pollutants and sediment into it. Also, it is suggested that because of the change in the weather, water demand will increase in the future, whereas its supply will decrease. And because water is essential for human beings and wildlife, its effect will be detrimental. Moreover, changing weather will affect the food supply since the seasons are changing, so agriculture is affected because every harvest requires different growing conditions. So regardless of the energy security or energy dependence problems of the energy importer countries, energy supply and demand is a global problem that concerns all of the countries in the world because of the severe results of climate change which stems from the consumption of fossil fuels and increasing greenhouse gas emissions. To sum up, the increasing level of carbon dioxide emission will have a risky and distinct effect that can be easily seen in everyone's life, so attention must be paid to it, and solutions must be sought.

1.2 RENEWABLE ENERGY

Renewable energy is an energy source that comes from natural sources and is often referred to as clean energy because it offsets the negative impacts of fossil fuels. Especially when the negative impacts of fossil fuels and ongoing investigations to find an alternative path to progress have become one of the most significant issues all over the world, renewable energy sources have gained intense attention. More importantly, for a country like Turkey, which is highly dependent on fossil fuels and where most of the fossil energy that is consumed comes from imported goods, this issue becomes more problematic. The unfavorable impact of imported energy dependence leads to an energy security problem, and causes a threat; renewable energy sources can be key to this problem (Erdil & Erbıyık, 2015). Renewable energy sources are usually referred to as 'alternative energy' because they can be alternatives to fossil fuels. Those alternative energies can be listed as solar energy, wind, geothermal, hydropower, and bioenergy. Those energy sources have been seen as a compelling alternative to fossil fuels over the past decades (Bölük, 2013).

The main renewable energy sources for Turkey are biomass, hydro, geothermal, and solar (Bölük, 2013). Unfortunately, renewable energy sources can only meet 13.3 percent of primary energy supply in Turkey as of now. But Turkey has a high potential for growth in renewable energy. Turkey has the greatest potential in renewable energy; even more, it is the second energy source that it possesses following coal. For example, Turkey's hydropower potential has the highest potential in Europe besides the fact that if this potential can be utilized, it is forecast that this hydropower potential can meet 33-44% of the country's electricity demand in 2020 (Bölük, 2013). Turkey's unsuccessful use of this potential has meant that the country faces a high share of foreign energy sources in its total primary energy supply (Kentel & Alp, 2013). The main economic tools that have been used by most of the EU countries to encourage the use of renewable energies are purchase guarantees, quota applications, feed-in-tariffs, and energy tax exemptions.

One of the reasons for an unsuccessful renewable energy implementation in Turkey is that the construction of renewable energy plants and their production requires huge know-how and also a high financial budget. Moreover, their inadequate use can harm the

environment and harm the initial intention: institutions and institutional changes as the essential variables to explain countries' different economic performances. In order to achieve economic growth, countries should consistently encourage organizations to be involved in productive activities. It is also important to mention that despite the belief that institutions can and should encourage efficient results, most of the time, they fail to do so. Even more, most of the time, they just redistribute the resources rather than engaging in productive activities. Renewable energy production and consumption require some institutional changes as well; it should be encouraged by the government and be efficient. So there has to be a detailed prior study that should be carried out before making renewable energy plans and implementations. Besides the investment cost and lack of willpower, there is also a problem related to the time discrepancy of the climate change problem. Because of the expected negative results of climate change which is foreseen as happening in the distant future, investments regarding the issue are lacking at the time. In addition, the sector most affected by climate change is predicted to be the agriculture sector whose share of economic activity has been decreasing over time. But even though its share of economic activity has decreased, according to Food and Agriculture Organization of United Nations' estimations Turkey is still the 7th largest agricultural producer in the world; therefore, its attention must still count for something. To sum up, the main challenges in shifting fossil fuel resources to renewable energy resources are the time discrepancy of the effect of climate change, the high investment costs of renewable energy plants, and low fossil fuel prices.

To address the problems in energy, the energy policy of Turkey has been changing and it has been much studied over the years. Turkey's primary energy is mainly supplied through natural gas, coal, and oil, all of which are fossil fuel sources. This energy need mainly comes from industrial sector, transportation, and energy sector. Electricity generation is an important indicator in energy sector, and electricity is mainly supplied through thermal, natural gas, hydro and lignite. Because the electricity sector holds a significant amount of energy consumption, there have been remarkable shifts and political changes in the electricity sector since the 1980s. Industrial use has the highest share of electricity consumption, followed by household consumption. Although renewable energies are used for electricity generation, their respective share is still very

low and this has growth potential. Consequently, the energy policy of Turkey is important mainly because of the following concerns; self-sufficiency concern, increasing energy production, and increasing diversification of energy resources. And because of the rising attention, the Kyoto Protocol, local environmental problems such as air pollution, HEPP (Hydro Energy Power Plant) related problems, and a strategic reluctance to depend on few specific countries, namely Russia and Iran, plus a desire for diversification of energy with the country's own resources have all encouraged scholars to investigate energy policy in Turkey.

The rest of the thesis is organized as follows. Chapter 2 reviews the literature on Turkey's energy problems, including energy consumption and economic growth, sustainable development and energy, energy security and trade deficit, and renewable energy. In Chapter 3, descriptive data will be presented to provide an overview of the main energy issues in Turkey. It will be shown that rapid economic growth was accompanied by an increase in energy demand. Also, the primary energy sources of Turkey and their import country partners will be given. Renewable energy usage will also be shown, and carbon dioxide emission as a result of fossil energy use and its change over time will be given as well. According to the literature and the main determinants of the energy policy, data will be conveyed in Chapter 3. The energy policy changes and the drivers of the changes in energy policies will be discussed in Chapter 4. Energy concerns will be discussed, and the changes in energy policies regarding the problems that have been dealt with in a given energy policy change will also be explained. Following which an explanation of the energy policies, the consequences, and the problems that occurred as a result of these policies will be clarified. The historical changes in the Turkish energy policies will be explained in detail, and the consequences of the changes and their driving reasons will be assessed.

CHAPTER 2: LITERATURE REVIEW

Energy is a subject that has been discussed intensively over the last few years in the world and in Turkey as well. I will discuss the literature on energy issues in Turkey, starting with the literature on the link between economic growth and energy consumption, then moving onto the literature discussing energy security, dependency, and trade deficit. I will then discuss the sustainable development and renewable energy literature on Turkey. Finally, I will discuss the literature on energy policies in Turkey.

2.1 ECONOMIC GROWTH AND ENERGY DEMAND

The relationship between energy consumption and economic growth is usually explained by the help of the Environmental Kuznets Curve (EKC), which suggests that energy consumption and environmental degradation increases in a country as the economy grows but after reaching an income point, which is called the turning point it begins to decrease. The theory concludes that the relationship between Gross Domestic Product (GDP) per capita and pollution emission per capita is in the shape of an inverted-U (Bozkurt & Akan, 2014). (Bozkurt & Akan, 2014) studies economic growth, carbon dioxide emission, and their relation to energy consumption in Turkey. They look at this relationship, between 1960 and 2010 and use annual data of Gross Domestic Product (GDP), Carbon Dioxide (CO_2), and Energy Consumption (EC). Their results show that economic growth is affected negatively by CO_2 whereas positively by EC. (Pata, 2018) investigates the relationship between CO_2 emissions, economic growth, financial development, trade openness, industrialization, urbanization, coal, and non-carbohydrate energy consumption using the EKC for the period between 1971 and 2014 for Turkey. He differentiates his study from the EKC by separating trade openness into import and export, and final energy consumption into carbon and non-carbohydrate energy consumption. His results show that economic growth, coal consumption, industrialization, and urbanization increase CO_2, whereas export and non-carbohydrate energy consumption decrease CO_2 in the long run. His study also suggests that there is an inverted U shaped relationship between GDP per capita and CO_2 emission, as suggested in EKC theory, but the turning point was at an income of $14,360 and found to be outside of the sample period. (Özkan & Özkan, 2012) look at the industrial production, namely

at cement, steel, and electricity production, and that of petroleum products in Turkey, which are responsible for most of the environmental degradation caused by carbon dioxide emission. They investigate CO_2 emissions in Turkey using VAR testing for the period of 1990-2010. According to their empirical study results, bidirectional Granger causality omits the connection between CO_2 emissions and the production of cement and electricity. The results also suggest that cement production in Turkey causes a huge burden because it accounts for 8% of the national carbon dioxide emissions. They suggest in their study that alternative energy sources or implementation of a move to lower carbon emission with existing procedures should be investigated. (Bulut & Muratoglu, 2018) investigate whether increasing the usage of renewable energy sources enhances the Gross Domestic Product (GDP) in Turkey or not. They use data that cover the years between 1990 and 2015. They diversify their study by including democracy in their model. They use the Cobb-Douglas production function. Their study shows that the democracy index affects GDP positively. Also, their ARDL approach shows that GDP is positively associated with technology, labor, capital, and fossil energy consumption but is not associated with renewable energy consumption. On the other hand, the DOLS estimator finds out that GDP is positively associated with technology, labor, fossil energy consumption, and capital but is not associated with the democracy index or renewable energy consumption. Their findings also show that as the income of individuals within society increases, so do their democratic demands. Besides, according to their causality tests, neither fossil fuel nor renewable energy Granger cause GDP.

2.2 ENERGY DEPENDENCY, SECURITY AND TRADE DEFICIT

Turkey's energy demand has been increasing over the last few decades, and its energy dependency as a result. This energy dependency and excessive energy importation has an important effect on the trade deficit. Energy is essential for sustainable economic development. (Bölük & Koç, 2011) search for the reason for the rapid increase in energy consumption in Turkey, and they find that the young population, high population growth, and rapid urbanization are the main drivers. They underline the fact that increasing energy consumption not only affects the environment negatively, but because of the high import rates in terms of energy needs, it also poses an important burden on the Turkish economy. According to this study, the most dependent energies are natural gas, oil, and hard coal.

Energy-related carbon dioxide emissions have increased over the years. Turkey has high growth potential in energy demand as an outcome of its economic and social improvements. Foreign trade balance and greenhouse gas emissions are negatively affected by the increasing energy consumption, accompanied by insufficient primary energy sources and, as a consequence, affect energy security badly. According to (Bölük, 2013) Turkey can only generate 28% of its energy needs. As much as 85% of greenhouse gas emissions come from the energy sector. Renewable energy sources, namely, hydro, wind, and biomass, have started to become challenging alternatives to fossil fuels over the past few years. Although there is huge growth potential, renewable energy sources provide only 6.3 % of the primary energy supply. Compared to European countries, Turkey has the highest potential in hydro and wind energy, but only a fraction of this potential is used, unlike those European countries. The application of renewable energy also helps the employment sectors and is expected to create direct jobs in the energy sector of between 275,000 to 545,000. Besides (Bölük, 2013) shows the predictive employment in the renewable energy sector in 2011 for selective countries and job creation probability from renewable energy improvement for Turkey under different policy applications for the period between 2013 and 2023.

2.3 SUSTAINABLE DEVELOPMENT AND RENEWABLE ENERGY

According to the International Institute for Sustainable Development, the definition of sustainable development is: 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (IISD, 2020). As the world's population increases rapidly and with the existence of on-going development of industrialization and technology, concerns about the use of energy sources have increased, and finding alternative plans has become a necessity. Globally, an increasing population, economic growth, urbanization, and technological developments have been increasing the energy needs of countries (Nurgül Topallı 2014). The desirability of renewable energy has increased because renewables have the possibility to decrease the dependency on energy imports (Valentin 2011). Because of changes in global economic vision and Turkey's rapidly increasing energy imports, the relationship between sustainable development and energy consumption has been studied extensively.

(Demirtaş, 2013) states that energy planning is crucial for sustainable development. Renewable energy can play a crucial role in energy dependency and other related environmental problems. Finding the best alternative renewable energy can be a key to having a successful renewable energy plan, and in his study the best option is found by the AHP (Analytic Hierarchy Process) method, which is a multi-criteria selection method. The evaluation criteria for energy issues cover technical, economic, environmental, and social concerns. For the evaluation process, ten managers from the energy sector were interviewed. The AHP method was performed according to the measurement scale that was explained in detail in the study between factors of 1 and 8. The results show that wind energy is the best option compared to the other alternatives like biomass, solar, hydropower, and geothermal. (Şimşek & Şimşek, 2013) aim to analyze the availability and future of renewable energy sources in Turkey and examine the government action plans and economic circumstances. In order to have sustainable development and prevent environmental pollution, it should improve its energy situation by using its renewable energy potential more effectively. They explain incentive mechanism and renewable energy applications in the world and show which countries use their potential effectively and what incentive mechanisms drive them. They analyze the incentive mechanism regarding renewable energy in Turkey and recommend law changes accordingly. Experiences from different countries show that countries that set their incentives higher than costs achieve their renewable energy goals earlier than others. Turkey's energy demand increases over the years, and unfortunately, Turkey fails to have a stable plan to deal with its increasing energy demand.

Due to Turkey's heavy dependence on energy supply from foreign countries, energy efficiency is an important subject. There have been policies formulated to deal with the energy efficiency problem; additional incentives must be followed to deal with the issue in the long run. (Duzgun & Komurgoz, 2014) study one of the market-based incentive mechanisms for electricity and natural gas generation called the White Certificate System (WhC) and its applicability to Turkey. White certificates are the result of the energy efficiency evaluation issued by the independent sector to confirm the claim of energy savings by market participants. Lack of information, legal challenges, financial obstacles,

loss, and illegal consumption are the main impediments to energy efficiency. (Yuksel, 2010) looks at Turkey's current energy state and future availabilities and targets for renewable energies. He explains the production and consumption of energy. Coal and lignite energy that the country possesses are of low quality, and it is not acceptable for sustainable development since it causes most of the air pollution and is not efficient. Natural gas consumption has been increasing over the years and increases dependency and consumption of fossil fuels , but the one sector that needs to be focused on is the electricity sector since it holds 13.4% overall consumption and grows 8.5% annually. He also points out that solar, geothermal, and hydropower consumption increased, but this is not sufficient enough to increase renewable energy's share of total primary energy consumption. He explains the two different views on energy policies, named those of Greens and Developmentalists. Greens believe that a strong regulatory system and strong institutions need to be active and take action on environmental concerns. Developmentalists, on the other hand, believe that the government should intervene at the minimum level. He points out the observation made by the Ministry of Energy and Natural Resources (MENR) in the research, which is the arguable energy loss during the transmission and distribution of energy. A total of 20% of energy is lost during the distribution process, which is not acceptable. He proves that when bracketed with energy efficiency aims, renewable energies can meet a notable portion of future energy need. Therefore, renewable energy sources and their utilization are closely linked to sustainable development.

(Küçükali & Barış, 2011) investigate the availability and potential of renewable energy sources in Turkey and discuss government policies and economic aspects. They find that although Turkey has a high potential in hydro and wind power, it has not been able to use that potential effectively like Germany, Spain, and Austria. The main reason for that is government policies and incentives. They evaluate a strong relationship between government policies and the utilization of renewable energy sources. They list policies and law implementations and underline the differences between European countries. The contradictions within EU legislation are listed as well. (Erdil & Erbıyık, 2015) use SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis to determine the most favorable energy among solar, biomass, geothermal, wind, and hydropower. These are

the major common renewable energy sources in Turkey. These sources can be used in electricity generation and for heating. They conducted a survey for this research to evaluate the major renewable energy sources of Turkey. They get the views of 120 experts presented in the literature review and ask them to evaluate this review by SWOT Analysis and collect 40 surveys back and evaluate them. Their findings show that Turkey puts more importance on its energy needs compared to environmental concerns. (Kok & Benli, 2017) study the effects and potential of nuclear energy as a renewable energy source and its effect on Turkey's economic growth. Their study depicts the intensive use of fossil fuels in the heating and transportation sector in Turkey, Turkey's dependence on imports for these energy needs, and finally, problems relating to these issues. The renewable energy potential of Turkey, especially nuclear energy, can benefit from dealing with the dependency issue. (Erdogdu, 2008) explains the current, potential, and future of bioenergy in Turkey. He points out that renewables are the second major energy source of Turkey, and bioenergy holds an important place among the renewable energy potential of Turkey since it is a country that still has a huge agricultural sector. He explains which areas bioenergy can be used in or is currently using. It is important to perceive that bioenergy is mainly used by households in rural areas of Turkey for heating, cooking, and cleaning purposes. The main bioenergy sources in Turkey are wood, and animal wastes usually used as fertilizers; therefore they do not have much potential to find its position in producing energy. Besides, because the legislation is not made specifically for bioenergy, and there are not many waste power plants established; therefore, it is mostly self-produced and used by agriculturalists. Nevertheless, increasing the use of bioenergy can be beneficial for the environment and also helps to reduce fossil fuel dependency. (Ilkilic , et al., 2011) explains the importance of renewable energy's role in the Turkish energy sector, and they focus their study on wind energy. They investigate the current situation, potential, application, incentives, and legal changes. They highlight the importance of using wind energy because of its environmentally friendly nature and Turkey's increasing energy dependence. They explain the importance of using wind energy as an electricity-producing source regarding the climate change problem. They show wind energy's status in the world and its historical background. Furthermore, they explain the potential of wind energy in Turkey. Turkey has one of the uttermost potentials of wind energy between European countries. They list the sites that have the highest

potential in wind energy and the Marmara Sea region, the Aegean Sea Coast, inland Anatolia, and the Mediterranean Coast have the highest potentials. They mention legal changes to encourage the use of wind energy. Finally, the potential of Turkey is once again pointed out, and with successful usage, Turkey can become one of the largest producers of wind energy in the world. (Rincon , et al., 2019) examine the energy target of Turkey for 2023 that predicts the share of renewable energies in electricity generation will be 30%, and bioenergy's contribution to this renewable energy will increase. Turkey is the 7th largest agricultural producer in the world; therefore, they examine in this paper whether this agricultural residue plays an important role in increasing the share of biomass in renewable energy production. Biomass, is usually used as a source of heat or used for cooking; they investigate the potential of biomass energy from crops and breeding in different regions. They try to find out which supply-chain is more suitable for each province and whether this biomass potential can be used for covering the biomass part of the renewable electricity target.

2.4 ENERGY POLICY IN TURKEY

Energy policy is defined as the legislation subject to energy sources, energy prices, energy efficiency, the effects on climate and environment of energy production, utilization, and transportation. A simpler explanation of energy policy can be the government's actions regarding the supply and demand of energy. The main challenge in energy policy is the interchange between clean, safe, and well-priced energy. Energy policy is an intersectoral issue that includes concerns about climate, environment, economy, development, agriculture, public health, and international relations. This general characteristic of energy policy affects how it is proposed, adopted, implemented, and evaluated (Tosun, 2017). The importance of climate change and its environmental consequences has gained more and more attention in recent years, so that exploring opportunities and potentials is as important as evaluating the current situation and policies regarding the issues. (Acar & Yeldan, 2016) try to find out how the current policy deals with these challenges, and they try to investigate this issue by looking at coal subsidies. Their results show that the elimination of these subsidies leads to a remarkable decrease in carbon dioxide emissions, while causing a negligible reduction in GDP. They also underline that these coal subsidies contradict with Turkey's renewable energy plans and expectations, since these subsidies

eliminate the competitiveness of renewable energies and leave Turkey with a continuation of the fossil-fuel-based system and jeopardize investment decisions of renewable energy investors. Their study makes an inference that the elimination of coal subsidies can decrease carbon dioxide emissions, decrease the fiscal burden, and can lead to green energy and green jobs. (Şimşek & Şimşek, 2013) explore the potential of renewable energies in Turkey and energy policies' role in encouraging the use of them. The government can use its tools to encourage or affect the use of renewable energies: quotas, tax cuts, tax exemptions, feed-in tariffs, investment incentives, green certificates, and tender incentives. They present a table that shows the list of these incentives and the countries which use these tools. They also explain the binding agreements between nations. The effectiveness of the European regions' energy binding contracts and energy policies of European countries are evaluated as critical examples. The incentive mechanism of the European countries and its examination results lead to the conclusion that incentives higher than costs assist countries in attaining the objectives of implementation of renewable energy sooner than expected. They explain the incentive mechanism and policy changes in most influencer countries. The key to successful energy policy in Turkey is strong cooperation among consumers, the government and the private sector. They indicate state and non-state organizations which are responsible for energy policies and discuss their roles. The private sector's entrance into the Turkish electricity market was in 1982. Since then a number of legislations have been made to identify the role of the private sector in the energy production process. The first law that presented the role of renewable energy sources in electricity production in Turkey was the Electricity Market Law No. 4628, passed in 2001; following this, they explain all of the legal changes regarding energy production and targets in detail. They visualize the incentives that concern renewable energy in Turkey in a table with a clear presentation, which is helpful to understand and follow the changes. They conclude their study by noting the multi-dimensional importance of having a solid energy policy for Turkey and the necessary conditions for developing a successful plan. (Baris & Kucukali, 2012) explain the present situation and potential of renewable energy and also the government's role regarding the legislations process and environmental consequences of renewable energy studies. They accentuate the impressive potential of Turkey in renewable energy production, but its lack of usage due to unsuccessful government plans. They contrast this

lack of implementation of renewable energies with the challenging and questionable encouragement of coal in electricity production in the 8th and 9th Development Plans. Hydropower, solar energy, biomass, and wind energy and their potentials are explained individually. They emphasize the conflict between Turkish and European hydropower policy and its severity, and the importance of preserving the environmental precedence. Up until this study, the usage of the geothermal potential was 13%, but there are plans to increase its production level. (Erdogdu, 2008) states that Turkey has the highest energy production potential in renewable energy sources following coal. Production process and necessary conditions are explained, but in the conclusion part, he also suggests some guidelines for policies. The economic, environmental, and social consequences must be looked at when making policy decisions. The environmental consequences of the energy production process were ignored by many countries in the past, however the climate change problem nowadays forces countries to take into account the environmental consequences of their actions.

Overall, the literature has been successful in explaining the current situation, problems and the potential growth in renewable energy as a solution to decrease dependence, but the studies lack solid ground about future predictions and fail to show the comparison of how much the policies that have been made so far meet the expected results. We can see from the previous studies that economic growth and energy consumption increased together, and by not compensating for increasing energy needs, dependency on imports has also increased. Therefore, the obvious solution of increasing renewable energy's share in energy production is mentioned in almost every study and is present in the list of necessary legal changes. But whether solid changes have been made or there is much impact of renewables is still unknown. It is crucial to put together the literature with the actual descriptive data, therefore, and Chapter 3 provides these data.

CHAPTER 3: EMPIRICAL TRENDS

In the last couple of decades, the Turkish economy has seen rapid growth and also a shift from agriculture to industry as a developing country, and this transformation has shifted its energy demand upward. Turkish energy demand has been increasing continuously, whereas the effective policies about renewable energy sources or the enhancement of the energy sources that a country has to meet the demand has been lacking. As a consequence, Turkey has no choice but to import its energy needs and increase its dependency.

Because Turkey has limited natural gas and petroleum energy sources of its own, its energy needs have been met by imports, which has increased the dependency of Turkey. Because of the dependency issue and a rising awareness about environmental problems, Turkey has been encouraged to implement policies to solve this issue more intensively since the 2000s.

It was explained in previous chapters that Turkey has a huge dependence on energy needs and has had increasing carbon dioxide emissions over the years. In this chapter, the empirical trends of the energy-related matters will be shown and the importance of the situation will be demonstrated more visually and tangibly.

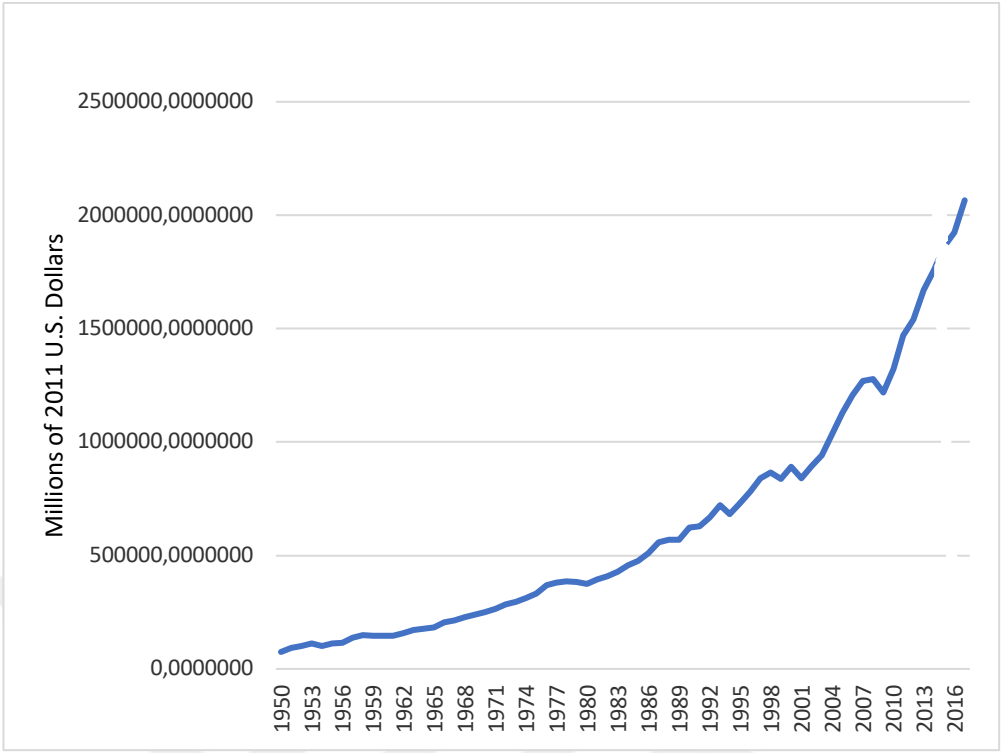

Figure 3.1 Real GDP at Constant National Prices for Turkey 1950-2017
Source: Federal Reserve Bank, Economic Research Division

Figure 3.1 shows the increasing trend of real GDP in terms of constant 2011prices for Turkey between 1950 and 2017. GDP has been increasing rapidly only with the exception of the respective years of economic crisis, such as 2001 and 2009. In Figure 3.2 below, we can see the GDP change between 2009 and 2018 in terms of Turkish lira.

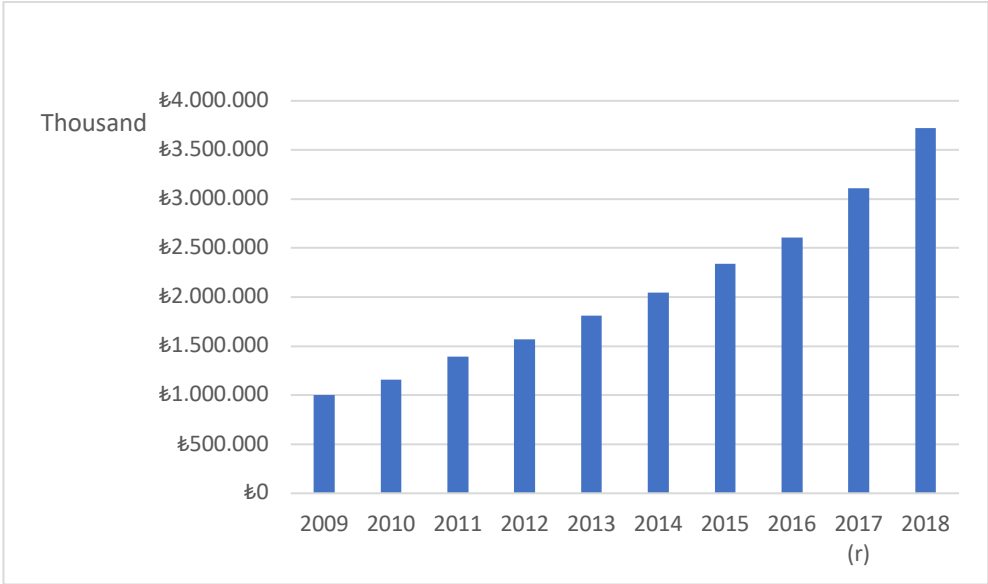

Figure 3.2 Turkey's GDP (₺)

Source: TurkStat, Quarterly Gross Domestic Product, Quarter III: July-September, 2019

In Figure 3.3, we can see Turkey's GDP per capita from 1970 until 2018. It is clear that, like GDP, GDP per capita in Turkey increased except for the respective crisis years.

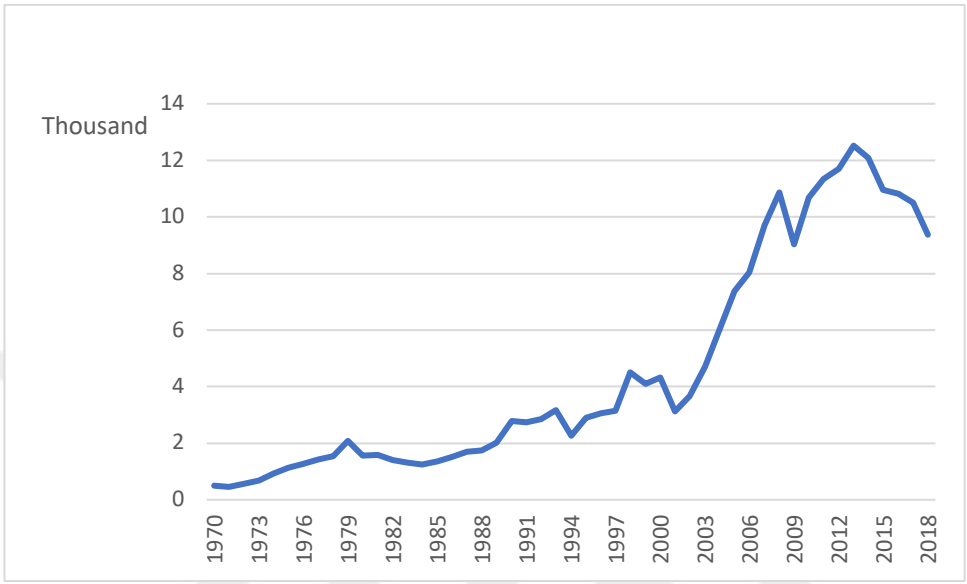

Figure 3.3 Turkey's GDP per capita (current US$)
Source: World Bank National Accounts Data, OECD National Accounts data files

A similar trend can be seen in the graph below that shows the changes in energy usage in Turkey for the years between 1969 and 2015 as well. Energy use also slightly decreased during crises but overall increased over time. We can see visually in Figure 3.4 that Turkey's energy use has gradually increased.

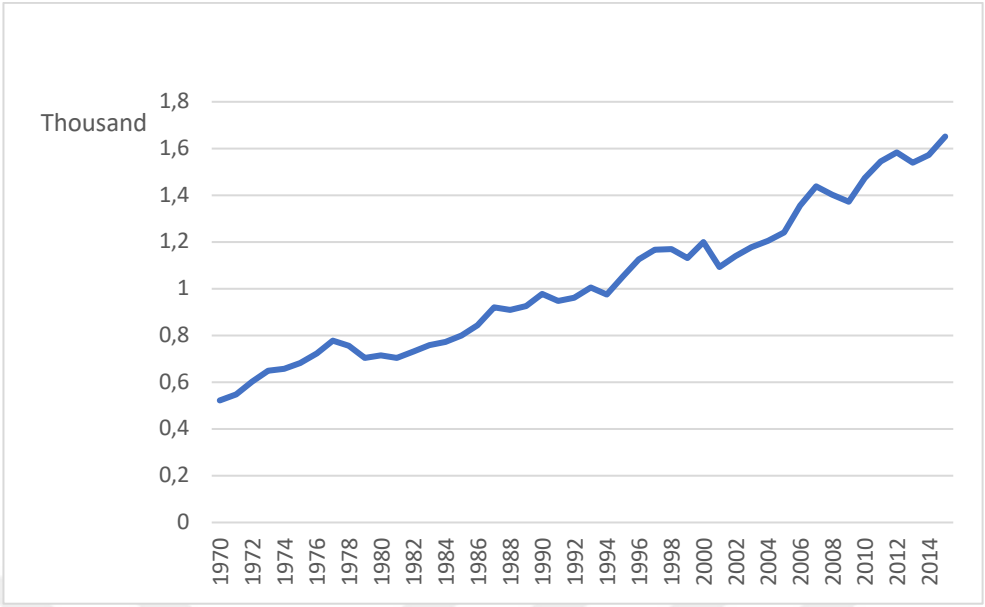

Figure 3.4 Turkey's Energy Use (kg of oil equivalent per capita)
Source: International Energy Agency (http://www.iea.org/stats/index.asp)

In Figure 3.5, energy efficiency has been shown. It is calculated by dividing energy use by gross domestic product. It is clear that energy efficiency has gradually increased.

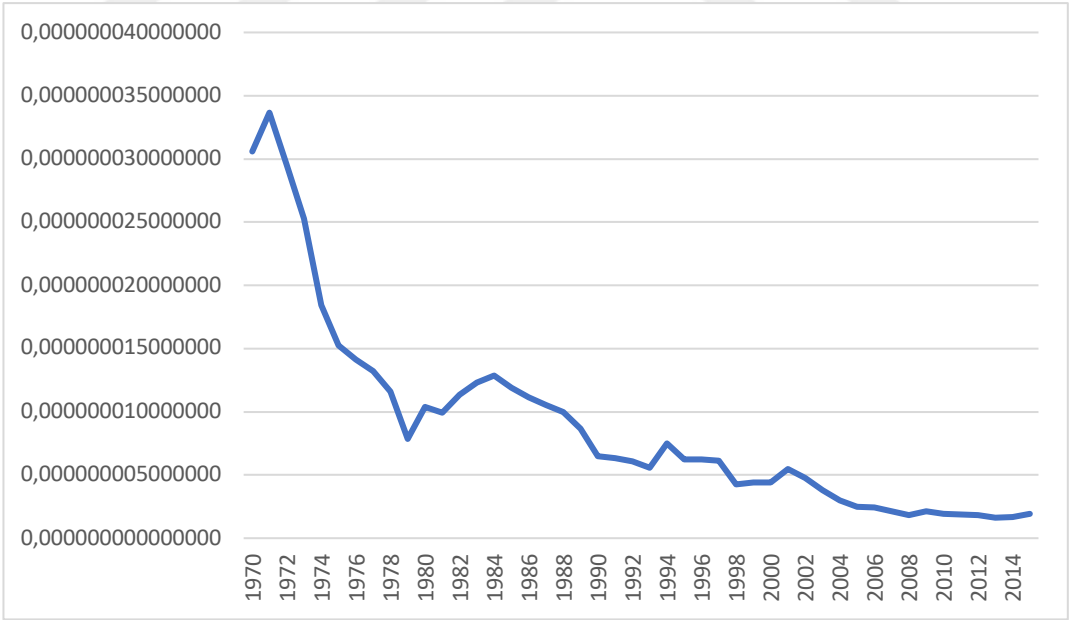

Figure 3.5 Energy Efficiency (Energy Use/GDP)

Because Turkey is not abundant in fossil fuels, this increasing energy demand has been supplied through energy imports. Turkey imports almost 80 % of its energy needs, which has been a major issue in recent years regarding energy dependency and security. We can see this trend in Figure 3.6 below. It can be seen that Turkey's net energy import has

almost reached 80%. This high percentage makes the country vulnerable. Also, because of the price volatility of imported energy resources, policies, or future plans regarding energy can be easily interrupted.

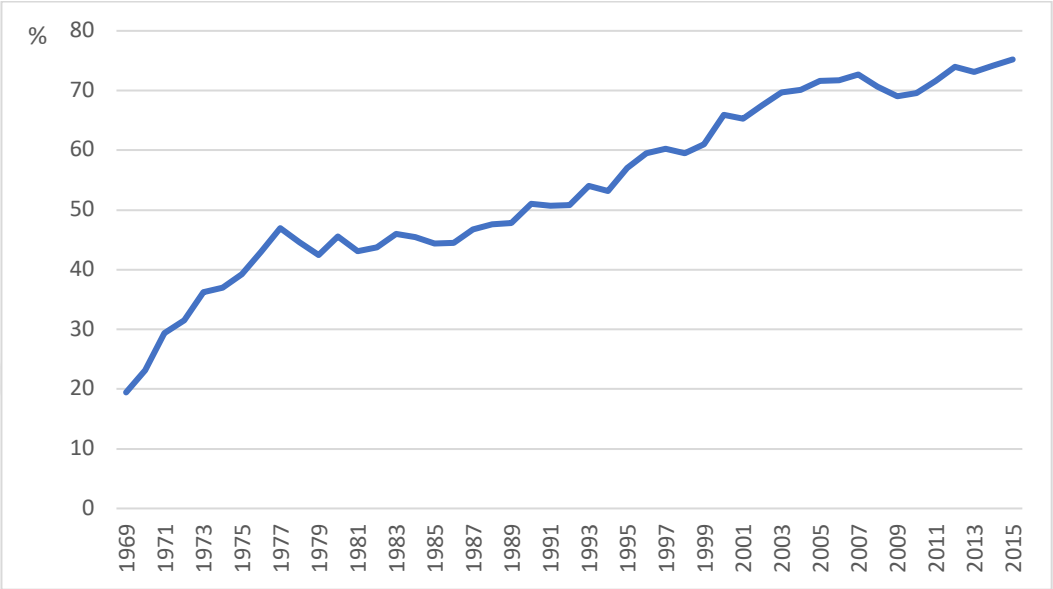

Figure 3.6 Turkey's Energy Imports, Net (% of energy use)
Source: World Bank IEA Statistics, 2014

Shown in Figure 3.7 below is the total primary energy supply of Turkey by source. This is also an important statement because designating which energy type is used more can be helpful for making future energy plans, gives insight and is helpful to choose an energy source to focus on. It can be seen that oil, coal, and natural gas are used most, followed by nuclear and biofuels and waste.

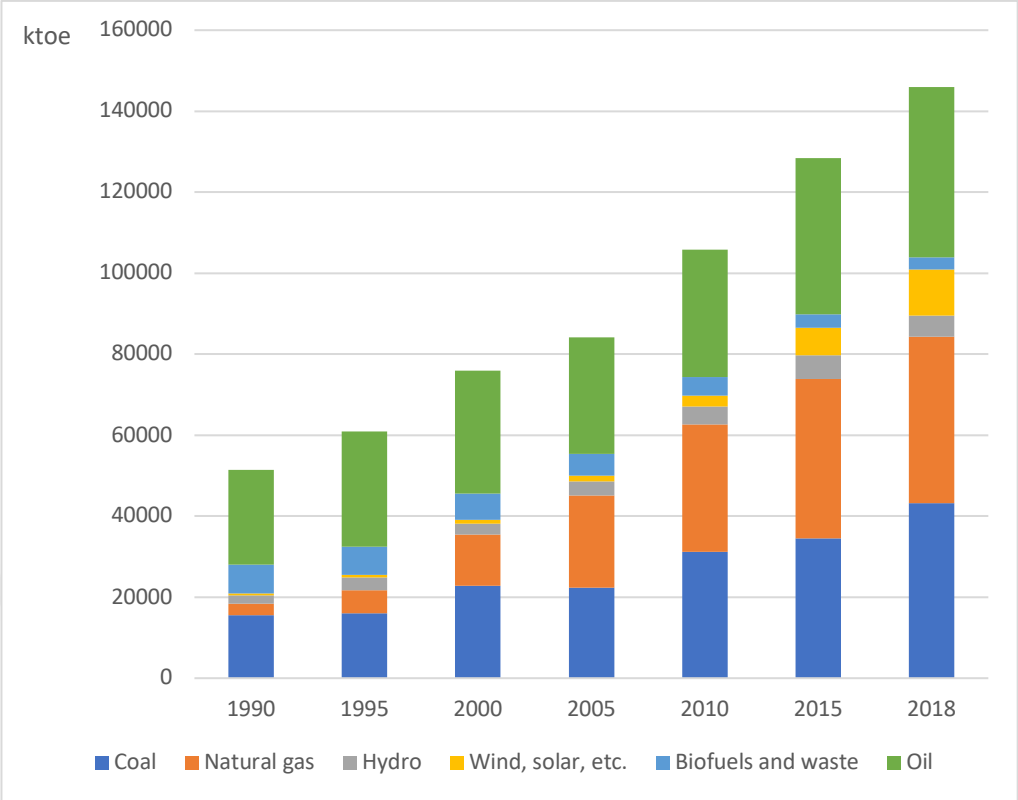

Figure 3.7 Total Primary Energy Supply (TPES) by source, Turkey 1990-2018
Source: International Energy Agency, World Energy Balances and Statistics, 2019

Because of this environmental concern and the effect of increasing carbon dioxide emissions on climate change and raising awareness, countries have been forced to find alternative energy sources and renewable energy sources have gained importance. Turkey has tried to follow this trend and made strategic energy plans to increase its renewable energy use, but has not been able to draw up a stable plan, so renewable energy use has fluctuated over time, as we can see in Figure 3.8 below.

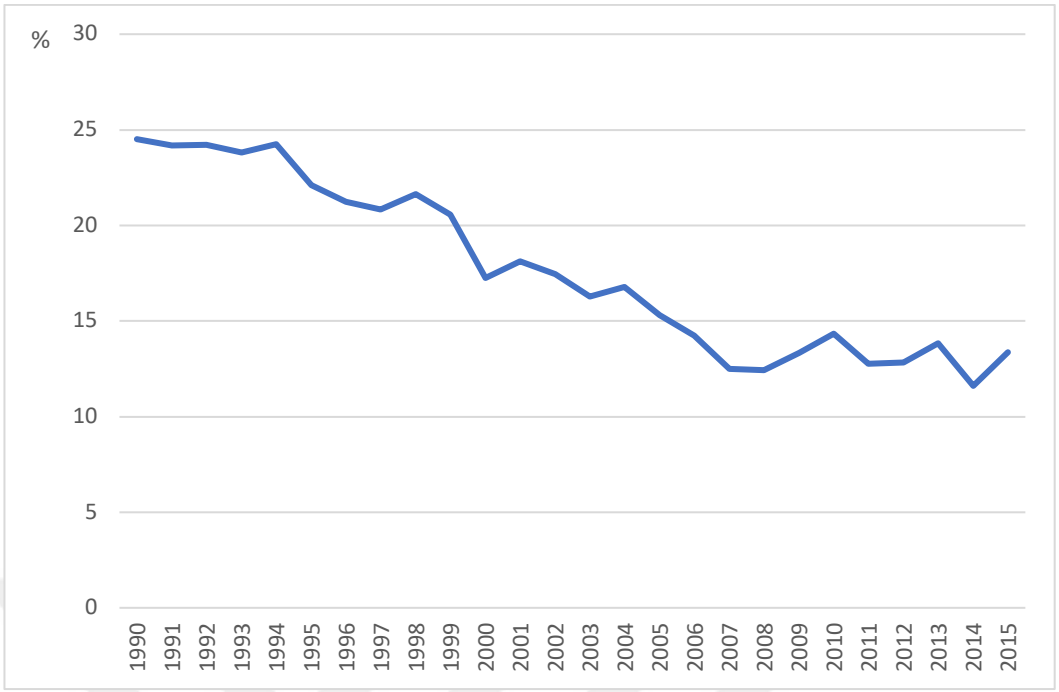

Figure 3.8 Turkey's Renewable Energy Consumption (% of total final energy consumption) Source: World Bank, Sustainable Energy for All Database from SE4ALL Global Tracking Framework led jointly by World Bank, International Energy Agency, and the Energy Sector Management Assistant Program

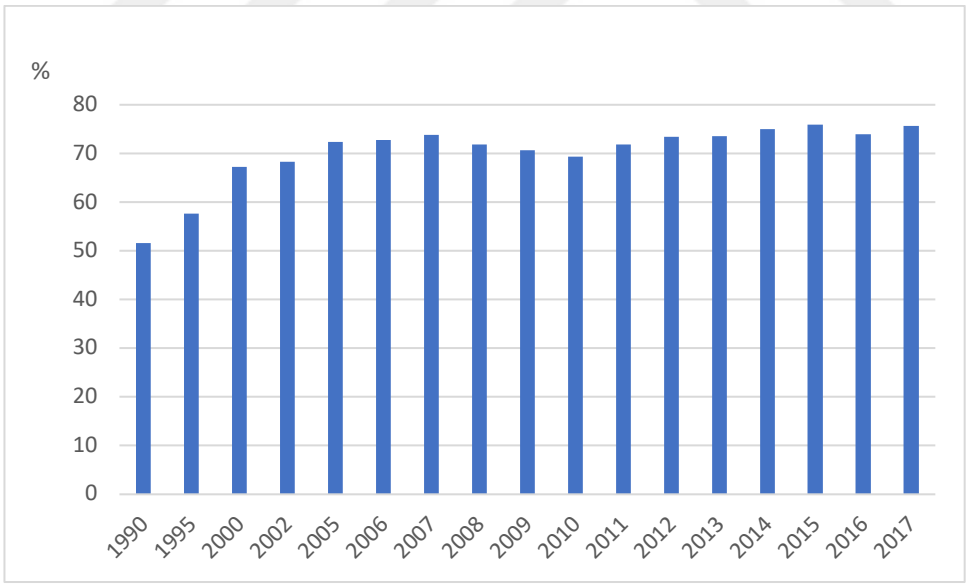

Figure 3.9 Increasing in Foreign Dependency in Primary Energy Consumption in Turkey, 1990-2017

Source: Republic of Turkey Ministry of Energy and Natural Resources and Union of Chambers of Turkish Engineers and Architects Presentation Reports 2019

Figure 3.9 above shows the increasing dependence on primary energy consumption of Turkey between 1990 and 2017. It is clear that Turkey's import dependence on energy is between 65 and 80 percent over the last few decades.

Because electricity consumption holds an important position in primary energy consumption, its demand has been rapidly growing since the 2000s and is expected to grow more in the coming years. The designation of electricity production is a critical point. Regardless of energy consumption reduction or the sustainability issue, it is vital to understand energy production and consumption (Yuksel, 2010). Figure 3.10 below shows the changes in the quantities of sources of electricity generation between 2000 and 2018. It can be seen that natural gas, lignite, and imported coal are the main resources for electricity generation. As a renewable energy source, hydropower, wind, and geothermal energy also hold a significant place, but they still have improvement opportunities.

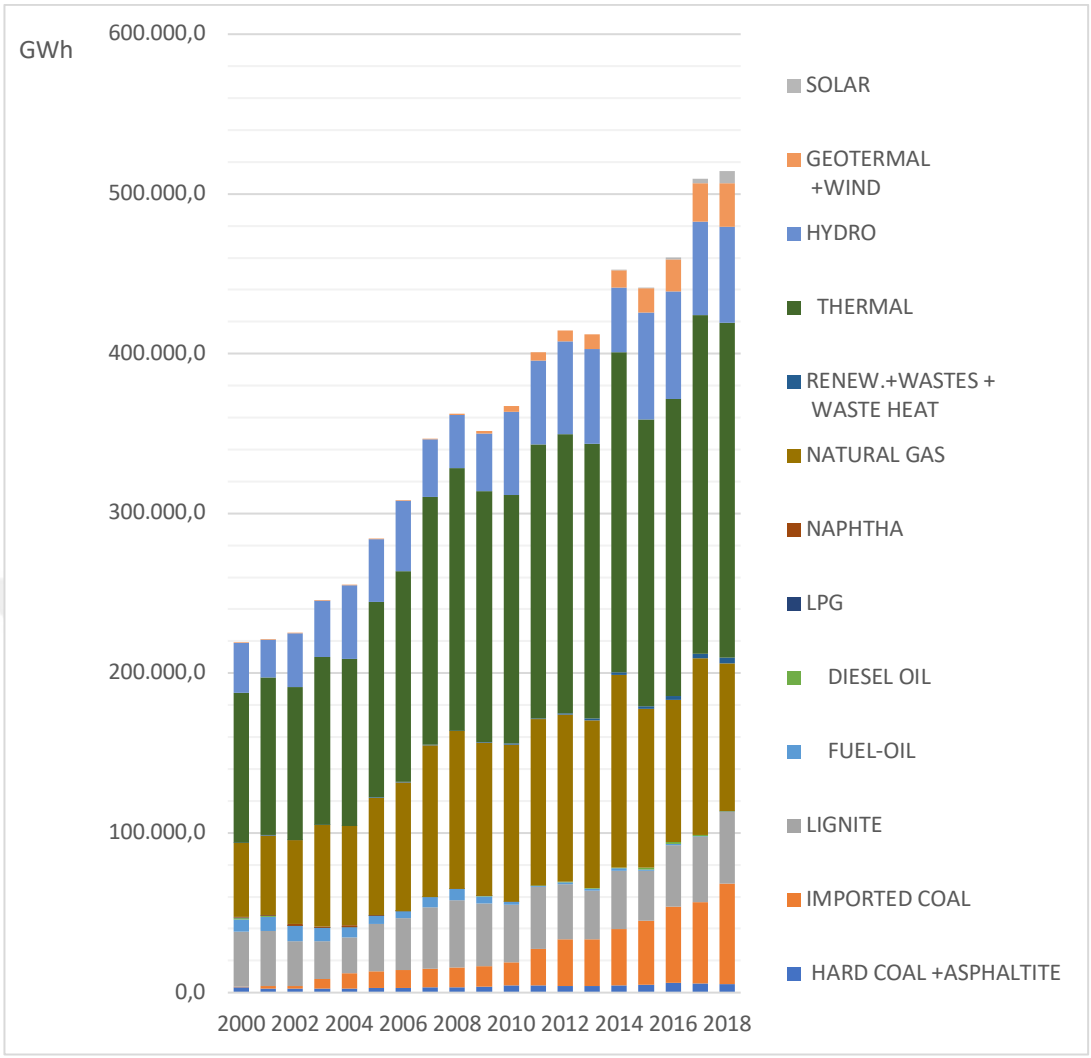

Figure 3.10 Turkey's Electricity Generation by Source 2000-2018
Source: TEIAS

Continuing with the electricity sector, for example, it can be seen that most of the electricity generation comes from coal, natural gas and hydro. Figure 3.11 below shows the sectoral distribution of electricity consumption. It is clear that most of the electricity is consumed by the industry sector. Energy is an important economic factor, and the largest consumer is the industrial sector (Biresselioglu, et al., 2017).

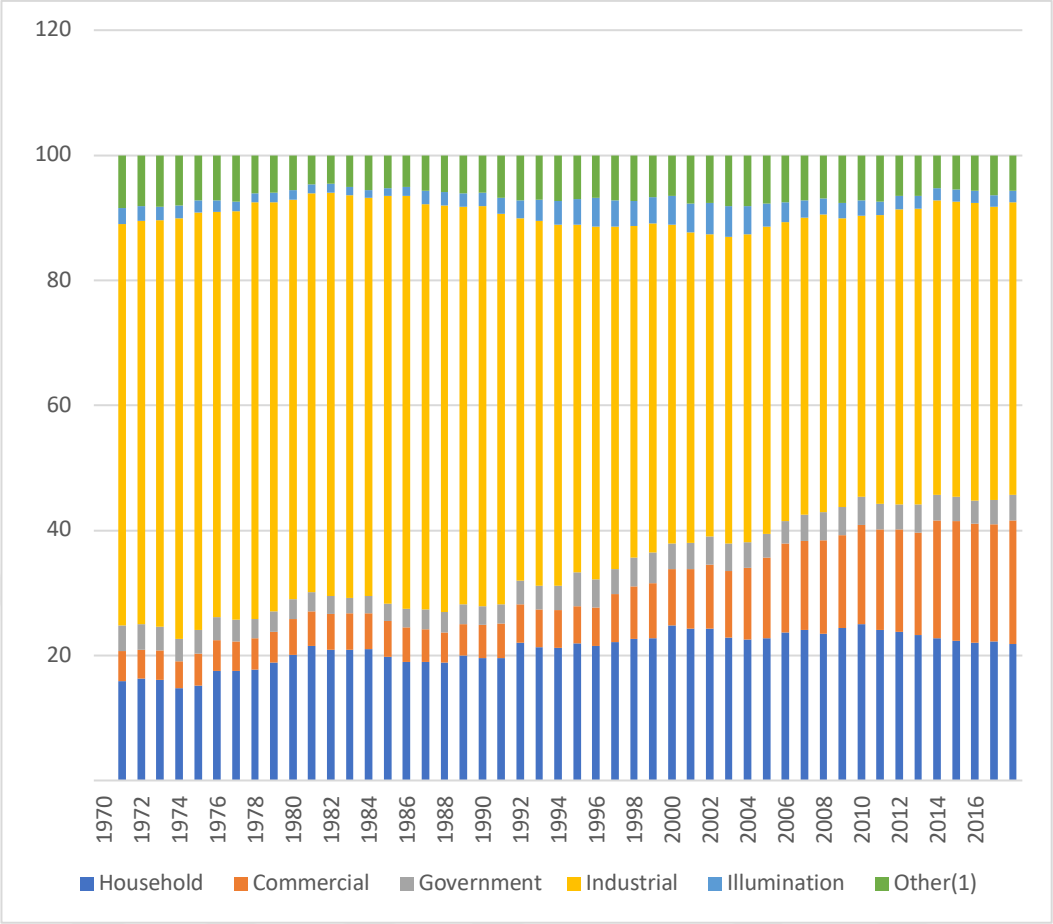

Figure 3.11 Sectoral Distribution of Electricity Consumption, 1970-2018
Source: TEDC, Electricity Distribution and Consumption Statistics of Turkey

As energy consumption increases, so do carbon dioxide emissions, since most of the used energy comes from fossil fuels. Carbon dioxide is the most prevalent greenhouse gas that is caused by human activities. Therefore, it is usually referred to as a representative of all the greenhouse gases. So, this increasing energy consumption trend has caused not only a dependency problem but also an environmental problem too, as can be seen in Figure 3.12 below. Increasing carbon dioxide has been a significant problem for many countries in recent years, and not exceptionally, and Turkey is one of those countries. This situation needs to be taken control of since the predictions about the future of the earth are severely detrimental if things continue in the same way. Figure 3.13 shows the changes in carbon dioxide emission between the years 1969 and 2013.

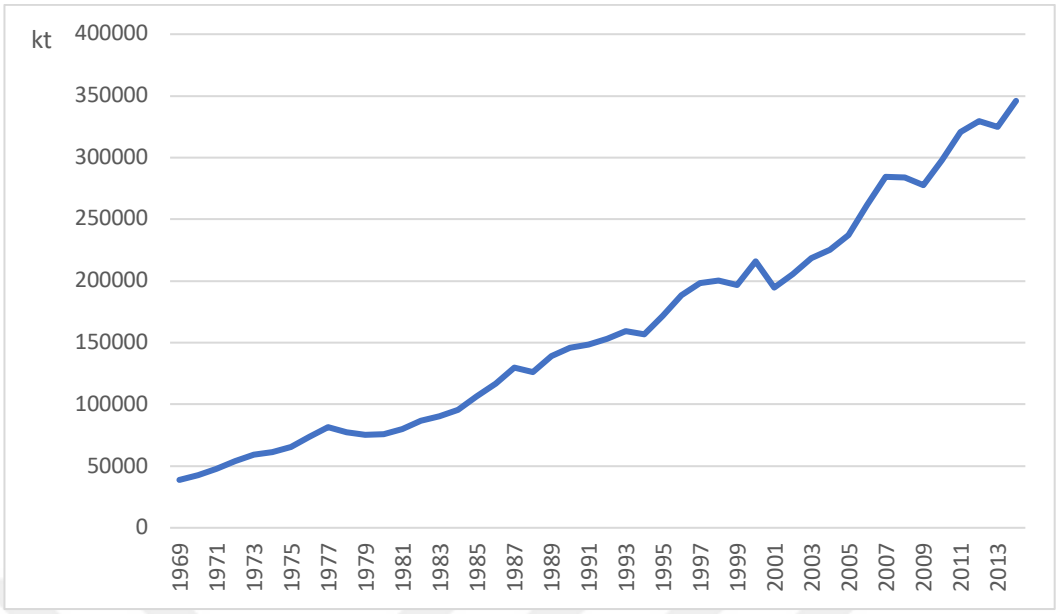

Figure 3.12 Turkey's CO2 Emissions (kt)
Source: World Bank, Carbon Dioxide Information Analysis Center, Environmental Sciences Division

It is also essential to look at greenhouse gas emission to see the whole picture and not disregard the contribution of any of the gases that contributed to the climate change problem. Greenhouse gas emission of Turkey can be seen in Figure 3.13 below.

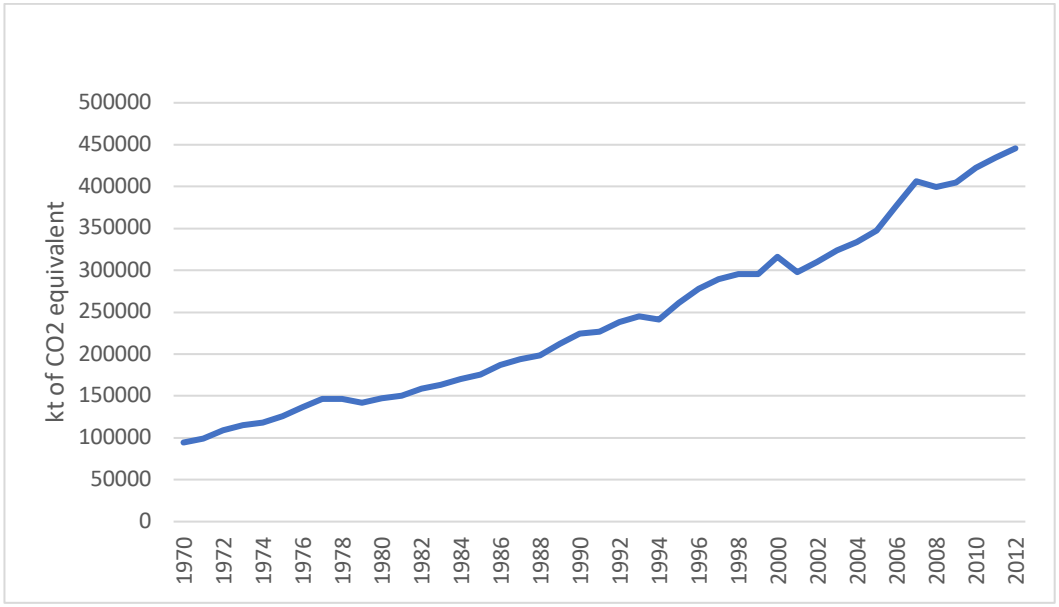

Figure 3.13 Turkey's Greenhouse Gas Emission
Source: World Bank, Emission Database for Global Atmospheric Research

Figure 3.14 shows the import partners of Turkey and the changes in their proportion between 2008 and 2018. From Figure 3.14 it can be seen that Russia holds a strong place in Turkey's imports and the major imported product from Russia is natural gas, this huge import putting a burden on Turkey's trade deficit. As of 2019, imports from Russia account for 22.454 million dollars. The total imports of Turkey in the same year were valued at 202 billion dollars.

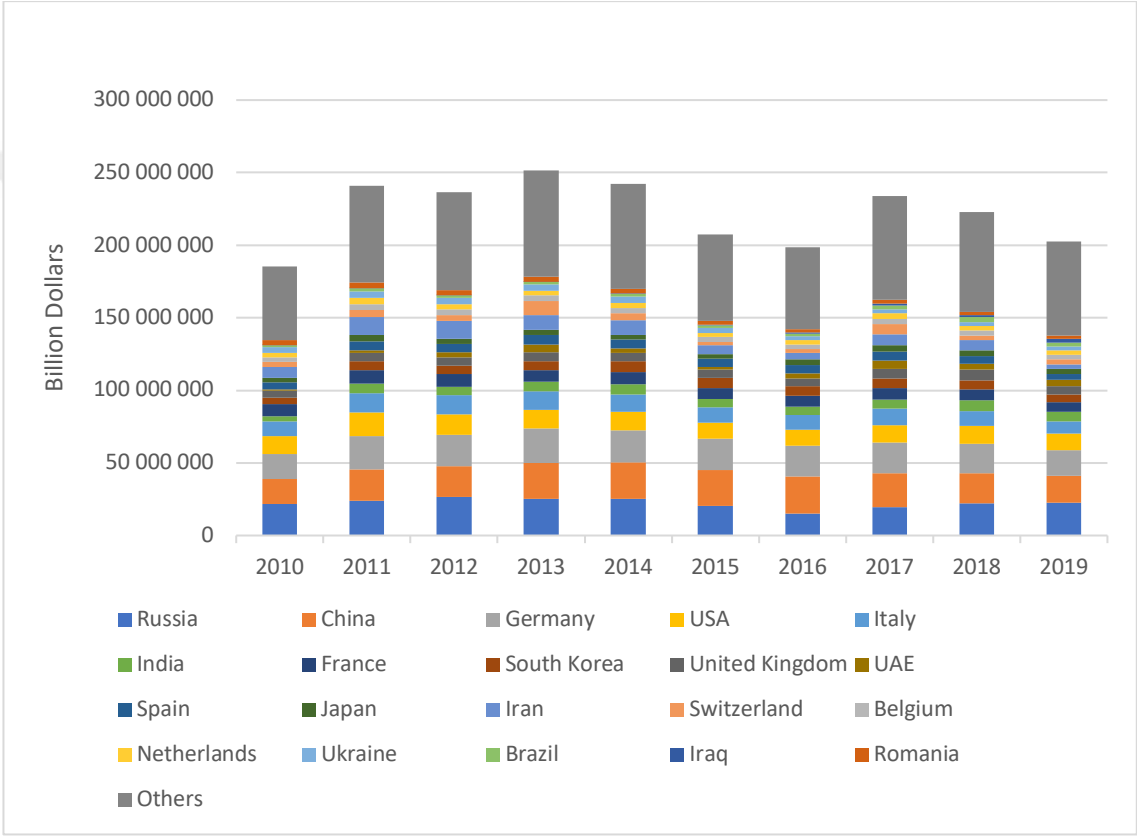

Figure 3.14 Turkey's Import Partners by Country ($000)
Source: Turkish Statistical Institute, http://www.tuik.gov.tr/PreTablo.do?alt_id=1046

Turkey's top 10 import partners in 2019 and their respective share in overall imports can be seen in Table 3.1 below.

Table 3.1 Turkey's Imports by Country, 2019

Country	Percentage of Import
Russia	11%
China	9.9%
Germany	9.8%
United States	5.9%
Italy	4.9%
India	3.6%
United Kingdom	3.6%
France	3.5%
Iran	3.3%
South Korea	3%

Source: https://comtrade.tradingeconomics.com

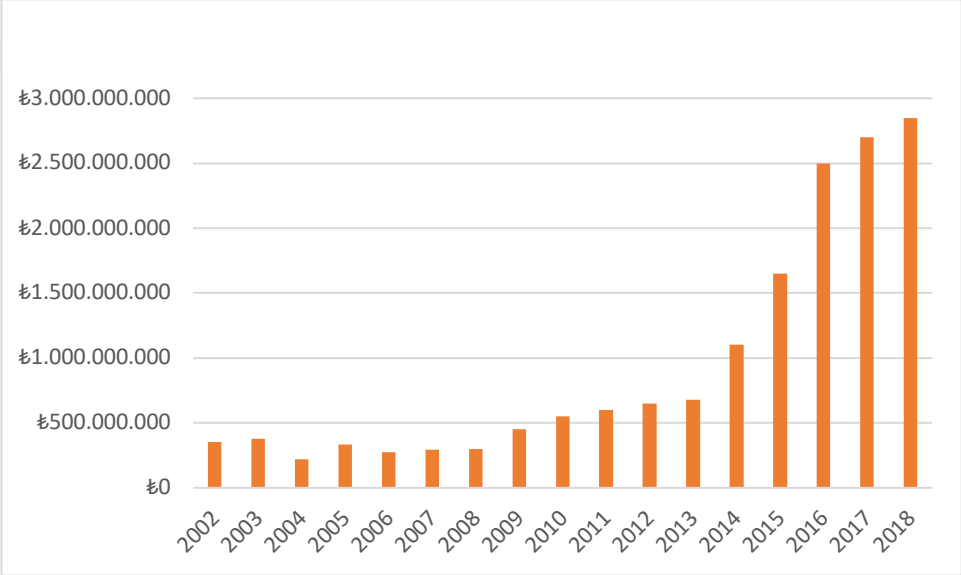

Figure 3.15 Turkey's Investment Programs for TEİAŞ

Source: Turkish Electricity Transmission Company

Figure 3.15 above, shows the investment changes over time for TEİAŞ between 2002 and 2018. It is clear that since 2014, investment in the electricity sector has accelerated.

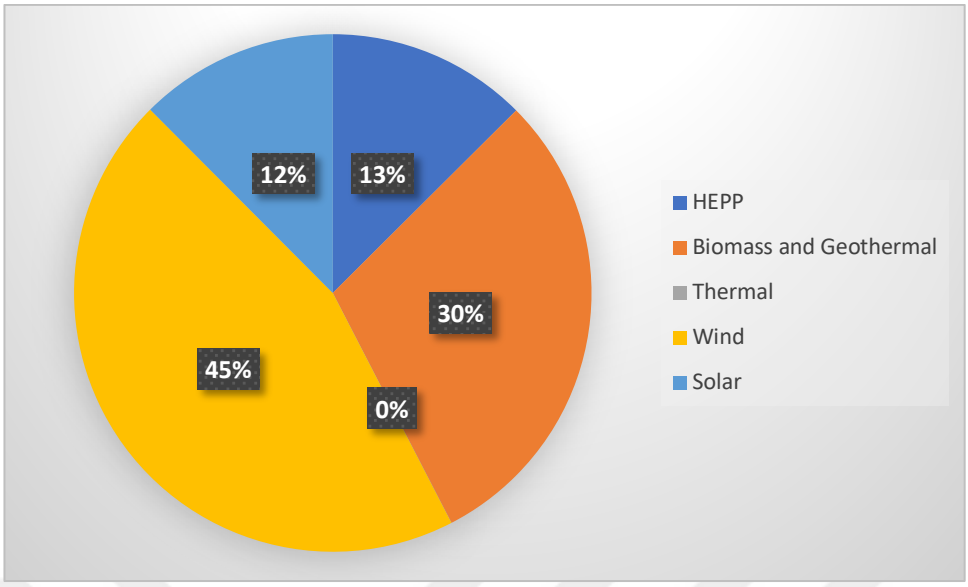

Figure: 3.16 Turkey's Energy Investments in Categories, 2020

Source: Republic of Turkey Ministry of Energy and Natural Resources

Figure 3.16 shows the percentage of energy investment in different energy generation sources in 2020. It is clear that almost half of the investment is in wind energy.

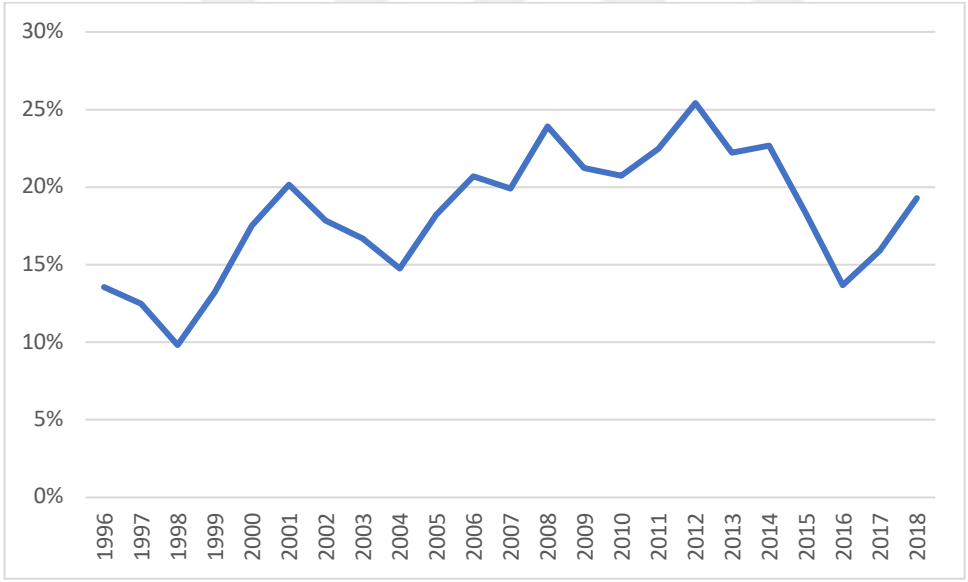

Figure 3.17 Energy Import's Share of Total Imports

Source: TÜİK

In Figure 3.17 above, energy import's share of total imports has been illustrated. It can be seen that energy imports' share of total imports fluctuated between 10 and 25 percent over the years between 1996 and 2018.

CHAPTER 4: POLITICAL ECONOMY OF ENERGY

4.1 GENERAL VIEW ON ENERGY POLICIES AND TURKEY

Energy policy is usually defined as a combination of decisions regarding energy, technology, conduct supply and demand, and future projections made accordingly. Because of global warming and climate change and concerning thoughts about future generations' deprivation necessitates the development of national and international policy to encourage the development and adaptation of renewable energy. Balance in the energy market, hence energy prices are set according to supply and demand. The main energy demand drivers are economic growth, development level, lifestyle, technological developments, and energy prices. The main energy supply drivers are reserves, production, investment costs, political relations between countries, and transformation technologies. Energy supply security is a concept that consists of accessibility, availability, and acceptability. In this context, energy security is defined as providing a sufficient amount of energy at an affordable price. Ensuring production and transportation security are important problems in energy security. These problems occur because of the fact that supply and demand are often located in different geographies. The definition of energy security changes according to the country's situation, whether it is an energy importer or an exporter. As energy supply security is an important issue for a country that produces less energy than it needs, energy demand security is important for countries that produce more energy than they need as well. Besides, energy security is an international problem; this also shows that producers and consumers are mutually dependent on each other (Ediger, 2007).

Energy security has a different importance for different countries, depending on their level of development. It is important to have an uninterrupted energy supply for developed countries, while for a developing country that has a deficit in its balance of payments, it is important to obtain energy at the lowest and fixed prices. The world economy is adversely affected by any interruption in global energy resources. For energy security, countries are obligated to diversify their energy supply portfolio, increase efficiency in their energy consumption, and develop effective energy management strategies. One of the main objectives of the development policies for developing

countries is to take measures to increase energy efficiency. Globalization, the privatization and liberalization process in the energy markets, and the legal and structural changes that ensure this transformation process, create significant uncertainty in the world energy market. This uncertainty forces countries to focus on their local resources and to discover their potential while increasing productivity.

Nowadays, one of the main concerns in the world is global warming caused by greenhouse gas emissions. There has been a consensus on decreasing fossil energy usage, namely natural gas, coal, and oil, for over a decade now. The reasons for that agreement are to cope with the global climate change, adverse environmental effects of fossil fuels, and volatility of energy prices. As a Mediterranean country, Turkey will be severely affected by climate change problems, such as drought, water supply shortage, challenges in the agriculture sector, and heatwaves. Intensive use of fossil fuels causes environmental problems and air pollution. Air pollution affects people's health, and, as a consequence, their productivity. This decrease in their productivity will have an effect on the economy as an end result.

Turkey is dependent on imports for primary energy supply to the tune of almost 80 %. Turkey has negligible fossil-fuel resources; therefore, it is obligated to import energy, mainly oil and natural gas, to meet its domestic energy needs, which in result contributes to greenhouse gas emissions globally, and it causes some issues regarding climate change and energy security (Rincon, et al., 2019). Therefore, to overcome the existing problems, Turkey had to introduce some energy targets, incentives and to make policy changes to address these problems. Turkey's energy goal consists of four main points: self-sufficiency, decreasing energy dependency, increasing local production, and diversifying the energy resources.

Since the 1970s oil crisis, many countries have initiated various programs to develop renewable energy solutions. However, low oil prices have been one of the most important factors in preventing the development of renewable energies. Even so, because of the increase in greenhouse gas emissions, volatility in fossil fuel prices and an increase in the importance of energy security have motivated many countries to intensify their

investments in renewable energy sources (Melikoglu, 2017). As of 2017, renewable energy supplies 19% of the global energy reserve. This renewable energy supply consists of 10% biofuels and waste, 2% wind and solar, 2% hydro, and 5% nuclear. Especially solar, wind, and geothermal, all renewable resources, are considered as energy sources of the future, mainly because they are clean and replenishable. There are some technical, institutional, and economic barriers that limit the widespread use of renewable energies. Among these obstacles, high installation and transmission costs, intermittent production, and storage problems can be named as the major ones. But the one factor that has been preventing countries from investing in renewable energy sources is time discrepancy. The lawmakers of this generation do not think that the effects of climate change will happen in the near future; therefore, focusing on them seems unnecessary and costly.

Turkey is a country that imports more than half of its energy needs. The energy policy of Turkey is influenced by the overall structure of the world's energy sector. A country that imports energy and whose import makes up 19% of its total imports, Turkey needs to follow the price changes of energy in the world closely, since any small change can cause a huge problem in its trade deficit. As a result of its geological situation and its natural structure, Turkey has all kinds of energy sources, but besides lignite, reserves are small, and production is very low. Turkey's primary energy supply consists of 30.49% natural gas, 30.47% oil, 17.28% hard coal, 9.49% lignite, 4.91% geothermal, 3.44% hydraulic, 1.74% biofuel and waste, 1.06 % wind, 0.75% sun and 0.38% asphaltite.

4.2 TURKEY'S ECONOMIC TRANSFORMATION AFTER 1980

During the 1950s, Turkey has experienced some neoliberal political and economic changes. The high increase in the trade deficit caused the economic policy to shift to a protectionist system again at the end of the 1950s. From 1950s to 1970s viewed as a regulated capitalism. In this regulated capitalism, government is in charge of everything. Set of rules set up by government and it is mandatory to obey those rules. During regulated capitalism, in order to keep unemployment low, prevent high inflation, and promote economic growth, government used taxing, monetary policy, and spending. Also government targeted the key sectors of the times such as telephone and railroads. Government also intervened in financial sector, environmental, job safety anti-trust laws

to keep the economic state as wanted. Also there was a relative recession in the economy. Another problem was the decrease in the demand for our exported goods, to be able to control trade balance, government exposed import restrictions. Because of the growing dependency to the foreign markets, government carry out more controlled foreign trade regime. The reason for this kind of view is that free trade regime leads to a continuously and increasingly growing rate of trade deficit. Moreover this causes some problem in paying the foreign aid debts and credits. Moreover because of the reduction in consumer goods, to compensate the needs of the society import substitution industrialization was adopted. To be able to satisfy the need of the society, public investments increase distinctly in the sectors like energy, coal, cement, sugar. As a result, the share of public investment in the national income increased. Also these incentives towards sugar and cement paid of better than the other sectors and improvements in those sectors almost supply all of the domestic demand in the economy. It is also important to mention that private investment in industry also increased during this period. Necessary conditions was made by government to allow private sector to groove. But this incentives also made private sectors' development intensively dependent on government actions and detained from competing in the world market. But still comparing to the previous periods national income growth rate was significantly low in this era. Economic growth now depends on external resources. So in an economy that is dependent to the imported goods, when a decline in import was happened it is inevitable to face decrease in the growth rate as well. Consequently, restrictive trade policies had not become sufficient enough to solve trade deficit problem. Even though earlier years in this period has seen fast growth, in the end, actions took was not able to solve the problems in the economy.

Overall in 1970s, Turkey enjoyed a little bit of growth as a consequence of its import substitution industrialization implementation. However, this growth came to an end after the oil crisis and the change in Europe's austerity program to deal with the crisis. The oil crisis was an indication of an increase in oil prices, together with a fall in its supply. Since oil is one of the primary energy sources of industrialized economies, a crisis in this market can jeopardize the financial and political steadiness of the global economy. Oil prices are questionable, but still an important indicator to designate the economic condition of a country (Kiani, 2011). The first oil crisis took place in 1973, as the Arab members of the

Organization of Petroleum Exporting Countries decided to retaliate against the Western countries which had stood with Israel against Egypt and Syria during the Yom Kippur War. Due to their oil embargo, oil prices rose almost 400%, which caused a deleterious effect on the global economy and politics. Nevertheless, even in this difficult environment Turkey managed to postpone the crisis. But the leading factor in Turkey's economical plans in this period was external borrowing, which was a huge problem. The government cut the taxes but not spending to make sure the economy worked exactly the same. But this did not work in the long term, and the government's debt pushed them to borrow more from foreign sources. Therefore, foreign aids had used in this period became another foreign factor that Turkey is depend on. In 1977 these actions to postpone the crisis reached their limit and caused a liquidity crisis in Turkey. Inflation rates increased, which caused a devaluation and a decrease in growth and an increase in unemployment. Furthermore, the oil crisis in 1973 was the first important trigger or an alarm to warn the countries about finding a solution to their energy dependency and security problem.

The year 1980 was the turning point in Turkish economy policies. If we look at the economy at the time, we see high inflation, recession in growth, and increasing black market activity. Worsening political conditions has put an important burden on the economic activities. The first years between 1981 and 1983 was the military phase and shaped the economic and political policies with unskillful and unfortunate way (Boratav, et al., 1996). Also, because of the strikes in many companies, production was almost entirely stopped. So, they called upon the government to take action and to create a safe environment for investors. After 1980, the government's intense involvement began to cause problems in the economy, which affected productivity and prevented a healthy development process. There were ideas and ideological views that forced the reevaluation of the state and society relationship and rearrangements in the economy. Before opening up to the world trade markets, Turkey had used regulated capitalism to protect its domestic market with simple tools like tariffs. But even though the purpose of this system was to protect the domestic market, it caused some problems like eliminating foreign competition. In light of these problems, Turkey decided to become more global.

After the 1980s, energy policies were affected by liberalization and privatization. The changes in the global economy, political and social trends, had an effect on Turkey's policies. The January 24 Economic Reform Package was introduced in 1980, and it was an important milestone and heralded the liberalization and the free-market orientation in the Turkish economy. In this plan, it was stated that Turkey needed to provide the following conditions in order to improve its economic situation. These conditions were: trade liberalization, a decrease in government spending, and a decrease in wages (Boratav, 2016). The subareas for these conditions were a flexible exchange rate, austerity and an export drive, public enterprise reform and privatization, financial liberalization, import liberalization, and lastly, the promotion of direct foreign investment. These conditions provide a brief summary of the changes at that time. In light of these changes, Turkey turned towards export-oriented industrialization.

In addition, the idea behind privatization was the belief that the government did not work efficiently, so it was spending its resources in vain. In this regard, changes were made in the energy sector as well. The energy sector was liberalized through the idea of increasing competitiveness and being able to provide efficient energy at affordable prices to the consumers. A lot of laws have been introduced to support the growth of renewable energy and increase the effectiveness of other energy sectors. Electricity is one of the main inputs for the industrial sector; therefore, it holds an important place in energy policies. The electricity sector has been seen as a leader to supply continuous input to the industry. Regarding this, the monopolistic character of the Turkish electricity sector was changed by the enactment of Law No. 3096 in 1984. The main purpose of this privatization was to create a competitive, efficient electricity market. Through this law, the electricity sector was opened up to private companies. According to this new practice for financing energy projects, four basic models were introduced: Build-Own-Operate (BOO), Build-Operate-Transfer (BOT), Auto-Production Model, and Transfer of Operating Rights (TOOR).

Following the changes in the economic system at the end of the 1980s, the reason for the increase in GDP was the successful transformation by moving demand from the domestic market to the international market, accompanied by external borrowing. The problem with Turkey's strategy after the 1980s export-oriented industrialization plan is not

finding successful and stable capital accumulation. The biggest issue with this kind of economic plan is that it will always be dependent on foreign markets. Especially for a country like Turkey, which already hugely relies on a few specific countries for energy, depending on foreign demand as well for its products increases the country's fragility and causes serious problems. Furthermore, during 1980s foreign endorsement was played an import role in shaping Turkey's economy policies. One of the goals of a country in free-market or neoliberal capitalism is to earn foreign currency by making exports. During this period, import was liberalized, export incentives were made and the quantitative import restrictions was abandoned (Boratav, 2016). This increasing dependence on foreign capital has caused problems in Turkish economy policy decisions since its development hugely depends on external powers.

During 1990s, which was also named as the second phase of neo-liberalism in Turkey, the problems about political instability, reduced growth rates, perpetual inflation and ineffectual budgetary performances was still ongoing (Önis & Bayram, 2008). Turkey had some difficulties or more accurately made some wrong choices about the industry that they chose to grow. An industrial-based sector can create jobs and lead to economic growth, but Turkey rather chose to grow in sectors like construction, etc (Boratav, 2016). So inevitably, these wrong actions resulted in problems in the Turkish economic system, causing it to become more dependent on the foreign countries' capital movements and the world market. As a result of the privatization plans, the government's main objective became to encourage private sector development and make inducements to increase their profits, workers' wages decreased, and society suffered from this change in the system. This dependence on foreign capital investment resulted in increasing budget deficit caused a crisis in 1994.

In summary, the first domestic demand for durable goods and intermediate goods increased, so the government exposed ISI in the economy in the 1970s. Later, because of the worsening conditions in the domestic economy and the oil crisis in the world, demand decreased due to austerity programs. The Turkey of the 1970s was a more introverted country that had some protective policies and focused on domestic consumers and had a high currency rate. But after the 1980s, there were some changes in Turkey's policies, the

country became more open to the world, made some export incentives and expected economic growth as a result. In addition, a country that imports most of its energy supply, oil constitutes a significant amount of this import, and the oil crisis proved the vulnerability of Turkey as well. Due to the oil crisis and its effect on Turkey's trade deficit and economy, the oil shortage occurred, which made for long lines of waiting in front of gas stations, and this disparity gave way to the privatization of the energy sector. The effects or the aftermath situation of the crisis were shown as an excuse to judge the government for not being able to handle the energy sector effectively. But in order to straighten out our economy, the January 24 legislation plus significant decisions were introduced in the 1980s, and the economy accepted export-oriented industrialization. To make sure this approach became successful, the Turkish currency was devaluated to make commodities cheaper and more desirable, and wages decreased as well to decrease the demand in the domestic sector. But the dependence on foreign markets for demand and foreign investments for development in private sector has hindered the initial plans.

4.3 TURKEY'S ENERGY POLICY AFTER 2001 CRISIS

Since the 2000s, Turkey has introduced many policies to improve renewable energy source production and consumption, as well as to increase the efficiency in existing fossil energy sources, and also decrease the transition loss. The policies that have been implemented are listed later in this chapter chronologically. The main concerns behind these policies implemented are the energy security problem and environmental degradation. Turkish energy policies were intended to achieve supply security, sustainability, and to increase the power of competitiveness. The main concern that overshadows all of the other reasons is the security of supply.

Since the 1980s, the Turkish government has cut public investments, which included energy investments as well, to make private investment involvement in the economy possible, and new policies have been introduced to attract private investors. The privatization of the energy sector has made a new appearance in Turkey, which was concluded after the 2000s by the AKP regime (Erensu, 2018). Up until the 2000s, the privatization attempts of Turkey were not very successful. The attempts at privatization and their legal framework were allowing the government's intervention until the law

changed in 1994, with the Law on Privatization Practices (Law No.4640) (Bugra & Savaskan, 2014). But this law change was not sufficient to solve the problem, so the law was changed again in 1999, with the intention of making the process easier. After the AKP regime's privatization law in 2003, an important step towards privatization was taken.

In 2001, the Electricity Market Law (Law No. 4628) was established to increase the competitiveness, to encourage private investors to participate and reinforce efficiency in the electricity sector. After the enactment of this law, the electricity sector became a profit-seeking sector in comparison to the nature of the previous public entity. As part of this law, the Energy Market Regulatory Authority (EMRA) was established as an independent party that issues licenses, sets the quality limits for opening a market, settles disputes and implements penalties in natural gas, petroleum, electricity and LPG markets. A part of this law to increase the renewable energy resources share in electricity generation, means that a corporate entity, or an individual who has installed a facility that generates 500kW and more from renewables are exempted from licensing obligations and can set up a company (Baris & Kucukali, 2012). According to the Electricity Market Law, units generated by the Turkish Electricity Generation and Transmission Co. (TEAŞ) were assigned to the Turkish Electricity Generation Co. (EÜAŞ), the wholesale operations were given to the Turkish Electricity Trading and Contracting Co. (TETAŞ) and the distribution matters designated to the Turkish Electricity Distribution Co. (TEDAŞ). The justification of this law is to make sure of continuity of the developments in the electricity market, and guarantee adequate, fair prices and environmentally non-controversial electricity to consumers, and to be an independent regulator and supervisor of the market. The privatization act in the electricity sector gained speed after the implementation of the Electricity Sector Reform and Privatization Strategy Paper in 2003.

Parallel to the Electricity Market Law, the Natural Gas Market Law was established, based on similar objectives. The Natural Gas Law ended the monopoly owned by the government and liberalized the natural gas market like the electricity example. The restricting of the natural gas sector started after the implementation of this law and created job opportunities. Figure 4.1 shows the installed natural gas development

between 1995 and 2016. Installed natural gas has increased over time, as a consequence of increasing demand in energy and natural gas's share in energy supply. Natural gas entered Turkey's energy supply in the 1990s, and its respective share has increased over time. As the natural gas installation and its share in electricity generation increased over time as a result of the privatization efforts, it also necessitates to pay attention on energy security in energy planning.

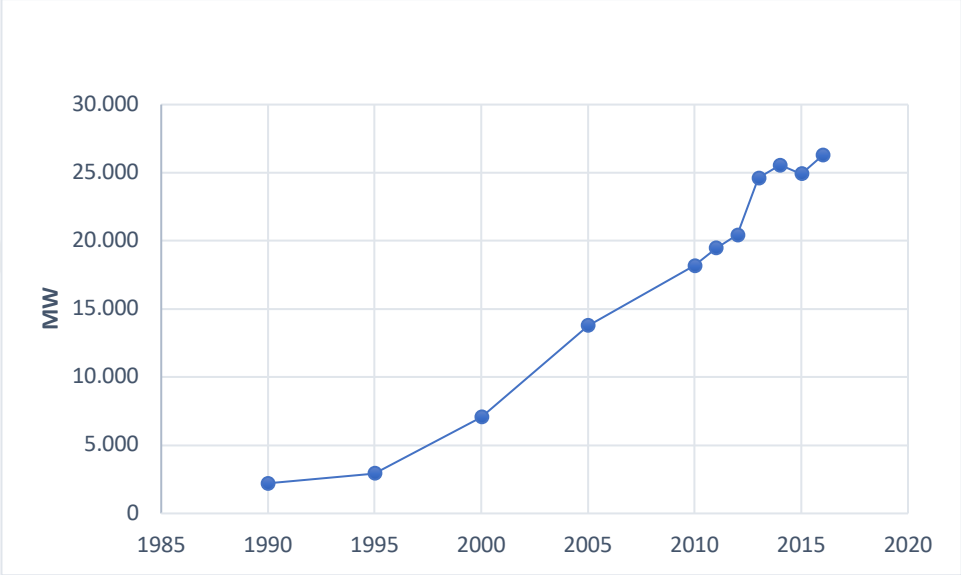

Figure 4.1 Installed Capacity of Natural Gas between 1995 and 2016
Source: Turkish Energy Market Outlook, World Energy Council Report 2016

Also, as part of the transition to a new system, in 2003 the Petroleum Market Law and in 2005, the Liquefied Petroleum Law were adopted. Many changes and new law implementations accompanied the privatization process of the energy sector. In 2004, Law No. 3213 was amended by Law No. 5177 and made possible the mineral exploration in forests, water resources nearby, and areas that have previously been cited as protected environment (Bugra & Savaskan, 2014). This law change also relaxed the law regarding environmental effects. After this law change, applications for mining exploration increased tremendously. The Law on Utilization of Renewable Energy Sources for the Purpose of Generating Electrical Energy, the Strategy Plan, and the Renewable Energy Law were implemented to strengthen renewable energy's role in energy production in order to overcome energy security problems as well as the climate change problem. These law changes were followed by the Energy Efficiency Law in 2007, Electricity Market and

Security of Supply Strategy in 2009, Strategy Law in 2010, and Renewable Energy Law in 2011. The list of law changes can be seen in Table 4.1 below.

Table 4.1 Energy Laws Enacted

Year	Law Enacted
2001	Electricity Market Law
2001	Natural Gas Market Law
2003	Petroleum Market Law
2005	Liquefied Petroleum Market Law
2005	The Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy
2007	Energy Efficiency Law
2009	Electricity Market and Security of Supply Strategy
2010	Strategy Law
2011	Renewable Energy Law
2012	Energy Efficiency Strategy
2017	National Energy Efficiency Action Plan
2017	Buildings' Energy Performance Regulation
2017	Green Buildings Regulation

The idea behind the liberalization of the energy sector was the wish to actualize advantageous results of a free and unrestrained market structure for the oil, electricity, and natural gas sectors (Celebi, 2006). It is claimed that sustainable development and affordable prices can only be achieved through a perfectly competitive market structure. This competitive market was seen as a factor that can eliminate the negative and ineffective use of scarce resources that is caused by the government.

The Energy Efficiency Strategy was introduced in 2012 and set goals for 2023. For a better application of the Energy Efficiency Strategy goals, the National Energy Efficiency Action Plan was instituted in 2017. This new strategy has been evaluated not only as a new strategy but as an indicator of a new phase in which the connection between government and capital has been reorganized (Erensu, 2018). According to this strategy

plan, the Turkish government aims to increase the share of renewable energy in electricity generation by 30% and decrease the natural gas share as well.

4.4 PROBLEMS WITH NUCLEAR POWER PLANTS AND HEPPS

Nuclear power plants have a significantly different place in the promotion of renewable energy sources in Turkey, as well as for the rest of the world. Firstly, nuclear power plants require a huge installation budget and extensive knowledge. Nuclear power plants gained attention because they were seen as an important opportunity to decrease dependence on fossil fuels. It wasn't until the early 2000s that energy dependency was cited as a major justification of the nuclear programs (Jewell & Ates, 2015). Nuclear power plants differ from other renewable energies because of their safety problems. Since nuclear power plants require significant preparations before installation and because there are deep concerns about the installation of nuclear power plants, there have been several attempts made to establish nuclear power plants in Turkey since the 1950s. Those attempts are listed in Table 4.2 below.

Table 4.2 Nuclear Power Attempts

1^{st} attempt	Turkish Atomic Energy Commission established in 1957.	The first feasibility study of the nuclear power plant was made in 1967 and planned to start nuclear generation in 1977.	
2^{nd} attempt	Feasibility in 1972 in Akkuyu and Sinop.	A license for building a nuclear power plant was issued in 1976.	
3^{rd} attempt	It started in the 1980s.	Political factors (instability) and conflict with	

		vendors were the reasons for the failure of this attempt.	
4^{th} attempt	It began in 1993.	Anti-Nuclear Platform movement started, which has been active until this year.	
5^{th} attempt	Initiated in 2002.	This attempt motivated by concerns over Turkey's growing Russian gas imports.	

Source: (Jewell & Ates, 2015)

Turkey's interest in nuclear energy was started with the establishment of the Turkish Atomic Energy Commission (TAEC) in 1956. Following this, in 1959, Cekmece Nuclear Research and Training Centre (ÇNAEM) and in 1969 Ankara Nuclear Research and Training Centre (ANRTC) were established. The first attempt at nuclear power was unsuccessful due to Turkey's small economy, which has a GDP of less than $20 billion.

There are advantages and disadvantages of using nuclear power. The advantages of using nuclear power are cheap electricity, low carbon dioxide emission, and reliability. The disadvantages of using nuclear power are the issue of nuclear waste disposal and the risk of an accident (Akyuz, 2017). Whether nuclear energy is cheap or costly is an ongoing debate, because it can produce cheap energy, but the initial installation cost is still high, which is as a factor that makes it costly. One factor that makes nuclear energy more

appealing is its reliability compared to other renewable energy sources; nuclear energy is not affected by weather conditions. However, nuclear energy is sensitive to natural disasters, such as tsunamis and earthquakes. It is also unclear whether nuclear energy is environmentally friendly or not: it can produce energy without any gas emission, but there is still the chance of an accident, which in return causes detrimental consequences to nature, the effects of which will be seen in a number of years following. The biggest problem with nuclear energy is its waste disposal problem. Unfortunately, Turkey lacks human resources and technical knowledge to safely operate nuclear power plants (Jewell & Ates, 2015).

As part of the process of establishing a nuclear power plant in Turkey, and part of the agreement that was signed on 12 May 2010 with Russia to open the first nuclear power plant in Akkuyu, Turkish students were sent to Russia to specialize in nuclear power plants. According to the Republic of Turkey Ministry of Energy and Natural Resources, 157 students are studying in Russia for this purpose (Resources, 2020). The fifth attempt at installing a nuclear power plant was started in April 2018 and is expected to be in operation in 2023.

Besides nuclear power plants, there are also concerns related to hydropower plants. The uncertainty of wind and solar energy was used as an excuse to invest in hydropower. There are some technical and usage differences between HEPPS and dams. Dams are structures built on rivers as hydroelectric power plants (HEPPs), but in addition to generating electricity, the so-called dams can be built for other purposes such as irrigation water storage, drinking water supply, and flood protection. However, on the other hand, HEPPs are only constructed for electricity generation. Hydropower plants are preferred because no hazardous waste is generated through their operations and they also produce very limited greenhouse gas emissions, and the lifespan of a hydropower plant is approximately 50 years. Unfortunately, there is no flow regulation in HEPPs, and the electricity generated by the power plant varies according to the seasons. While electricity production increases during peak rainfall and river flow, a HEPP may sometimes produce no electricity during dry seasons. Also, regardless of their clean operation process, hydropower plants cause some damage to the environment, which cannot be overlooked.

The main concerns regarding HEPPs are blockage of fish passages, reduction of local transport, and the blocking of the link between downstream and upstream by the facility (Baris & Kucukali, 2012). The construction period of the hydropower plants can cause some detrimental environmental effects that can harm the morphological structures of the rivers, such as changing the natural flow of the rivers, noise, and dust. In addition, there is the decrease in forest areas due to intensive tree felling, and there are significant differences in ground and groundwater levels due to changes in water amounts, which affects both forest areas and hydrogeological structures to a great extent. Also, there are concerns regarding the increasing number of hydropower plants and their negative environmental consequences. These concerns have been multiplied due to the almost 70% of these power plants exempt from Environmental Impact Assessment (Bugra & Savaskan, 2014). The General Directorate of Protection of Natural Assets was introduced in August 2011 and held responsible for authorizing the natural protected areas and special environmental protection areas. But this change in the legislative system caused some concerns because details of the protected areas must be sent to the Turkish Ministry of Public Works and Settlement for reconsideration, and the results can easily be changed with no institution to challenge it (Baris & Kucukali, 2012). Although there some concerns about hydropower's disturbance of natural assets and ecology and some protest raised against its installations, licenses have still been granted. According to the TEİAŞ December Installed Capacity Report, there are 558 hydropower plants installed in Turkey. In addition, the private sector's investment in HEPP in the last 15 years was approximately 25 billion dollars for installed plants, 6 billion dollars for still in construction, and 29 billion dollars for the planned plants. Figure 4.2 shows the increasing trend in hydropower plant installations between 1990 and 2016.

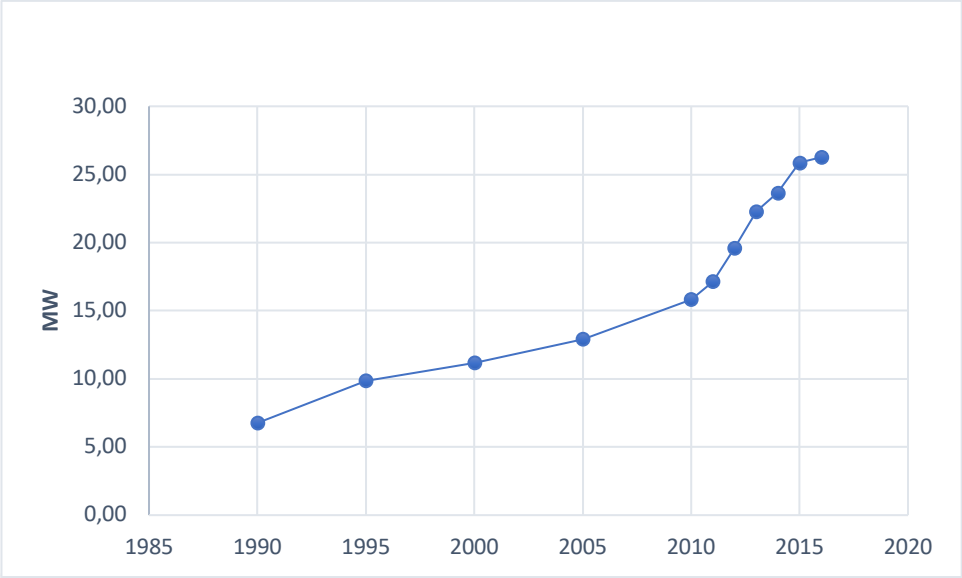

Figure 4.2 Installed Capacity of Hydro between 1990 and 2016
Source: Turkish Energy Market Outlook, World Energy Council Report 2016

4.5 GENERAL PROBLEMS IN TURKEY'S ENERGY POLICY

The problem with Turkish energy policy is that there is a chance of improvement and yet full potential is not used; therefore, the energy dependency, environmental damage, and so on, the problems related to an insufficient energy policy are all still ongoing.

Energy dependency is an important issue for Turkey, as has been already stated several times before in this thesis; meanwhile, looking at the energy import partners of Turkey can provide some valuable information. If we look at Turkey's import partners, we can see that Germany, Russia, China, the United States, and Italy are the leading countries. Russia has the highest share of Turkey's import partners with 11%, and this cost Turkey 21.99 billion dollars in 2018, the highest share of those imports being mineral fuels, oil, and distillation products, which cost 13.07 billion dollars. It is clear that energy imports constitute a major share and therefore put one of the highest burdens on our trade deficit. According to the Turkish Statistical Institute, in 2019, 21.55 % of import expenditure came from energy. Also, as of 2018, mineral fuels, oils, and distillation products cost Turkey 43 billion dollars and imposed a heavy burden on the country.

The rising concerns about climate change and global warming cause countries to come together and make plans internationally. As a result of this concern, the United Nations

Framework Convention on Climate Change (UNFCC) was introduced in 1992, and the United Nations Climate Change Conference has been held since 1995. After this gathering, the countries decided on a more solid provision against climate change and embraced the Kyoto Protocol. The Kyoto Protocol legally ties countries to set emission reduction targets. The first emission target was between 2008 and 2012. The second period started in 2013 and will end in 2020. The Intergovernmental Panel on Climate Change assessment report shows that humans actions are of vital importance and are one of the main causes of climate change. The biggest challenge in dealing with climate change issues is the lack of enforcement. There are countless studies about the climate change problem, but the solutions that have been suggested by scholars or the international conventions are not binding, it is left to the goodwill of the people, which creates a problem as a result. Although the problem is accepted, the solutions have not been internalized yet. Also, the effects are expected to be felt in the distant future, which imposes the idea that there is still time to take action against climate change. But as we have seen in the earlier months of 2020 in Australia, the effects of climate change are already happening, and we don't know which country will be affected and when, so the precautions must be made now.

In 2016, a survey was carried out to identify the public's views on the biggest energy problems in Turkey, and this is shown in Table 4.4 below. It is clear that 38.6% of the problems related to energy issue cite dependency as the biggest problem followed by high energy prices.

Table 4.4: What is the biggest problem in Turkey?'
Source: Turkish Public Preferences for Energy Survey in 2016 by Kadir Has University

Type of Problem	Percentage
Dependency on imported energy	38.6%
High energy prices	30.8%
Does not know/No answer	5.4%
Low energy quality	4.1%
Not enough use of renewable energy	3.6%
Inefficient use of energy	3.3%
Problems about work safety	3%
Environmental problems	2.8%
Dependency on fossil fuels	2.7%

Power cut	2.1%
Taxes	1.2%
None of them	1.1%
Other	0.8%
Corruption	0.4%

It can be said that these two problems, dependency on imported energy and high energy prices are somewhat related. As a consequence, we need more permanent plans. What we can do is to compensate for the demand, by trying to increase the percentage of renewable energy, which would bring further benefits according to the studies by increasing the productivity in energy.

4.5.1 Environmental Problems and Loan Problem of Energy Companies

A number of new policies and incentives to encourage the changes in the energy sector have been introduced, but their results are not what was intended. Besides not solving the current problems, they also add new problems for the Turkish energy sector. The negative results can be named as the excessive borrowing of energy companies and the adverse environmental results caused by improper installation. For example, hydropower installation licensing is different from Europe, and this causes a serious problem in Turkey's habitat. Wind energy can cause noise pollution, bat and avian mortality, geothermal energy can worsen water and air pollution, bioenergy can cause soil degradation and worsen natural life, but since these energy sources are not abundant yet in Turkey, these negative effects have mostly not been seen. Also, the negative effects of renewables cannot be compared to fossil energy sources' effects, because the effects of the renewables can be eliminated or decreased through careful planning (Baris & Kucukali, 2012). The biggest obstacle in dealing with environmental issues and fighting against climate change is politics. Verbal explanations have not been sufficient to fight against the problem and attain the objectives. Political will is the most critical factor for actualizing these objectives.

After the 2000s, ever since the government policies regarding diversifying the energy sources of Turkey were at their peak, energy investments have increased. According to the data obtained from Turkey's Energy and Natural Resources Ministry, in 2003 the

government accepted only 35 investment projects only including projects regarding hydroelectric power plants (HPP) and thermic ones, but in 2019 the number of accepted projects had increased to 164, and they cover more energy fields such as biomass, waste, geothermal, solar power plants, wind power plants, thermic and hydroelectric power plants.

The investments in the energy sector increased, but most of these investments were compensated by loans. According to Bloomberg, the Turkish energy sector has borrowed 95 billion dollars to actualize these investment plans and 51 billion dollars has not paid yet. Those energy companies have problems paying off their debts due to the fluctuations in foreign exchange rates and other related problems. For the objective of paying off their debts, banks are working on a refinancing method, and while their search continues, the prices of electricity and natural gas also increase to raise the earnings of the energy companies. The debt in the electricity production and transportation sectors is almost 47 billion dollars, and the part that needs configuration is 12-13 billion dollars. Due to their excessive debts, many companies have closed down. Besides the fluctuation in the foreign exchange rate, there is another reason for their debt, which is that the companies that are encouraged and have borrowed money accordingly did not calculate the demand and supply of the energy sector. Sectoral breakdown of loans extended by banks and the energy-related sectors share of those loans between 2013 and 2019 has been shown in Figure 4.3 below.

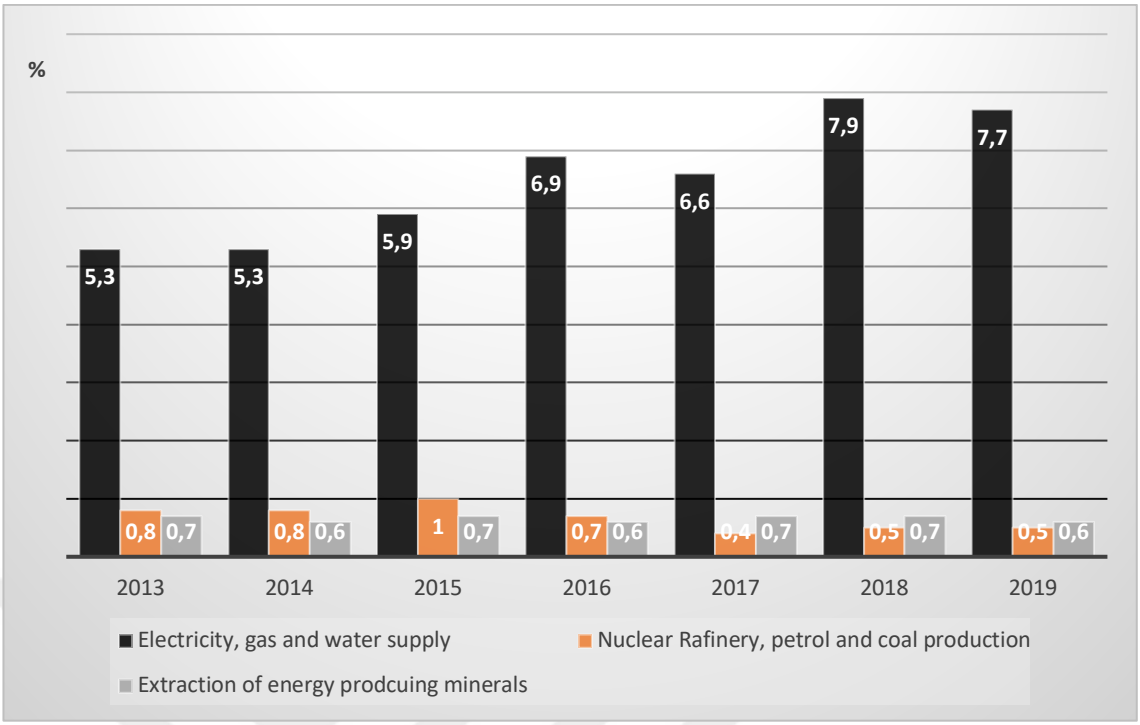

Figure 4.3 Sectoral Breakdown of Loans Extended by Banks (Percentage of Overall Loans)
Source: Risk Center, Sectoral Breakdown of Loans Extended by Banks (https://www.riskmerkezi.org/tr/istatistikler/23)

It is necessary to look at the distribution of energy debts to understand how debts have increased. The sub-sector of debt within the energy sector is found especially in electricity production and distribution. The debts that are causing problems for private banks belong to electricity generation plants and distribution companies. According to published reports, seven power plants producing electricity from coal, five hydroelectric power plants, and eight natural gas power plants, and two electricity distributor companies own the debt. A $70 billion loan was used for energy investment in Turkey between 2007 and 2017. So far, only 23 billion dollars of the debt has been paid off. The $13 billion of the remaining $47 billion is a problem. The distribution of debts is as follows: coal power plants owe 5 billion dollars, HEPPs owe 3.2 billion dollars, natural gas plants owe 2.7 billion dollars, and electricity distribution companies owe 1.9 billion dollars.

In order to understand the process of the formation of these debts, it is essential to look at the Electricity Market Law No. 4628 enacted in 2001. The law paved the way for the liberalization of the electricity market, which includes four steps: production, transmission, distribution, and sales. After the privatization acts in 2011, production,

distribution, and sales were completely privatized. The most important reason for debt is that some firms, based on nepotism, not considering the supply and demand balance, have established power plants after being given permission by the government. According to the Ministry of Energy and Natural Resources 2018 data, the number of power plants producing energy rose to 7,423, including unlicensed power plants. The excess in the number of power plants is remarkable but not enough to see the whole picture. For that, there is a need to look at the demand and supply side. According to the ministry's statement, Turkey's installed capacity is 89,000 megawatts, whereas electricity consumption is 30.3 thousand megawatts. The number of power plants is an important reason for the increase in installed power. This difference is causing a problem. Companies from various sectors construct power plants disregarding demand. The companies that have been successful in the last two decades and their close relation to the government attracts our attention when examining this problem. The growth of the business was not limited to a single sector in any of these companies. All these enterprises have invested in energy production and distribution projects. Also, as they borrowed loans for their establishment, they were allowed to do so in American dollars, even if their earnings were in Turkish lira. In the economic crisis that started in 2018, the Turkish lira lost value against the American dollar. Besides that, electricity savings increased due to the increase in their prices. Even without the depreciation of the Turkish lira, these companies would have faced a similar result, as they did not consider the demand side and pursued rent but perhaps with a smoother transition. Energy investments in Turkey mainly support the demand that is created through privatization and urbanization. However, the real supply and demand situations of energy have been disregarded, and the plans were made accordingly. Although the strategic plans include the involvement of renewable energy, there have not been any incentives to make this involvement effective. The real supply and demand for energy and energy efficiency must be looked at while making plans for renewable energy. Otherwise, the investment plans for energy will merely produce further problems.

The problem in the Turkish energy sector has three aspects as investigated: dependency, environmental concern, and loan problems. These issues are related to each other to an extent. A solution to the dependency problem was always sought through the increment

of renewable energy. Although the initial intention was to increase diversification by using domestic resources to create diversification, an increase in renewable energy use may not be the only solution. Studies should also look at other alternative countries and at increasing efficiency. Looking differently at the problem in a sustainable development plan, renewables are the best option.

CHAPTER 5: CONCLUSION

There have been many studies regarding energy policies, energy and trade deficit, energy and environmental issues, but none of them put the whole picture together. Most of the studies focus on one aspect of the issue, and this study aims to put all the related literature together. This assembly is necessary because the energy issue can only be solved by looking at all the aspects of the issue. Several publications have claimed that the collaboration of academics, government, and companies needs to happen to come up with a reliable solution (Gregorio, et al., 2018).

It is clear that Turkey's energy problem has two major aspects, one is dependency, and the other one is related to global concern about increasing environmental damage. A standard solution to these two problems seems to be to increase the share of renewable energy in Turkish total primary energy supply. Overall, Turkey needs to make necessary plans, have an energy revolution, and use its high amount of renewable energy efficiently, thus contributing to economic growth and reinforcing energy supply security (Cubukcuoglu, 2016).

The preferred cure was worse than the disease. However, during 2000s government did not choose the above path. The reason was not a lack of effort in managing energy policy. On the contrary, successive governments were very active in shaping energy industry. Rather the energy investments are directed to either lignite burning power plants, or to Natural Gas converter plants increasing carbon emissions or nuclear plant financed and constructed by Russian government and continued import dependence. Moreover, these new investments were heavily debt-financed in foreign currency which added foreign exchange risks to the already existing environmental and security risks to the mix. In other words, the supposed cure, private sector led energy investment made dependency and environment problems worse. Successive governments choose this path because rent seeking firms close to governing elite were not technologically sophisticated and they preferred to invest in established and cheap technologies such as coal powered plants.

It has been clearly stated why energy is an important indicator for countries. Especially for an energy importer country, Turkey needs to keep updated on improvements in the energy production sector as well as the price fluctuations and political stability. As a country that imports almost 80% of its energy needs, Turkey has not been able to come up with a satisfactory energy plan that deals with the issue. The biggest challenge in the efficiency of the energy sector in Turkey is the lack of a solid energy plan or strategy. If the energy import trends of all countries in the world are examined, it can be seen that import and export patterns do not frequently change. This kind of transformation requires thoroughly detailed study in order to decrease the energy dependency rate by increasing its renewable energy resources and making changes in the law to support this action. Water resources, solar energy, and wind energy can be utilized to achieve the aim of decreasing energy import and to meet carbon dioxide emission goals. As a country that has considerable potential in renewable energies, research must be made to encourage its development and the subsequent legislation must be supported. There have been many aspects of renewable energy generation. The transformation to renewable energies cannot happen easily, because the cost of the initial investment in solar and wind power and mainly all the other renewable energy sources requires a huge amount of money. But as the years go by and with the acceleration of studies on research and development, the gap has been closing. For example, even normal people can afford to install solar panels on their homes now. There needs to be a solid plan which involves the private sector, households, and government. Energy production in the country should be designed accordingly to support the green economy, and to be aware of the growing popularity of global trends regarding renewable energies and energy efficiency. Product development and targets should be directed to the goal of being green, energy-efficient, and environmentally friendly.

In Chapter 1, energy consumption, energy dependency, and renewable energy's effect on sustainable development, and their effect on the country's economic growth have been explained. The negative results of fossil energy consumption, namely carbon dioxide emission and as a consequence, climate change and air pollution and its grooving (growing? Editor) importance in recent years have also been discussed. The characteristics of renewable energy sources and fossil energy sources are explained, and

the difference between them has been highlighted. A definition of energy policy has been provided, and the problems related to energy policies have been mentioned. Besides environmental concerns, support for energy sectors through incentives from the government, and inducements to invest in energy production have created a loan problem in the energy sector, which causes a major debt problem.

In Chapter 2, some studies in the literature have been bracketed under certain sub-headings. These sub-headings were chosen, namely: energy consumption and economic growth, sustainable development and energy, energy security or dependency and trade deficit, and renewable energy. Although all the sub-headings are closely linked to each other, for the purpose of simplification, these ones were chosen.

In Chapter 3, empirical evidence of the discussed topics has been shown to illustrate the situation more visibly. Increases in GDP, energy use, and carbon dioxide emission have been shown. Turkey's energy import in terms of total energy use has been visualized, and the significance of the high percentage has been demonstrated. Also, the total primary energy consumption by source has been designated, and the most used energy sources and the contribution of the increasing energy consumption drivers have been identified. Renewable energy consumption has also been shown, and insufficient use of the renewables has been proved. A substantial portion of the energy is used for electricity generation; therefore, electricity generation by source has been looked at individually. Also, to specify the contributors toward this substantial electricity generation, electricity generation by sector has been represented. Turkey's import partners by country have been listed, to understand which countries Turkey majorly depends on.

In Chapter 4, the energy policies of Turkey and why it is important for Turkey to have a solid energy policy have been discussed. Changes to the Turkish economy and their outcome in terms of energy policies through legislation have been listed. The chosen economic policies, such as protectionist or more liberal economic strategies' effect on energy policies and energy sectors, have been explained in detail. International conventions and organizations dealing with climate change problems mostly and their effects on Turkish energy policies have also been analyzed. Energy security is an

individual problem for a country, but concerns relating to climate change have a different aspect that concerns all of the countries in the world, as climate change affects the whole world. Turkish energy policy has experienced changes in overtime (what do you mean? Editor) parallel with its political view. For example, during regulated capitalism, in order to keep unemployment low, prevent high inflation, and promote economic growth, the government used taxation, monetary policy, and spending to make that happen. Also, the government imposed further regulation in key sectors such as the telephone and railroads. Those regulations make sure that prices are stable and not very high; even more in some cases, those regulations have made sure that firms have a fixed rate of profit. As seen in this example, the government has used regulations for other areas of the economy as well, such as the financial sector, the environment, job safety anti-trust laws, and so on to keep the economic state of the country consistent with the lines of their basic philosophy.

However, as time goes by, economists have considered that this system does not work efficiently. They saw that the system caused budget deficits and tax burdens. And they suggested that we should free the market and let the market solve its own problem without any interventions. This way, it is foreseen that the economy can provide optimal outcomes in every aspect. and also secure individual liberty. The idea of neoliberal capitalism also argues that in order to have regulation, one should consider whether its benefits outweigh its costs. After the 1980s, this idea became more acceptable and spread around the world and would soon dominate the global level of economic institutions. But it can be said that the neoliberal system also was not the end, and the biggest problem about neoliberal capitalism is economic disparity. Consequently, as has been stated, capitalism evolves and changes over time; this means that in an economic system, there are times where the system needs regulated capitalism. In contrast, at other times, it can be uncontrolled neoliberal capitalism, so in a way, there is a cycle in the system. Furthermore, from Turkey's example or from that of any other country in the world, it can be said that capitalism can always come up with some different remedies for its predicament.

For that reason, Turkey should raise its domestic and renewable energy use in the country and maybe look for alternative countries to import energy from. Because saving energy, productive use of existing sources, and recycling energy are important issues worthy of

immediate attention (Mehmet Ali Alkan 2010). The government also plays an important role in this matter, for as much as making a future plan is important, it is also important to support firms in their use of renewable energy, and also give some incentives to increase the consumption of renewable energy. Moreover, it should make its current incentives more appealing. We should make use of more renewable energy sources like bioenergy, sun, wind, and geothermal. Additionally, we should search for other potential countries to import energy from and decrease the dependency rate on specific countries, for example, Russia for natural gas. We should also include universities in the process of finding solutions to energy problems and developing energy policies and strategies. Also, because of the increasing need for technical personnel like engineers etc., we should pay attention to education policies.

An overall assessment of Turkey's energy policy and its effectiveness is considered to be lacking. There is no applicable study that has been worked in detail to implement. The reasons for not having an effectual, stable and established energy system in Turkey can be listed as follows: first and foremost, the lag behind international developments in the energy sector, and the interrupted strategies that change from government to government, weakness and deficiency in energy policies, and lastly the lack of contribution, integration of universities and other research and development institutions in the energy policymaking process. In order to decrease dependence and fulfill security in the energy sector, Turkey needs to delineate accurate energy policy for the long term, which is based on scientific calculations, conscious, determined foreign policy, designed in the interests of the economy, and environmentally aware policies. Environmental damage is still an ongoing problem through selected energy sources and their carbon dioxide combustion as well. There are few cases in the world that are as full of uncertainties as that of energy (Guner & Albostan, 2007). As mentioned countless times throughout this thesis, energy is one of the most important strategic issues for developing countries, as indeed it is for Turkey as well, and for the rest of the world also. In energy policies, significant studies have resulted in by-laws and regulations, particularly parallel to EU standards. However, qualified and extensive studies have not been reflected in the market, in the sense of providing audit, price formation that reflects costs, reducing loss and leakage rates, and increasing energy efficiency (Guner & Albostan, 2007). Domestic and renewable energy

share should be increased in the total primary energy supply. Support and incentives should be enhanced for domestic firms to produce energy from renewable energy sources, and the existing incentives should be made more attractive. Bioenergy, sun, geothermal, and wind taking the lead, renewable energy sources must be made more used and promoted. The incentives within the context of the Renewable Energy Law should be further increased. To ensure supply security in natural gas, legal arrangements must be made to strengthen the national storage system. Also, to decrease extensive dependence on Russia, to diversify the natural gas supply, potential country research must be done. It is necessary to reduce the tax rates on all types of energy used in our country, and also to eliminate any tax on the bioenergy produced from domestic sources. Universities should be involved in the solution to energy problems and in developing the right energy policies and strategies. Education policies should be established as soon as possible in order to meet the shortage of technical personnel (engineers, intermediate staff) experienced in the energy sector, and which is likely to increase in the coming years.

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