AN ANALYTICAL PERSPECTIVE ON THE EUROPEAN UNION'S OIL SUPPLY SECURITY IN THE AFTERMATH OF THE IRANIAN NUCLEAR CRISIS: MODELLING THE FUTURE

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JUNE 2014

AN ANALYTICAL PERSPECTIVE ON THE EUROPEAN UNION'S OIL SUPPLY SECURITY IN THE AFTERMATH OF THE IRANIAN NUCLEAR CRISIS: MODELING THE FUTURE

A THESIS SUBMITTED TO

THE GRADUATE SCHOOL OF SOCIAL SCIENCES

OF

IZMIR UNIVERSITY OF ECONOMICS

BY

ÖZGE ŞENYÜZ

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ART

IN

THE GRADUATE SCHOOL OF SOCIAL SCIENCES

JUNE 2014

Approval of the Graduate School of Social Sciences

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June 2014, 113 pages

ABSTRACT

This thesis analyzes the oil supplier plan of the European Union (EU) changed owing to the effect of embargo imposed on Iran in 2012. In the globalizing world, the amount of energy consumed is increasing in parallel with rising energy demand day to day. Especially, the given value of oil has been continuing to maintain its importance from past to present. However, even if having huge amount of reserves makes any country an important country both strategically and economically, it is not enough to qualify a country as an energy-rich country. Because, the significance of the policies and strategies implemented while dealing with the issue of energy is appreciable. For this reason, it will be much better to consider energy, a global factor, within the scope of policies adopted, of the geographical position and of the administration of foreign relations. In fact, implementing wrong policies and having bad relations with the other countries may cause a resource-rich country to go into a decline. Currently, Iran, on which an embargo has been imposed in oil purchasing since 2012, sets an example for such kind of situation. Of course, this situation affected Iran's oil trading with the EU, one of the biggest oil importers of the world

and caused the EU to turn towards the other countries to meet the oil it imported from Iran. The objective of this thesis is to shed light on the EU's oil supplier plan in the wake of the Iranian embargo and with the parameters such as oil prices, oil resources and the country risks, to observe its reactions in the light of scenarios developed using GAMS model regarding oil purchase.

Keywords: Oil Supply Security, Islamic Republic of Iran, European Union, Oil Supply Strategy, GAMS Modelling

İRAN NÜKLEER KRİZİ SONRASI AVRUPA BİRLİĞİ PETROL ARZ GÜVENLİĞİNE İLİŞKİN ANALİTİK BİR BAKIŞ AÇISI: GELECEĞİN MODELLENMESİ

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Tez Yöneticisi: Doç. Dr. Mehmet Efe BİRESSELİOĞLU

Haziran 2014, 113 sayfa

ÖZET

Bu çalışma, 2012 yılında İran'a uygulanan ambargonun etkisiyle değişen Avrupa Birliği (AB) petrol arz planını incelemektedir. Globalleşen dünyada, artan enerji talebi ile birlikte tüketilen enerji miktarı da günden güne artmaktadır. Özellikle, petrole verilen değer geçmişten günümüze önemini sürdürmeye devam etmektedir. Her ne kadar, büyük miktarda rezervlere sahip olmak bir ülkeyi hem stratejik hem de ekonomik olarak değerli kılsa da, bir ülkeyi enerji açısından zengin bir ülke olarak tanımlamaya yetmemektedir. Çünkü, enerji konusunu ele alırken uygulanan politika ve planlanan stratejilerin önemi azımsanmayacak ölçüde fazladır. Bu yüzden, global bir etken olan enerjiyi, izlenilen politika, bulunulan coğrafya ve dış ilişkiler yönetimi kapsamında değerlendirmek daha doğru olacaktır. Öyle ki, yanlış politika uygulamaları ve dış ülkeler ile kötü ilişkiler içerisinde bulunmak büyük rezervlere sahip bir ülkenin düşüşe geçmesine sebep olabilir. Şu anda, 2012'den beri petrol alımında ambargo uygulanan Iran, bu duruma bir emsal teşkil etmektedir. Tabi ki bu durum, İran'ın dünyanın en büyük petrol ithalatçılarından biri olan Avrupa Birliği ile olan petrol ticaretini de etkilemiş ve AB'nin daha önce İran'dan ithal ettiği petrolü

karşılamak için başka ülkelere yönelmesine sebep olmuştur. Bu çalışmanın amacı, Iran ambargosundan sonra AB'nin petrol tedariki planına ışık tutmak ve petrol fiyatları, petrol kaynakları ile ülke riskleri gibi parametrelerle, GAMS modeli kullanılarak geliştirilen senaryolar karşısında, AB'nin petrol alımına ilişkin tepkilerini gözlemlemektir.

Anahtar Kelimeler: Petrol Kaynak Güvenliği, İran İslam Cumhuriyeti, Avrupa Birliği, Petrol Tedariki Stratejisi, GAMS Modeli

To My Parents

ACKNOWLEDGMENTS

I express sincere appreciation to Assoc. Prof. Dr. M. Efe BIRESSELIOGLU for his guidance and insight throughout the research. Special thanks go to Asst. Prof. Dr. M. Hakan DEMIR for his technical assistance of the GAMS Model, his suggestions and comments. To my parents, Selmiye and Turgay, I offer sincere thanks for their unshakable faith in me and their willingness to endure with me the vicissitudes of my endeavors.

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Özge Şenyüz was born in Izmir on May 15, 1989. She received his B.S. degree in Physics from Kocaeli University in June 2011. She worked in a private energy investor company as a project manager from 2013 to 2014.

CHAPTER 1

INTRODUCTION

After the oil crisis in 1973, the importance of security of supply has been recognized for the first time. Further, the need of diversification of supplier and supply has been realized. Thus, countries were divided into two groups as energy rich countries and energy dependent ones. However, as mentioned in the several researches, only having a large amount of fossil fuel reserves is not enough to make a country to become an energy rich country. Hence, the importance of the applied politics and the planned strategies can't be discussed separately from the scope of energy, which presents a global issue (Hamilton, 2009). In spite of having huge reserves, wrong policy making and poor foreign relations can lead a resource rich country to fall into decline. Currently, Iran sets a precedent of that kind of situation by virtue of facing the oil embargo since 2012. Of course, the oil embargo affected the oil trading that the EU, which is one of the biggest oil importers in the World, was obliged to meet its oil demand from another countries from which it provided oil importation before Iran (Cordesman et al., 2014). This thesis aims to analyze the best supplier plan for EU after the Iranian embargo. According to the data of EIA, EU met its 5, 98% (European Commission, 2011) oil demand from Iran in 2011. So ever, this rate seems not very much, it represents a big amount of oil when the huge oil demand of EU is taken into the account. One of the missions of this thesis is to observe the reactions of EU in several different circumstances while shedding light on the oil supplier plan of EU after the Iranian embargo. Thus, this thesis is believed to provide an opportunity of making comparison about current EU supplier plan and the other

possible alternative choices of the Union. Here, it is better to mention that the energy demand of the EU shows an increasing trend every year (Lombard et al., 2008). The foreign energy dependency of the EU is increasing so much that the energy imports of the union reached 51% of its energy use in 2011 (World Bank Data, 2014). By mentioning it with numbers, according the latest data of World Bank, European total energy consumption was 83, 82449 Quadrillion Btu, while the total energy production of the Union was 45, 37886 Quadrillion Btu in 2010. This data is also proves that the increasing European energy demand is met by energy importation instead of domestic production. The reason for EU's energy dependence is due to its insufficient natural reserves which are not enough to meet the energy demand of it. Focusing on the fossil fuel reserves, EU has 12,433736 billion barrels of proved crude oil reserves (EIA, 2014), 142, 11 Trillion cubic feet natural gas reserves (EIA, 2014) and 90743, 37 Million short tons of Coal reserves (EIA, 2011). However, the researches of BP proves that the overall production of fossil fuels has decreased by 25% since 1990, mainly for the decrease in the coal production could not met by the increases in the coal production could not met by increases in oil and gas production. Besides, the overall production of fossil fuels are estimated to decrease by another 45% by 2020(BP, 2013). As for the energy importation, pipelines and LNG terminals are used for gas importation, harbor facilities, refineries, storage capacities of pipelines are used for oil importation, harbor facilities and railroads are used for coal importation and interconnections are used for electricity importation in EU. According to BP (2013), the total pipeline entry capacity of EU is about 310 billion cubic meters (bcm) In addition; the pipeline entry points of EU are mainly from Algeria, Norway, Libya, Iran, Azerbaijan and primarily from Russia directly and indirectly via Ukraine and Belarus. Currently, EU attaches more importance to

climate change, increasing dependence on imports, and security of supply while deciding on its energy strategies (Hübler and Löschel, 2013). Besides, according to the EU's 2050 targets the Union also intends to decrease its import dependency on Russia, which meets a great energy demand of EU, even the gas prices are specified by Russia gas prices in Europe (IEA, 2013). Separately, the union shows a great effort to decrease its CO2 emissions that in 2012 it was announced by the European Commission and CO2 emissions were back top re-1995 levels in EU. Moreover, in order to realize the main aims of EU considering to have more stable, transparent international energy markets and prices, to make a better market analysis and to involve in more technological & international cooperation. The Union is also in bilateral cooperation with Algeria, Brazil, China, India, Iraq, Japan, Norway, South Africa, Turkey, Ukraine and USA (European Commission, 2014). However, as mentioned above, EU is an energy dependent association and the energy demand of the Union is increasing day by day. By taking into the account of lack of enough fossil fuel reserves, the dependency of energy importation will come to an end (Ratner, et al., 2012). For that reason it is advocated that every taken decisions considering European energy strategy becomes more of an issue for the Union.

Looking back through the history, it is possible to realize the cornerstones of the current energy politics of EU. The problematic of meeting the energy demand is a global concern. For that reason, an energy crisis creates a domino effect on countries and the impacts of a full-scale energy crisis can jump onto one to another country (Hamilton, 2009). In 1973, the rapidly occurring oil crisis caused a tremendous effect on the global oil market. The reason for a sudden increase on the oil cost, led a decline on the oil consumption rates (Riha et al., 2011). Thus, the importance of

security of supply has been realized for the first time. Besides, the ambition of Saudi Arabia as to taking back its territories from Israel caused a fluctuation at that period of time (Emery, 2010). Moreover, the intent of Saudi Arabia manifested itself according as if the country had been trying to revenge upon Israel. Hence, Saudi Arabia's announcement concerning Israel, clearly mentioned that the oil embargo would be applied for the countries which supported Israel (Kilian, 2008). This incident having taking place in the history is one of the evidences that energy can be employed of as a weapon in the World politics. Separately, it is one of the demonstrations of the connection between energy and politics. On the other hand, this behavior of Saudi Arabia was not supported by all Arabian countries. Iran and some Arabic countries did not stop oil trading with foreign countries and the energy relations between EU and Iran increased at that period of time (Ozturk et al., 2013). Herewith, Iran returned profit from selling huge amount of oil to EU. Meanwhile, the rising future energy demand of Iran was on the Iranian agenda and by seeing its gained profit as an opportunity, the country turned towards making investment on nuclear energy. However, with the Iranian revolution in 1979, the good relations between U.S. and Iran broke down (Wise, 2012). For that reason, the nuclear aim of Iran was interrupted and also the EU was pressurized by the U.S. as regards that fact that it should terminate its oil trade relations with Iran.

Leastwise, the oil importation from Iran continued for a while. Even, in 1980 the rate of oil importation from Iran to EU rose to 53% (Official Journal of the European Communities, 1981). Solely, this rate of increase caused U.S. to show more reaction to EU and the Union put the seal on the decision of U.S. considering Iran. For that reason, in spite of losing money, the EU stopped its oil importation from Iran

(Katzman, 2010). Looking from another perspective, the losses were not so significant from the Iranian side. Despite freezing its oil trading with EU, Iran continued to export its oil indirectly to foreign countries (Hiro, 1991). However, it was not the fiscal issues that Iran needed to concern about. From the Iraqi side, Saddam was all the keyed up in relation to reformation at Iran.

Hence, he hesitated that the Shi's living in Iraq could inspire from the Iranian revolution and revolt against the Iraqi administration (Karsh, 2009). As a consequence, the war between Iran and Iraq became unavoidable, the war having lasted for eight years between the above countries officially began in 1980 (Takeyh, 2010). By taking into the account of the bad going relations between Iran and U.S., Iran was left without any supports coming from foreign countries (Ottaway and Kaysi, 2012). But, the backing on Iran would not be longevity that Iraq lost its attraction when the country decided to make war with Kuwait (Robins, 2013). During the Iraq-Iran war, the oil prices showed an increasing tendency and according to the occurrence of raise on the cost, oil consumption was decreased rapidly (Emery, 2010). Despite the efforts of Saudi Arabia in order to decrease the production level of oil, the swiftly decreasing oil prices could not be stopped For that reason, most of the oil suppliers had to face an oil shock with a 50% reduction at the oil prices in 1986 (Hamilton, 2011). On the contrary, the level of oil consumption was rising rapidly in the Asian countries for the reason of growing industrialization (EIA, 2009). Most of the Asian countries indexed their local monetary unit to dollar (Patnaik, Shah, 2011). For that reason, when an unexpected rise in the dollar value arose, it threw the Asian countries for a loop. Besides, it was not only the Asian countries that were influenced from this financial crisis, the global oil market were also affected from the Asian

crisis and the oil prices showed a decreasing tendency once again at the history (He et al., 2010). On the other hand, the energy demand of the Asian countries, mainly the demand of China and Indıa, was still increasing. In order to meet this energy demand, China, this turned towards the development of nuclear energy in its territory, decided to make a cooperation concerning nuclear studies with Iran owing to the request of the country (Chen, 2010). In consequence of lack of sufficient technology and industrialization, Iran was not able to sustain its nuclear studies (Torbat, 2010). Besides, for the reason of the sanctions, many foreign countries withdrew their supports from Iran, which has huge amount of fossil fuel resources, in spite of their dependency on fossil fuel importation.

Iran is counted as one of the fossil fuel rich countries in the world with having 2nd largest natural gas reserves and 4th largest oil reserves in the world (Abbaszadeh et al., 2013). The reason of its undeveloped industry is that fossil fuel trading constituted most of Iranian economy. Accordingly, the fossil fuel exportation was so vital for the country that even after the announcement of Arab members of the Organization of Petroleum Exporting Countries considering the oil embargo, Iran did not apply this decision and continued oil trading with foreign countries (Kilian, 2008). Moreover, Iran continued to export oil to EU in 1980s despite the disrupted foreign relations resulting from the Iranian revolution. However, due to the U.S pressure on EU, The Union had to step back and Iran-EU relations reached on impasse In spite of hesitant foreign relations between EU and Iran, the period of extensive dialog started among them in 1997 (Rakel, 2010). However, after the surfacing of secret Iranian nuclear projects, the relations between Iran and EU, which was the first trading partner of Iran, were exhausted. Apart from its impaired political

relations, the nuclear aim of Iran also was the major reason of the last sanctions that were imposed on the country (Pillar et al., 2013).

Intrinsically, Iran met with the technology of nuclear energy in 1959 thanks to the support of U.S. (Sahimi, 2003). Further, by reason of gaining a lot of profit due to the increase of Iranian oil production level in 1973, the first Iranian Atom Energy institution was established in 1974 (Maragheh, 2002). Iran's ever-increasing energy demand and its being surrounded by the countries that had already had the nuclear power brought about Iran to pay attention to the nuclear energy. Yet, the nuclear studies of Iran entered a standstill period by virtue of Iranian revolution in 1979. Moreover, together with the management change in Iran, U.S. also took its support away from the country (Kemp, 1993). As a matter of fact, Iran showed a decisive approach as to developing its nuclear facilities and the country continued to work on its nuclear studies even after the Iran-Iraq war, during which Iranian nuclear studies were stopped. However, in spite of signing the NPT, the disclosure of Iranian nuclear projects that were not reported to IAEA, caused accruing of Iranian Nuclear Crisis in 2002 (Bahgat, 2013). At that period of time, mistrustfulness on Iran increased among foreign countries which engendered a deprivation on Iranian external affairs. Nevertheless, all of these circumstances were not enough to deter Iran from its nuclear aim. Thus, the nuclear target of Iran contributed to worsening the viewpoint of foreign countries about Iran. In fact, when Iran started to intensify its nuclear activities, European Commission clarified that "Negotiations for a Trade and Cooperation Agreement (TCA) between the EU and Iran have been put on hold since August 2005"(IAEA, Updated brief by Deputy Director General for Safeguards, 2006). In the ongoing process, Iran, whose intention was to develop its nuclear

ability, announced that it would continue the nuclear research and development activities in 2006. Therewith, the financial and commercial sanctions on Tehran was expanded. Furthermore, even if Iran was called for making collaboration with IAEA and the approval of expanded Cargo controls and arms embargo on Iran in the forthcoming years, Iran enounced that it would not step back from its uranium enrichment activities (Ekinci, 2009). This explanation was probably the final straw for the World Powers and immediately after, U.S. convoked to apply oil sanctions on Iran as from 1st July 2012 (Farzanegan, 2013). In this way, the last sanction on Iran was accepted by European Union. Thus, total EU imports from Iran decreased by 86% between the years of 2012-2013 and total EU exports decreased by 26% during the same period (European Commission, 2014). In spite of meeting its 5, 98% of oil demand from Iran, the Union had to find new oil suppliers in order to meet this oil demand after the applied implications on Iran. When the oil supplier countries of EU was compared between 2011 and 2013, it was seen that, in addition to Iran, EU stopped making oil importation from Yemen, Argentina, Australia and Papua New Guinea after the Iranian sanction. On the other hand, the Union have start to buy oil from United States, Other Middle East Countries and from other Asian countries (European Commission, 2014). It is necessary to mention here that, the total percentage of both added and omitted countries (excluding Iran) did not exceed 0, 15% of EU's oil importation. Therefore, it is believed that, these countries are not very effective on the Union's oil supplying. Thus, the countries, which have less than 0, 01% share on oil exportation, are not taken into consideration.

The aim of this thesis is to submit probable strategies by analyzing some parameters as crude oil prices, oil resources and the country risks of the EU's oil supplier

countries In order to reach an objective view, the oil supplier countries of EU are decided to be selected before the Iranian sanction. At the beginning, on the purpose of assay the impacts and the consequences of oil sanctions, which effected the global oil market, is mentioned. Subsequently, the Iranian energy perspective is given and the nuclear behavior of Iran, which is the reason of adopted last Iranian sanction, is explained by the given details of the global acquaintance with the nuclear energy and accompanying the Nuclear Power Treaty (NPT). Once after the defining of the energy related relations between EU and Iran from past to today, the consequences of used mathematical model is presented. In addition to this, several scenarios are developed in the model in order to analyze each supplier country. Finally, the outcomes are reviewed and the conclusion is made.

The rest of the thesis is organized as follows in the next chapter," The Recent Past about the Direction of Global Oil Market's Future" is discussed to prevent the relation between the oil market and foreign relations and its effects on the global oil sector by considering both financial and political issues. Chapter 2 provides an overview about Iranian Energy Perspective in an effort to highlight Iranian rich fossil fuel reserves, which are enough to meet the great amount of EU's energy demand, and to address to the energy importation relation between Iran and EU. Chapter 3 ensures an another impact, which affects the oil market, in addition to the first chapter and thus, the impacts of political relations on the oil importation cycle is demonstrated once again. Chapter 4 procures an historic overview about the impacts, which will be mentioned in the first and 3rd chapter, on Iran and EU relations. Thus, the global influences on the oil market, the consequences of Iranian politics and the foreign relations of Iran are examined upon the embodiment of EU. At last, the last

chapter gives a comparative analysis which helps to evaluate the oil supplier plan of EU before and after the Iranian sanction. Besides, this chapter also makes it possible to estimate the feasibility of future oil model for EU in case of eliminating first three main oil supplier of EU and changing given importance to importation politics of EU.

CHAPTER 2

ANALYSIS OF THE DEVELOPMENT OF THE GLOBAL ENERGY MARKET

Natural resources have always been a valuable phenomenon for the world. In fact, with a quick glance at the past, it is seen that natural resources cause some conflicts and even wars, in the meanwhile to what extent they lead to country policies. As a matter of fact, it is not surprising to see how energy relations make countries suffer from their benefits in a split second for a case which affects them less or even indirectly. The reason for such complicated behaviors of countries was certainly to wag their finger once again at "Energy and politics are inseparable like fingernails" truth. Just because of this, what is unchanged up to present is obviously the impacts of natural resources on country's policies. In 1973s, some specific events about how world oil perception could set an example for the above-mentioned results, can be observed.

In the early 1970s, U.S. was at the top in oil consumption just like today. Although the U.S. exhibited ever increasing portfolio of oil production in order to meet its rising demand in 1960s, oil prices were increasing and this change started to affect the US in 1970s. For the sake of example, between August 1971 and August 1973, %10 increase had occurred in the price index for crude oil petroleum and for that reason oil production began to fall in the country. In 1973, gasoline provision took a tragic state with the decreasing production rate and came to the point of closure due to lack of gasoline more than 1,000 (Hamilton, 2011). In first place, the U.S.'s oil

production declining rate indicated the future oil prices and the US thought that to control the rising prices was to import large amount of oil as a solution (Murphy and Hall, 2011).

At this time in the Middle East, which contains huge amount of oil reserves to meet the oil demand in the U.S., circumstances were churning. Arab Unity willing to repair its prestige via taking back its captured land from Israel in 1967 was thinking of making an attack in which they would catch Israel off guard. In order to make that thought real, the Unity rolled up it sleeves and paid attention to making a sudden attack to Israel. Thus, Arabs could have the option of benefitting from İsrael's unprepared position and make sure to guarantee their victory by corrupting Israel's security concept (Emery, 2010). On 6 October 1973, this plan prepared for Israel was put into practice indefectibly and Israel which was forced to act in an improvised way, was against the unexpected attack of Syria and Egypt, they were defeated in Yom-Kippur war (Dunstan, 2012).

However, the Arabs policy of attrition on Israel would not be limited only to Yom-Kippur war. Shortly after the war, Arab members of the Organization of Petroleum-Exporting Countries announced that they would impose embargo on oil exportation to the countries which supported Israel (Kilian, 2008). Arabs, who were quite serious in their decisions, became sharpened against Israel, and short while after this explanation OPEC productions started to decline. But it was not easy to say that there was a real consensus within the Arab Unity as a whole, because, at the same time, there were a few Arab countries which did not support this policy. For instance, Iran and some countries increased their oil production rate rather than reducing it

during the Arab embargo (Painter, 2012). Thus, they profited heavily from oil exportation.

Of course, the results of Yom-Kippur War were not limited to these. Together with suddenly rising oil prices, these were only the beginning of the changing situation in the Middle East. Coming to 1978, Iran, which increased its oil production during Arab embargo, had to cope with large public protests. As a result of increased reactions, it had to reduce its production rate after a while (Jahani, 2011).

A year later, in 1979, U.S. gave its attention to Iran, the reason for which was the fact that U.S.'s national security advisor, Mr. Carter, thought of using Iran as a bulwark against Soviet attacks in the region (Emery, 2010). It was not so difficult for the US to make Iran as a partner for this plan, because, the leader of Iran, Shah, was in good relations with the U.S. However, not everything worked out exactly the way of U.S. expected it would. At this very moment, a sudden event erupted and Shah fled the country and left his management. Needless to say, U.S. was not late to build up a good relationship with transitional government which was established after Shah's left. But at the same time, there was something important that U.S. noticed while developing its relation with the government. Even though this provisional community was composed of Western Educated politicians, there was a religious man who was repressing on the government behind the curtain. Without doubt, this person was nobody but Ayatollah Ruhollah Khomeini (Amuzegar, 2003).

In the year 1979, Imam Khomeini, with whom United States of America had a poor contact, took the control of the country shortly after Shah ran away from Iran. With

Khomeini's ruling, the regime of the country evolved from constitutional monarchy to sharia republic which are mentioned in history books this as "Iranian Revolution" (Zabir, 2011).

During the revolution, Soviets were experiencing some problems in their relationships with Iran. Khomeini, who was not willing to remain unresponsive to the Soviets and also troubled with communist thought act, quickly closed Iran's pro-Soviet Communist Party and played Afghanistan off against Soviets (Parsi, 1989). Hereby, Khomeini pegged down that there was no possible way of correcting Soviets relationship with Iran. From the viewpoint of the United States, Iran seemed beneficial to be used against Soviets. According to the researches, his behavior of U.S. was not surprising for a country which willing to be the authority of the world. But at that date, its impact on other countries must have been so insufficient that after a while US had its share from Iran's manner (Hamilton, 2011).

On 4 November 1979, US was shocked with the information that its Embassy was swooped down by Iranians and also soldiers of U.S., who were in consulate, were captured. The United States which waited for long years for Iran to free the hostages displayed a non-military attitude after hostage crisis to Iran. Because, starting a battle would be costly for the U.S. as well. At some point, there were a huge distance between these two countries. Additionally, compared to fighting with Iran, an embargo could be more effective in the long term. Thus, the U.S. applied embargo to Iranian oil and pressurized some European countries, who were also US's clients, to apply the same embargo on the Islamic Republic (Maloney, 2010). However, things were not going in a way that America had planned. European countries were giving

more importance to oil than to the support of the United States. In other words, Europe was still importing oil from Iran which clearly shows that the commerce still existed between Europe and Iran in 1980s (Graham, 1980). Moreover, in May 1980, it was seen that oil importation between Iran and Europe was increased %53 (Official Journal of the European Communities, 1981).

United States was not as happy as lark about Iran's stable rate of oil commerce with EU and Europe's rejecting attitude of collaboration. Hence, the United States started to pressurize Europe more than it did before, in order to make them to support embargo ultimately. As a consequence, thanks to US's pressure, European countries accepted to make a collaboration with America (Emery, 2010). Thus, lots of European countries (Holland, Belgium, Italy, France, Britain and Denmark (The Economist, 1980) decreased their rate of oil importation. This incident, which affected Europe indirectly, caused Western Europe to lose approximately $10 billion because of oil limitations (Emery, 2010). Nevertheless, the economic dimension of business in the Iranian side was not too tragic. Because, thanks to Iran's ability to sell its oil to third countries via indirect ways, Iran's importation was going to keep on and the country was still gaining from oil exportations (Hiro, 1991). However, this did not mean that Iran suffered no loss. Iraq-Iran war which would broke out in 1980, would change all the balance of the oil market.

At the time Khomeini took over the governance of Iran, Saddam was transferred to head of the Iraq government. After Shiite supporter Khomeini realized the Iranian Revolution, Saddam started to think that the Shiites community living in Iraq territory would be affected from this revolution and rise against Sunnis. Islamic

revolution in the neighboring country was not a good example for Iraq. The reason was that, in 1970s there were so many Shiites living in the territory that they accounted for approximately 60 percent of Iraq's total population (Karsh, 2009). Thus, Iraq turned its attention to Iran and started to bargain for settling their old scores in the hope of benefitting from Iran political upheaval and economic disturbance.

To sum up, in addition to the Shiite subject, Saddam was willing to take back the half of the Shatt al Arab which was delivered to Tehran by way of the signed agreement in 1975 (Hiro, 1991). At long last, the thought of "Iran is supporting the Iraqi Kurds" and Saddam's self-seeking made the Iraqi leader to decide to declare one of the longest wars in the Middle East. On September 22, 1980, Iran-Iraq war which would affect the prices of oil market was officially started. In addition to the drastic changes after the war lasting for 8 years, other countries behavior towards Iran and Iraq was another subject at this issue. In particular, Iraq received significant support from other countries against Iran. The U.S. was one of the Iraq supporters and also it led to the Gulf States to behave in the same direction by thinking of Iran's favor in this war would have negative repercussions in the region (Arı, 2003). In other words, Iraq was regarded as a country that might prevent Iran's possible expansionist tendencies towards the region.

The Iran-Iraq war would continue for a long time, such as about 8 years. Meanwhile, same as Iran, Iraq's oil production rate would reach very low levels which means huge losses for a country that met a large portion of its revenues from oil production.

And of course, the oil market would have its share in terms of increasing oil prices (Şen and Babalı, 2007).

As a matter of fact, responses of consumer countries against the rise in oil prices were not late and this situation made world oil consumption start to fall. For that reason, occurrence of the decrease in oil prices was not too far away. According to Christian Emery, Saudi Arabia, in order to stop this price decline, lowered its oil production at the rate of 3/4 of its total production between 1981 and 1985. However, the country's attitude would not be enough to stop price declines. Consequently in 1986, Saudi Arabia gave up lowering the oil production rate and continued oil production rapidly from where it left off. However, the results of increasing oil production would not be good at all. The oil which were $27/barrel in 1985, dropped to $12/barrel in 1986 (Hamilton, 2011). Although this case was in favor of oil consumers, these sudden declines in prices created a shock period for oil producers. As for 1988, the war between Iraq and Iran finally ended and in contrast to gain, this war left huge economic losses for both countries. Especially, Iraq suffered heavy economic losses and was burdened with an external debt that it could not be quitted easily (Karsh, 2002). Nonetheless, too much losses had made the Iraqi leader to become more ambitious to have a victory. That’s why, Iraq was a guardian of the gulf in the eyes of Saddam and it was urgent to get rid of this situation.

After two-year period, Saddam put forward some allegations which would give rise to restlessness in the Middle East. These were the first inceptions of the Gulf Crisis (Karsh and Freedman, 1993). The allegations given by Saddam ensued from two fundamental reasons. In first place, between the years of 1981 and 1990 oil prices

were lowered constantly by Gulf countries, so they caused huge losses for Iraq. Secondly, Kuwait benefited from Iraq's oil which was located in Rumeyn territory. In the light of these information, Saddam insisted on having the right of authority on Kuwait and claiming from Kuwait to delete all the subsidies that he made on Iraq (Sciolino, 1991).

Upon Kuwait's rejection of Saddam's claims, Iraqi leader Saddam, with a sudden decision, attacked on Kuwait on August 2, 1990 and caused the outbreak of the Gulf Crisis. Unsurprisingly, crude oil prices doubled with the war (Emery, 2010). In addition to all, Iraq's possibility to attack on the Middle East built the tension. Eventually, it was decided to interfere to Iraq-Kuwait war. Before long, The United Nations Security Council took a decision requiring that Iraq should withdraw from Kuwaiti territory immediately. Additionally, U.S. and other allies led by U.S. intervened in the war by sending supporting units to the territory. Meanwhile, the United Nations (UN) Security Council settled to perform "economic sanctions and arms embargo" decisions against Iraq. Despite persistence of the United Nations, U.S. and allied countries, after Saddam was determined not to withdraw from Kuwait, on 17 January 1991, the Gulf officially began with Multinational Air Force's attack of allied countries against Iraq. Thanks to supportive behavior of allied countries, the war was concluded with Iraq's withdrawal (Khadduri and Ghareeb, 1997).

Later on, the armistice negotiations were made between the Gulf War Coalition Forces and Iraqi Military Missions on 3 March 1991, and the war virtually ended. Thus, Iraq once again left another battle interference with an economic trauma. In

fact, it had to accept all the taken conditions including to remove the annexation of Kuwait and to pay compensation (Khadduri and Ghareeb, 1997).

The sharp rise in oil prices that occurred during the period of war, was pointing to approaching future market stagnation. Saudi Arabia, aware of this future risk, took action in order to repair the world oil market by using its all of extra supply. But of course, the effort of Saudi Arabia could not prevent the oil market to be affected adversely. So, the U.S., which finally could provide hassle-free gasoline shopping, was faced with another recession when it was June 1990 (Greene and Jones, 1998) .

Meanwhile, due to the growth in Industrialization, the world oil consumption was gradually increasing. Exemplarily, while the newly industrialized economies were consuming only 17% of World's oil petroleum, this proportion increased to 69% in 1998 (EIA, 2009) and the principal ones of these countries were of course the East Asian countries. Numerous of East Asian Countries, namely Thailand, Malaysia, Indonesia and South Korea, indexed their economical currency units to the dollar in order to attract foreign savings into the region. Moreover, these countries began to be known as "the Southeast Asian Tigers" from the mid-1980s because of their exhibited miraculous development (Mcnally, 1998). However, their status would not be a bed of roses in the long run.

A notable portion of the goods exported by the Asian Tigers were performed by Japan and even the required materials for manufacture were imported by Japan. Besides, in spite of intensely given external borrowing incentives for Asian banks, the economic crisis had not broken out yet by the reason of having that cash flow

(Bullard et al., 1998). Of course, relaxation of control mechanisms and institutional inspection had already prevent the situation from being pre-noticed and precautions from being taken.

The unexpected rise in the dollar value in comparison with the other currencies in 1990s caused the Asian crisis to break out. This rise in dollar made exports of the Asian countries so expensive that trading became a damaging matter of fact for them. As a result, the more the country economies grew the more the outbreak of current deficits grew, and the more harmful their effects became. Another reason for the Asian Crisis, which occurred in 1997, was a rapidly developing country, namely China. By increasing its competitive capacity by attracting foreign capital via major reforms, China left export-oriented growth model adopted by Asian Countries in a difficult situation (Bullard et al, 1998).

World oil market was quite affected after the Asian Crisis. This reduction in the price, which will probably never be seen in the future again, left many oil manufacturer countries in an unexpected trouble. Indeed, oil prices fell to $ 12 per a barrel by the end of 1998 and according to some economists it was expected to fall even more (Hamilton, 2011). The oil shock that occurred after the Asian Crisis, also caused crisis to occur in Russia in the same year. With rapidly falling oil prices, Russia's necessity of external sources suddenly increased. Thus, the reason for the country that had to borrow more in order to finance its budget deficits to go through a crisis was of course the fact that IMF declared to withdraw its support from the country after experiencing fund shortage. In this way, Russia's economy started to fall. But of course, Russian Crisis would not continue for the lifetime. Obviously,

when oil prices started to increase, Russia would leave behind the crisis and its economy would recover in short time (Wade, 1998). Although Asian and the following Russian crises began as territorial crisis, they began to be seen as global crisis for all newly- emerging markets. With the crisis, while the balance of world commodity and finance markets were corrupted, the confidence of worldwide investors was affected negatively at the same time (Yeldan, 1998).

Thanks to rapidly growing industrialization, the consumption of petroleum got back to forceful enlargement when 1999 came. Moreover, the oil prices started to increase at the same time. For instance, according to Hamilton, "The price of West Texas Intermediate continued to climb an additional 38% between November 1999 and November 2000". However, this increase wouldn't be sustainable for so long. Only after one year of this situation, the U.S. found itself facing another recession again.

In addition to afore-mentioned crises, there were two more events happened which affected the oil prices. Namely, Venezuelan crisis in December 2002 and Iraq War (Second Gulf War) that occurred in 2003 gave a rise in changing oil prices. Although Kilian (2008) defended that these two events should be counted as one of the oil shocks, indeed, the writers of most of articles except Kilian, don't count them as one of the oil crisis. Because, their influences concerning oil did not affect all the globe contrary to other petroleum crisis. Exemplarily, according to World Bank Data, after the Iraq war in 2003, there was a decrease seen in the oil prices in Iraq. Also, in spite of decreasing oil production in Venezuela which happened at the same time, it would not affect the petrol prices in the country during the year. Coming to price of world oil data, between the years of 2003-2007, the oil prices exhibited an average rising tendency for the reason of swiftly growing oil demand in the globe due to the

residual development in industrialization. Also, the decline in the oil production in Saudi Arabia and in parallel with OPEC since 2005 could possibly lead to the occurrence of increasing prices.

As argued by D. Hamilton, there is a relationship between the economic crisis and oil prices such that the economic crisis has some observable impacts on oil prices (Hamilton, 2012). When it comes to 2008, together with the effects of both the globally- increasing petroleum demand and the economic crisis of 2007, which became a global crisis after bounding from developing countries to less developing countries, a sharp increase was observed in oil prices in conjunction with soaring inflation (Alantar, 2008). Such a pitch that, between 2006 and 2008, oil prices increased with 4,6% (World Bank Data, 2014). The miscalculation of the long-run price elasticity of oil demand was seen one of the most important reasons of this recession (Hamilton, 2009). Thankfully, this observed huge increase in oil prices was recorded in 2009, probably, due to reduction of the impact of the crisis and new discovered oil reserves.

In 2010, "Arab Spring" emerged in line with the demands of Arab nations concerning their request about obtainment of democracy, freedom and human rights. The rebellions, which first started at Egypt, built a domino effect. Then the revolution jumped onto Libya, Syria, Bahrain, Algeria, Jordan and Yemen. At the same time, Saudi Arabia, Oman, Iraq, Lebanon and Morocco were affected by this snowballing reactions (Jebnoun et al., 2013). Although the energy market of Tunisia where the first upheaval occurred, had a little impact after the revolution, Libya and Algeria notified crashing actual surpluses all thought. Indeed, in Libya where the

occurrence of a civil war almost appeared, according to EIA's given information Libyan oil market was faced with one third of decline in its production rate. The effects of Arab Spring were reflected in the global energy market as increasing oil prices and rising out oil consumption rate. With regard to IEA, in 2010 fossil fuel consumption that oil products accounted for almost half of it, increased $109 billion from the year of 2009. Additionally, among 2010-2012, Egypt, Morocco, Lebanon and Jordan were faced with almost doubled deficits and in 2011, the four major stock markets of Arab territory (Egypt, Tunisia, Morocco, Lebanon) reported big losses soon after inception of the revolution. Otherwise, oil production rates in Iraq and Saudi Arabia showed a surprisingly increasing tendency.

CHAPTER 3

ENERGY PROFILE OF IRAN

Iran is the second largest economy in the Middle East with regard to GDP, which is approximately US$400 billion, and also it has the 2nd largest population in the region, which is about 80 million people (World Bank Data, 2012). Iran is counted as one of the fossil fuel rich countries in the world with 2nd largest natural gas reserves and 4th largest oil reserves in the world (Abbaszadeh et al., 2013). In Iran totally 102 oil fields and 205 oil reserves exist, which is quite enough to make the country one of the members of OPEC, and it is responsible for approximately 10% of daily oil production of OPEC (IEA, Medium Term Oil Market Report, 2012). According to the researches of IEA (Key World statistics, 2013), the efficiency of Iranian oil is higher compared to many other countries in the world. As for Iranian production level, although in 2012 the Iranian refining capacity rose to 1,7% compared to 2011, the oil production in the country showed a decreasing tendency in the same period of time according to BP Statistical Review of World Energy Report(2013) "Iranian production fell to 3,5 mb/d in 2012 and crude oil production also dropped to 2,6 mb/d in mid-2012- the lowest level in more than 20 years." According to the perspective of studies, the increased age of the reservoirs could cause the decrease in Iranian production. Hence, according to experts, most of the Iranian reserves have entered into the second half of their lives and the country is detective in the implementation of the policies which obstructs the recovery of the reserves as well (Abbaszadeh et al., 2013).

In order to protect the Iranian oil production level from sudden decreases or fluctuations and to increase its procurement level, an improvement process is needed for Iran (Campbell, 2013). By taking into consideration Iranian future targets considering its oil sector, it is obvious that the importance of the need of new investments in this area is necessary. For instance, one of Iran's ambitions is to become the second largest crude oil producer in OPEC (Ministry of Petroleum of Iran, 2012). Besides, the domestic oil demand will rise up to 2, 2 % (IEA, Key World Statistics, 2013) and according to the US Energy Information Administration, Iranian oil production is expected to grow to 6, 8 mb/d in 2030.

On the other hand, in case of persisting in the international sanctions on Iran, it is estimated that the Iranian oil production will remain low in the future and the production level can't recover itself until 2020 (Yazdan et al., 2012). Hence, the investment policy for Iranian oil sector has to be considered as the domestic demand increases and according to very famous information source the production level tends to increase, and the most importantly, for the reserves to become exhausted is the key factor for the necessity of investment. Indeed, also the country is in need of the usage of enhanced oil recovery techniques which serve the purpose of extracting the production level (IEA, 2013). Considering oil recovery techniques, natural gas is used to increase the oil production via injecting it to the oil wells in order to maintain the production (Stern, 2007). However, the lack of investment and lack of access to the technical equipment because of the international sanctions cause an increase in the Iranian domestic gas consumption level, especially in power generation. Thus, it becomes hard to find the available amount of natural gas for reinjection into oil fields.

In fact, considering the energy policy in Iran, it can be seen that the country is trying to protect its oil reserves and to limit oil consumption. For instance, Iran is among the countries that prefer using natural gas in alternative for oil in transportation sector where oil is the most used energy product (Engerer and Horn, 2010). Apparently, one of the main reasons of that policy is to pave the way for exporting the oil from Iran. Because, as it is mentioned above, it is clear that the more the energy consumption increases, the more the oil usage will increase in this country. Considering the inability of Iran to use the recent technology and the tiredness of its reserves, the increase in domestic oil consumption will cause great troubles for the country. For this reason, Iran, unable to increase this technology adequately with its own facilities, found a solution of using an alternative source, that is, natural gas.

IEA (World Energy Outlook, 2013), published in 2013, suggests that 'the production level of natural gas will increase significantly until 2035.Here, It can be seen that Iran aims to be a key player on both natural gas and oil exportation. One of the factors which affect the production policy of Iran may be the fact that natural gas consumption level is expected to increase in India and Pakistan (Verma, 2007). Iran is an exporter country which has the potential to sustain South Asia. In June 2013, the Iran government announced that they started the talks with Indian investors and they were planning to sign a contract with them(Rizvi, 2014).This contract is critically important as it is the first contract that has been signed since Iranian Revolution in 1979. Considering the increasing energy demand of Iran, its aims to increase exportation and the present situation of its natural resources, it might be predicted that one of the potential solutions for the country is to make an investment

on renewable energy. Also, according to researches, to increase the usage of renewable energy is one of the necessities of Iran.

Apart from the energy profile of the country, although the industry does not develop well, the rate of Greenhouse gas emissions increase progressively. Having huge amount of fossil fuel reserves and lack of Access to technical expertise lead the consumption of oil and natural gas in parallel with its CO2 emission rates which is measured as 529,98 Mt (IEA, Key World Statistics, 2013). Moreover, Iran also uses the fossil fuels for the electricity production that the country is 3rd biggest electricity producer from oil in the World with 67 Twh, and also after U.S., Russia and Japan Iran is the biggest electricity producer from natural gas with 160 Twh (IEA,2013).

When these all events are evaluated, it seems logical for Iran to invest on renewable energy that has a lower rate of usage. According to researches made in Iran, there exists a huge potential for renewable energy usage in the country (Mohammadi et al., 2014). IEA World Energy Outlook (2013) suggests that 'there are minimum 26 suitable regions existing for constructing the wind energy and that the capacity of these regions is around 6500MW". By using the renewable energy, Iran to be able to reduce the pressure on the petroleum industry energy has evaluated alternative resource usage, so that one of the goals of the country on this topic got its place in the list as producing electricity from renewable energy more than 5000MW by 2015.

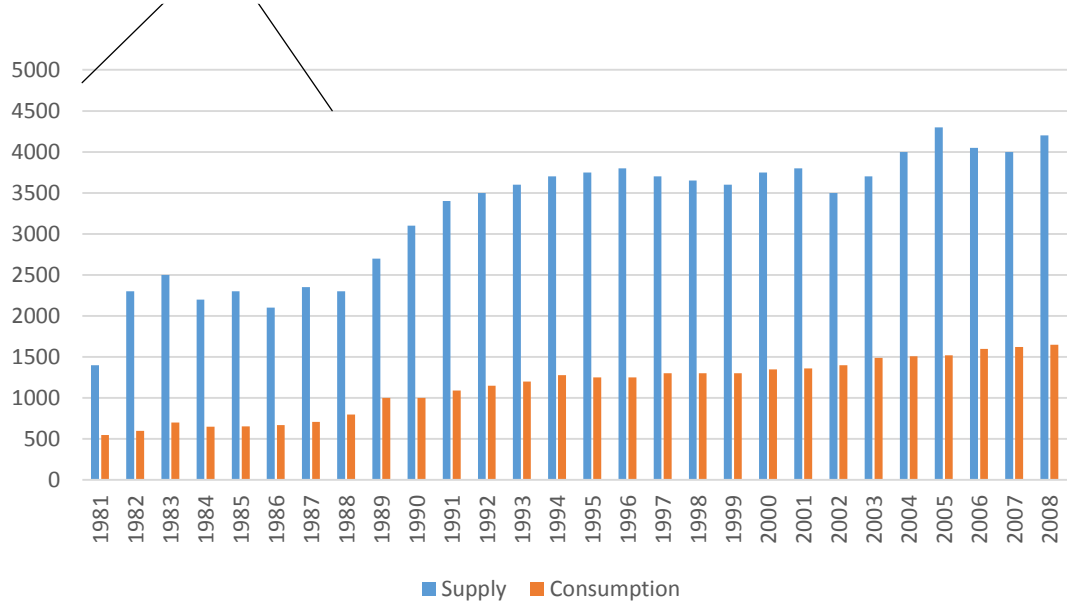
While the usage of clean energy as an alternative is mentioned here, it will be beneficial to express Iranian Nuclear Energy consumption that was mentioned in the previous chapter. Meeting with the concept of nuclear energy with the support of the

US, Iran disputed with the US and depending on this, with European countries after some circumstances which happened right after the Revolution and for this reason, Iran not only took bad reaction from world countries but also had to face with some sanctions because of persistence in studying on nuclear energy. In fact, the US sanctions caused OPEC's third largest producer to depreciate by $133 million (Bloomberg, 2012).

When this amount on a yearly basis is assessed, it shows that Iranian economy depreciates by %10 of its economy every year because of these sanctions. One of the reasons that Iranian Oil Industry is so costly because of the sanctions is that the big companies having invested on Iranian oil and gas left the country and were displaced by smaller and less known companies. Looking back to the history, it can be realized that wars, economic crises and political interests are very closely related to the energy phenomenon. It is possible for us to witness these events and similar events which have directly affected energy markets in history such as the effects of above-cited sanctions on Iranian energy portfolio. World Bank data will enlighten the research considering how the effects to be dealt with in the succeeding chapters comprehensively act on Iranian energy portfolio. According to this data obtained from this source, it can be generally said that petroleum production and energy use are negatively affected by wars and economic crises. In addition, when a quick look is taken at the data, the necessary opinion about the nuclear history of Iran can be procured.

Figure:1

Oil Supply and Oil Consumption in Iran



Source: Internatioal Energy Agency, 2013

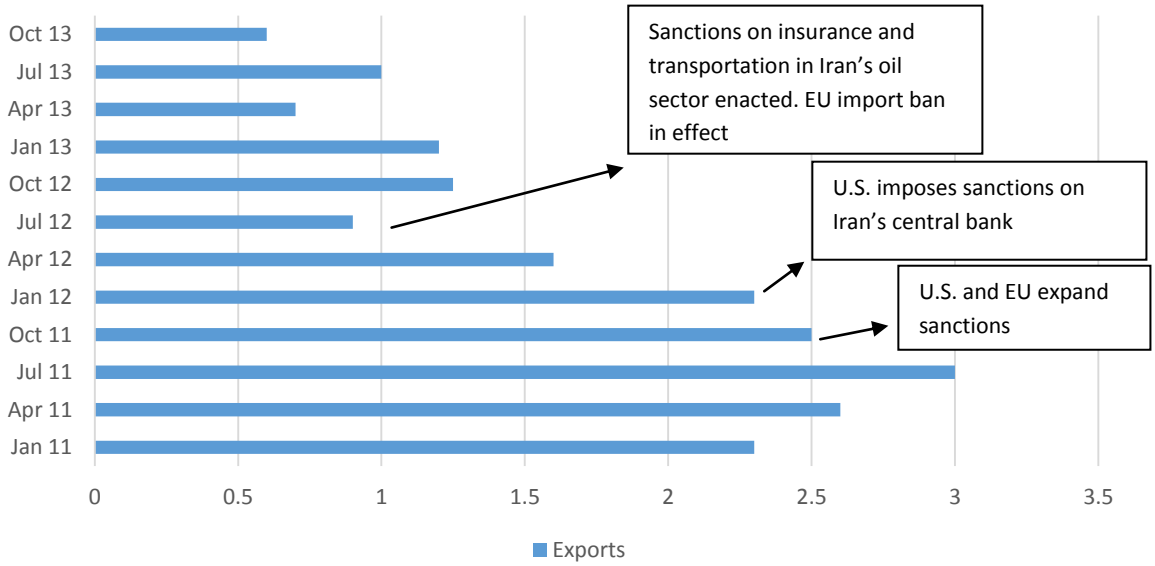
In 1979, there was a sharp decrease that occurred in Iranian total production level for the reason of Islamic revolution (Barsky and Killian, 2004). In addition, the effect of Hostage crisis which was the reason for quitting the support of the US on Iran that happened right after the revolution-in the same year, has also made things difficult for Iran. Also, during the Iran-Iraq war a sharp decrease was observed again in the level of Iranian production. Of course, the nuclear issue is one of the most effective subjects that has influenced on Iranian energy perspective.

Along with Iran's announcement concerning its willingness about restarting its uranium exchange activities in 2006, the production level which showed a decreasing tendency after the nuclear crisis in 2002, continued to fall down. As a matter of fact, together with the acceptance of enlarged sanctions on Iran, the production level regressed to approximately the same level at which it was after the nuclear crisis.

Because, the approved sanctions in 2010 have imposed restriction about Iranian oil importation until 2012 as shown in figure 1 and figure 2.

Figure 2:

Iranian Crude Oil Exports 2011-2013

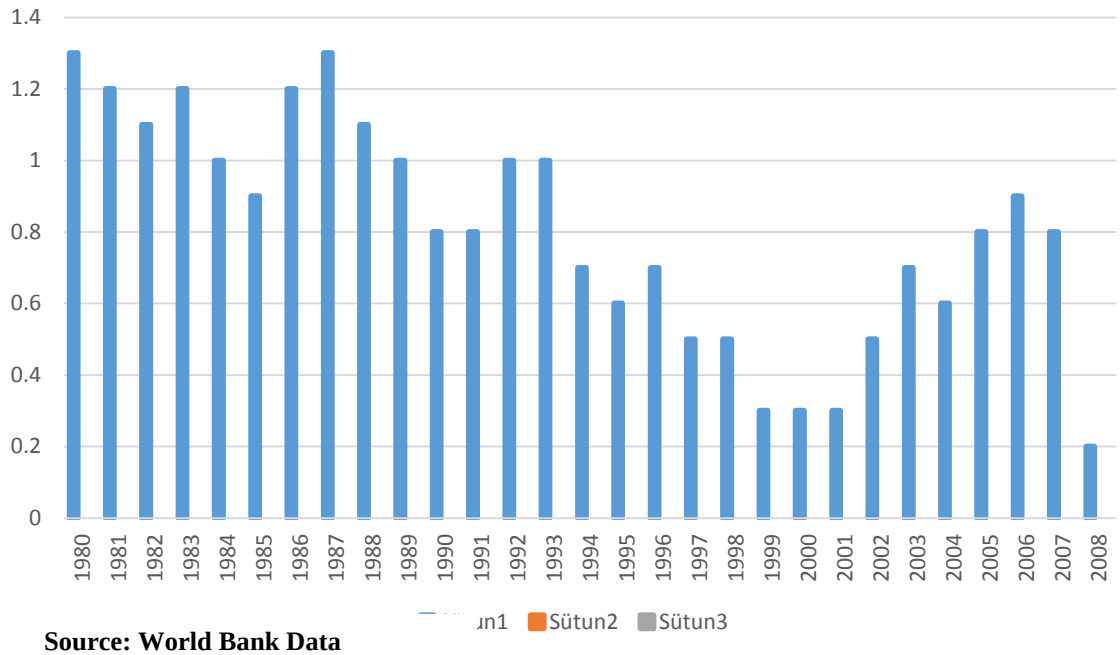


Source: International Energy Agency, Energy Outlook 2013

Among from Iranian fossil fuel perspective, by looking at the data of renewable energy usage in Iran, the politic impacts on imported technology could be seen easily. As a matter of fact, although the nuclear energy rate is the highest of that observed up to now, the Iranian energy use has never reached the rate in 1980s even if it draws an increasing- decreasing graph. As it was mentioned in the previous chapter, Iran got through a real recession period after the US support was cut on nuclear energy as shown in figure 3.

Figure 3:

[1] **Iranian Alternative and Nuclear Energy Usage (% of total energy use)**



Source: World Bank Data

Moreover, for the reason of sanctions, the amount of investors that was interested in Iran declined and even Azerbaijan State Oil Company (SOCAR) declared that they are not planning to use Iranian gas for TANAP project. Therefore, Iran began to search for new customers and investors. If Iran reaches a deal with the international community and thus, have the chance to get rid of the enforcement of sanctions, the country can support the global oil production with 4 mb/d higher from now (IEA, 2013).

In summary, together with passing over the sanctions that affected Iranian energy portfolio, the country may show that they have important capacity to contribute to

[1] According to World Bank Data there were no nuclear energy production in Iran until 2011 (0, 359 Twh). For that reason this graph is interpreted as renewable energy usage of Iran.

world countries in terms of fossil fuel. However, for this to become real, Iran needs to be sanctioned on. The investment requirement of almost $200billion now is predicted to rise up to $500 billion within 15 years, but unfortunately because of these sanctions, Iran does not attract the attention of investors. Moreover, lower prices and the problem of undeveloped industry caused the increase of fossil fuel consumption progressively. Also, oil production cannot meet the demand for the oil consumption and it has diminishing slope on the curve as well. Iranian Government is following the policy of substituting oil with natural gas. When fossil fuel can also be used for electricity production is considered, then CO_2 emissions will reach a plot with increasing rate. In order to avoid this case, Iran has to shift to clean energy sources such as renewable and nuclear energy.

CHAPTER 4

NUCLEAR ENERGY'S ROLE IN THE WORLD AND NON-PROLIFERATION TREATY

The sense of constantly broadening competition and increasing technological developments allowed science to be developed the science and these efforts started in the shortest time, to bear its fruit, putting the United States on history as the first country to have the capacity to produce nuclear weapons. Observing the results after using nuclear weapons on Hiroshima and Nagasaki territories, United States made a decision about not sharing their knowledge about the nuclear weapons with other countries in order to prevent nuclear weapon dissemination (Hasegawa, 2011). However, through the access of the Soviet Union to the capacity to develop nuclear weapons, the USA gave up the policy, considering it favorable to share the knowledge of nuclear technology with one of the allies, the UK. (Chao and Niblett, 2006).

However, the attitude of England wouldn't be as similar as the United States foresaw. British firms started to achieve substantial gains from nuclear technology transferring. The USA, having realized that technology it hesitated to share was becoming widespread through the UK., decided to follow the policy " Atoms for Peace", which would prevent nuclear weapons from spreading but would not hinder nuclear energy usage (Krige, 2008). During this period of time, many countries' awareness of the power of nuclear weapons and access to the nuclear technology caused lots of countries to take steps on producing nuclear weapons. In addition,

together with reducing the dependence on fossil fuels and the effects of global warming factor, many countries started to agree to nuclear energy as an alternative energy resource (Hecht, 2012).

This rising curiosity on nuclear issue caused a disturbance both in the United States and the Soviet Union and they both started to worry about the course of events about the nuclear arms. Ultimately, on July 1, 1968 a treaty, "Nuclear Weapons Proliferation Treaty (NPT)", which was believed to be a solution for refraining countries from producing nuclear weapons, was constituted , was opened for signature, and was signed by many countries. The main aim of this treaty, as the name suggests, was to prevent armament by preventing the spread of nuclear weapons and to procure to use of the nuclear energy only for peaceful targets (Allison, 2004).

In spite of having the opportunity for peaceful usage, the nuclear issue has always been a critical point for the globe. Of course, it is hard to deny the huge wrecking capacity of the nuclear energy. But also, a nuclear power plant can provide huge amounts of energy. According to the researches, growing nuclear energy usage up suits U.S.'s book. Because, United States and counterpart high rate oil consuming countries have always been dependent on imported fossil fuels. If other consumer countries steered for meeting their energy demand from nuclear energy, most of fossil fuel reserves would be freed (Toth and Rogner, 2006). However, in case of using the nuclear energy as a weapon, it would lead the world become face to face with the damages of its results**.** So, the NPT has seen a great solution to prevent nuclear armament while not forbidding nuclear energy usage (Muller et al., 1994).

After the NPT, countries were divided into two groups as the countries which possess nuclear weapons and those which do not have nuclear weapons. However, even the treaty that was constituted for the purpose of nuclear disarmament, would not be enough to stop the countries which could have already constructed nuclear weapons up to that date. As a matter of fact, thanks to the audit of International Atomic Energy Agency (IAEA), some weak points would be found related to NPT in 1971. One of the most important weakness among these items was the fact that IAEA inspectors could enter the plants allowed by signatory countries (Muller, 1990). This aspect of NPT was argued for many years until the defeat of Iraq at Kuwait territory. After the Iraq-Kuwait war, some of Iraqi secret projects, which were pertinent to the production of nuclear weapons, were came to light. As being a member of NPT, this behavior of Iraq submitted a concrete example for one of the deficits of NPT. In this way, the necessity of taking measures in the treaty was better understood and thus, the process of generating solutions was started immediately (Simpson, 1991).

By the year 1993, improvements within the scope of IAEA rose to the occasion and IAEA inspections were strengthened via the arrangement of 93+2 program. Thanks to this, it was guaranteed that the inspection regime named "Additional Protocol" occurred (Zak, 2002). Thus, for the purpose of tightening the controls of IAEA, the right giving the permission to perform immediate inspections to contractor countries, was accorded to IAEA. Thus, IAEA would have the ability to realize sudden supervisions. However, the additional protocol has an important difference than other protocols that NPT Member states were not obliged to be a side of the additional protocol (Hirsch, 2004).

Along with many countries' being convinced of NTP's necessity, it was decided to unconditionally and indefinitely protract the NPT at NPT Review and Extension Conference (NPTREC) in 1995. Cuba, India, Israel and Pakistan preferred to stay out of the NPT, while all states of the former Soviet Union countries except Russia decided to join the NPT by way of leaving their Nuclear weapons. Although the adoption of the agreement was witnessed mostly, there were still some application-oriented problems at hand. For example, in spite of being a promoter of the NPT, North Korea continued performing infringements (Huntley, 2006). In view of this, the universality of the treaty was assessed in NPT review conferences to be carried out later and some detected insufficiencies were talked about (Dhanapala, 2000).

Looking back through the history, it was observed that to control the willingness of power is harder than to control the released energy from a nuclear facility. After a big technologic discovery of U.S, countries as to say started to compete each other to reach the nuclear power. According to researches, it is hard to be sure whether the aim of the countries was peaceful or not. But, the result of an erupted nuclear weapon must have worried lots of the countries, especially the U.S. that it led them to develop the NPT in order to discipline their sense of power. Although, double coincidence of wishes of many countries lead them to sign the NPT, the functionality of this agreement is still seemed argumentative at today's conditions, so as the NPT is seen to have been insufficient in North Korea and Iran crisis. In the light of analysis, in case these problems are not resolved with diplomatic methods, the danger of facing the risk of losing the functionality of NPT may arise later on (Mureşan, 2006).

4.1 Introducing to Nuclear Technology, the Non-Proliferation Treaty and Iran

Iran, which is also a fossil fuel rich country, has become introduced to nuclear energy in 1959 by establishing Tehran Nuclear Research program by America as a result of signing the program " the Atoms for Peace" (Sahimi, 2003). Meanwhile, nuclear energy was thought to be a necessity for Iran, which received the great support of U.S. When the NPT agreement was developed as a precaution against nuclear disarmament, Iran was involved in the contractor of NPT countries at the date of 1968. Thus, the right of performing nuclear activities, production and research, to provide the necessary materials and technology has officially been given to Iran without suffering any discrimination (Kim, 2014).

When it comes to 1970s, oil crisis that suddenly occurred created a shocking effect in the world, drawing the attention of the world to another important issue, oil; and at this time oil prices increased. It's the first time that the globe understood the importance of oil in the life circle. However, it cannot be said that all of the countries went downhill by the oil crisis. Exemplary, Iran was one of the countries which saw this crisis as an opportunity and gained huge profits by entering elevation process with increasing its oil exportation (Yergin, 2006) Along with the recovery of the Iranian economy, Shah of Iran, who fixed his eyes on making energy-related investments, decided to develop 23.000MW nuclear power capacity until 2000 by foreseeing Iran's rising energy demand in the days to come. This decision pushed the Iranian government to make inroads in a short time. Thus, Iran Atomic Energy Authority was officially established in 1974 (Maragheh, 2002).

The US was leaning towards Iran's efforts on nuclear energy just like Europe. While Europe's this attitude was thought to be linked with the guidance of United States, the Ford Strategy Report shed light on the reason of U.S.'s supportive behavior (Nemchenok, 2009). According to the report, introducing the nuclear energy issue into Iran both would contribute to the country's economy and would enable the breakaway oil reserves to be exported thanks to this technology and to be used for converting them into other petrochemicals (Linzer, 2005). It follows from this that United States with a high ratio of oil consumption could benefit from these breakaway reserves (Liu, 1991).

Among other things, Iran was still keeping on taking steps to reach its goal related to nuclear energy. During that period of time, the country made an agreement with Germany about conducting six nuclear power plants, also made another agreement with the U.S. in relation to nuclear energy alteration and nuclear safety cooperation (Charnysh, 2006). Besides, when it comes to 1978, Iran sat the same table with the U.S. again to sign Nuclear Energy Agreement. In this way, the exportation of required nuclear equipment has been facilitated (Katzman, 2010).

Thus far, Iran was supported from nuclear side. However, it needs to say here that, the energy relations have always been related with the politics (Jenkins and Smith, 1990). In Shah's management, Iran was on good terms with U.S. As a result, the good relations among these two countries made many things smooth sailing. However, all the balance would change after Shah abdicated (Farber, 2009).

Along with the Iranian revolution, the nuclear program, which has been developed since 1979, entered a period of recession. One of the reasons for this was the worsening relationship between Iran and U.S. after Khomeini, who came to power after the revolution, in spite of having good connections with Iran under the Shah management (Kemp, 1993). Therefore, the nuclear energy that was seen a necessary technology for Iran under the power of Shah became a forbidden fruit for the country during provision time of Khomeini (Bahgat, 2006).

In addition, together with the Iran-Iraq war that began one year after the Iranian revolution, the firms associated with the Iranian nuclear projects also left Iran. Also, during the war, some of Iranian nuclear facilities were bombed and got major damages (Rajace, 1993). Moreover, in addition to severe economic bills that occurred after Iran-Iraq war, Iran's electrical energy requirements increased in a good deal (Rajace, 1993). Thereupon, Iran tried to find solutions for this problem and the nuclear issue had previously been brought to a certain degree before, has been put on the agenda again. Subsequently Iran, having decided to finish the plant whose constructions were left unanswered, started to look for collaborator countries to complete these plants. By virtue of the fact that Iran could not complete them on its own without the technical support of U.S. and Europe, which were the previous collaborators of Iran. After its relationship broke down with U.S., Europe also withdrew from its support on Iran for the reason of U.S.'s pressure. During this period of time, Iran did not give up looking for new collaborators and it developed its nuclear-relations with China (Dorraj, 2008). According to many sources it is believed that China-Iran correlation has continued ever since the nuclear crisis in 2002. In addition to the orientation of China, Iran also attempted to make another correlation

with Russia. Even in 1995, Iran signed a comprehensive nuclear treaty with the Russian Ministry of Atomic Energy (Eisenstadt, 1996).

Of course, the U.S., who completely broke off its relations with Iran and withdrew its support did not hesitated to undermine Iran ,which the US regarded as an enemy, and tried to convince Russia by not leaning the relationship between Iran and Russia. But in the meanwhile, the idea of giving up this correlation with Iran seeming to be supportive of the ailing Russian economy did not appeal to Russia and Russia did not give up the idea. Moreover, Russia would find a chance to control nuclear gains of Iran by making a correlation with the country (Trenin, 2006). Unsurprisingly, after Russia's refusal to U.S.'s offer, the U.S. began to claim that Iran started to produce nuclear weapons. Iran, having drawn the attention over itself through the claims of the United States, was stuck in a difficult situation for the reason of surfacing its nuclear projects according to the information obtained by the National Resistance Council and the People's Mujahidin Organization from inner sources of Iran. Based on the aforementioned information that appeared in 2002, Iran has a secret nuclear project about water reactors and a uranium enrichment plant that Iran conducted without informing IAEA. However, the reason of carrying out these projects without notifying them to IAEA made things difficult for Iran and after Iran's hiding nuclear project came into light, the country would find itself facing with lots of economic and political problems. For that reason this event has been recognized as the beginning of the Iranian nuclear crisis (Jafarzadeh, 2007).

Right after disclosure of Iranian nuclear projects, U.S. didn't delay to report that all the Iranian nuclear enrichment activities were required to be terminated. In addition,

it is worth stating here that Iran didn't have an imperative notification to IAEA before constructing new nuclear facilities. According to the agreement, Iran was supposed to notify to IAEA 180 days before stinging of nuclear fuel into its nuclear facilities (IAEA, INFCIR/214, 1974). Following these events, IAEA, who completed its inspections in Iran, made a statement about the worrisome situation in Iran. In the light of IAEA's given directions, there were no uranium enrichment activities found in Iran and all the nuclear-related running partook of a simulation study. Thanks to Iran's cooperation with IAEA about aforementioned matters and its efforts related to provide necessary information to the agency, the Iranian nuclear crisis did not reach worrisome dimensions for the globe. Further, alongside of not being leery of stating how satisfying to collaborate with Iran was for the agency, IAEA has also made the removal of Additional Protocol a current issue in every time in order to ensure greater transparency for Iran (Ekinci,2009).

As a result, the "Additional protocol" of NPT was signed on December 18, 2003 by Iran. At this point, the country was still trying to seem more trustable for IAEI, hence Iran announced that before the protocol confirmed it, Iran wouldn't act in accordance with the Additional Protocol, which needed to be approved by the parliament in order to be implemented by keeping the policy that it presented up to then (Hirsh, 2004).

The reason for Iran's act about performing the provisions of the Additional Protocol voluntarily and being in cahoots with the agency, prompted England, France and Germany (so called triad of EU or EU3) to take the next step. As a result of the negotiations, the Treaty of Paris was signed on 15 November 2004 and Iran agreed to

take trust-creating measures as a volunteer. In other words, Iran accepted to suspend all of Iranian uranium enrichment, conversion and reprocessing activities and to continue to practice the provisions of the "Additional Protocol"(Ekinci, 2009). In this way, the IAEA had the opportunity of examining Iranian nuclear program intensely as of February 2004(IAEA, staff report, 18 December 2003). However, by virtue of Iran's uncooperative behavior related to the examination of Iranian nuclear activities brought about rising the concerns about the country. Herewith, this situation led the Western powers to convince the U.S. in order to take its support. In very deed, all the chaos would start after a short period of time for Iran and these were the first signals of it. But of course, when the Iranian government, which elected Mahmoud Ahmadinejad as a president in 2005, cleared up that Iran started the operations related to uranium conversion again at the plant in Isfahan, it led the authorities over Iran to be quick off the mark (Bolton and Congress, 2010). Thus, the agency quickly adopted the obligation, which was stating that Iran did not correspond to security obligations. As a result of this final progress, the second detente process that was established by dint of the Paris Agreement, came to an end.

In January 2006, Iran informed the IAEA about its willingness to restart Iranian research and development activities which the country agreed to stop voluntarily before (IAEA, Updated brief by Deputy Director General for Safeguards, 2006). Further, IAEA submitted the Iran file to the UNSC again on the grounds that seals of the file were removed (Turkish Foreign Ministry, the Information about final Nuclear Program in Iran, 2010). After this point, UNSCR demanded from Iran to stop Iranian uranium enrichment and its reprocessing activities. Besides, with the decision of UNSCR 1737 (2006), all the directly or indirectly sale of sensitive nuclear materials,

technology and ballistic missiles were banned for the country, likewise to suspend all the sensitive nuclear work which were detected by IAEA, was determined (Ekinci, 2009). Also, with the numbered decision of 1747 (2007), the economic and trade sanctions on Tehran were expanded.

When it came to 2009, U.S.'s harsh attitude on Iran started to decline gradually. So much so that, U.S. president Barack Obama offered to start an unconditional dialogue with Iran about its nuclear program and on this wise, Iran found a chance to report its uranium facility that the country had already started to build for peaceful purposes to IAEA (Katzman, 2014).

Right after, on October 1, 2009, five permanent UNSC members and Germany that is also formulated as P5+1 countries, came together with Iran to discuss fuel rods requirements. But unfortunately at this meeting a compromise couldn't be reached. Besides, for that reason the IAEA made a decision, which was requiring suspension of the construction of the nuclear power plant, on 27 November 2009. Subsequently, the declaration which suggested retaining low riched uranium in Turkey was signed by Iran, Turkey and Brazil on 17 May 2010 (Turkish Foreign Minister, 2011). Despite the headways, the IAEA management demanded Iran to co-operate in a transparent manner in order to remove the concerns related to military dimensions of Iranian nuclear program (Yurtsever, 2012).

With regard to removal of these concerns, the attitudes of other organs linked to UN (except the IAEA) caught the attention. In studies conducted by the UN, the U.S. supported the implementation of sanctions on Iran, while China and Russia opposed

the implementation of heavy sanctions on Iran. UNSC, on the other hand, demanded Iran to halt its uranium enrichment activities and to increase its cooperation with IAEA in general (Akbaş and Baş, 2013).

In June 2010, UNSC's sanctions, which targeted Iranian nuclear activities and also more stringent financial constraints, extended cargo controls and the arms embargo, were adopted (Turkish Foreign Ministry, 2011). Although Turkey and Brazil objected to this decision, a total of 12 countries including 5 permanent members – the USA, Britain, France, Russia, China in the 15-membered UNSC voted in favor. After Iran explained not to take a step back despite all these restrictions, it was confronted with the interventions of the United States. Subsequently, when USA convoked the countries to abandon oil purchases from Iran till June 28, 2012, EU announced that they would implement the embargo from July 1, 2012 onwards. As understood here, Iran took great reactions from the world related to nuclear issue, the economy of the country suffered a lot together with these great restrictions on the country and the nuclear studies cost a pretty penny to the country (Bolton and Congress, 2010).

But, when it was November 24, 2013, a surprising development occurred. The softening period, which started after the election of Hassan Rouhani as the President in August and which resulted in Iran and the USA communicating each other for the first time in history since the 1979 Iran Islamic Revolution in the course of the sessions of UNSC in September, produced the first concrete result at this date. During the negotiations in Geneva between P5+1 countries and Iran, a treaty was for the first time achieved on Iran’s nuclear program (Albright, 2014).

According to the interim agreement, which allowed for six- month period to the international community and Iran for the purpose of a comprehensive final deal, Iran was foreseen to stop its nuclear program to a large extent, to reset enriched uranium operations over 5%, to dispose of 20% of the current enriched uranium at hand, and to expand the controls. In return to all these international community was foreseen to try a sanction relief estimated to be 7 million dollars on Iran (Akbaş and Baş, 2013). Thus, the major powers of the world officially recognized Iran's right of nuclear activities.

CHAPTER 5

HISTORY OF THE RELATIONS BETWEEN EUROPEAN UNION AND IRAN

The richness of Iran from the viewpoint of fossil fuels was mentioned in previous parts. In spite of having huge reserves, the country could not improve its oil market efficiently enough. One of the most important reasons of this situation is obviously Iran's relations with Europe which are not going well even in the present time. After the approval of UNSC's sanctions, which targeted Iranian nuclear activities and also more stringent financial constraints, EU announced that they would implement the embargo on Iran as from July 1, 2012. (Ekinci, 2009). For that reason, EU is an important factor for Iran from the point of being the community which implements the recent sanction on Iran.

When a quick glance is taken on EU-Iran relations, United Kingdom has been the first country, which interested in Iran, among other EU partners. The competition between UK and its opponent Russia, which was based on the ambition of gaining the resources on Iran, has continued since the mid-twentieth century (Özcan, 2006). Apart from that, US's closer relationship with Iran also caused EU to develop a step back policy on its politic relations with Iran. Unlikely, the trade relations between Iran and EU have existed since 380 B.Ch.E. and it can be said that the EU and Iran trade relations have been merchandized mostly on energy products (Moshaver, 2003). However, the trade relations among the two could not help prevent EU from growing away from Iran that aforementioned commerce has also been affected from

the sanctions of UNSC in a negative way. In fact, blowing up Iranian nuclear activities has been a determinant factor for EU-Iran relations. Due to this reason, at present there is no correlation or a contractual relation existing between them (European Commission, 2014).

In the time of the Shah, the foreign relations of Iran were so hope-inspiring that even an agreement was signed between the two at the time. However, it could not be a longevity agreement that it lapsed in 1977. After the Islamic revolution in 1979, which caused an alteration in the balances of the world, EU minimized its politic relations with Iran both for the pressure of the US and for the applied embargo which prevented the petrol trade with Iran (Moshaver, 2003).

After the war occurred between Iraq and Iran in 1980, the USA and EU chose to take side with Iraq, which caused the relationships between EU and Iran to become stable. Only after 21 years, by signing Maastricht Pact in 1999, Europe was able to take the first step about creating an efficient foreign policy over Iran along with the development of CFSF (Dry burgh, 2008). The most important reason of Europe being that much slow was that they could not make a common decision because of the conflicts on foreign policy. However, after the war between Iraq and Kuwait, in 1992, EU changed its political attitude over Iran and started to give some initiatives to the country (Council of the EU, 1992). In the meantime, the political aim of Europe was formed as focusing subjects such as the disarmament of Iran, collaboration for the subject of weapons of mass destruction, terrorism and human rights (Dryburgh, 2008). This critical period lasting five years ended in 1997 by the murder of four Iranian Kurdish dissident people against the regime in September

1992 and by the fact that German court decided that it was committed by Iranian secret agency on the order of government. This aforementioned crisis was going to be recorded as Mykonos Crisis in history (Santini, 2010). This event caused the political tension between Germany and Iran to become official and a European Court to officially blame Iranian Government in front of world public opinion for murder, reflecting to the relations between the EU and Iran. Exemplarily, after the crisis occurred, member countries of the EU recalled their ambassadors in Tehran and bilateral relations in state level were suspended. Besides, the Union had previously decided not to sell any weapons to Iran and they applied precaution package which included disallowing Iranian secret service staffs to enter the member countries (Denza, 2005). Subsequently, after Mohammed Khatami had officially been elected for the Presidency of Iran in August 1997, EU-Iran relations had been shaped and formed again (Tarock, 1999). In 1998, a comprehensive dialogue process began that would provide mutual benefits and rebuild the relations with Iran (European Commission, 2014). Although this comprehensive dialogue helped the EU-Iran relations to be developed, it remained limited. Because there was no contractual framework between two countries, the collaboration was not able to be settled.

After the news expressed that Iran had admitted carrying out the 9/11 attacks on the US, the recovering EU- Iran relations were damaged again (Smith, 2002). After that event happened, EU having focused on weapons of mass destruction became so sensible about this subject on their relations with Iran. The EU having increased the negotiations with the country started political dialogues and those on human rights in 2002. In fact, after Iran declared that they would continue on nuclear studies, the Union changed their focus to Iran's nuclear policy (Ekinci, 2009). After Iran was

detected and confirmed to have made nuclear studies without declaring to IAEA, a panic was experienced and the thought that Iran was performing nuclear studies to produce weapons became common among many Western experts (Fitzpatrick, 2006). Thus, this event certainly caused Iranian nuclear crisis to break out. As it was mentioned in the previous chapters, Iran's effort to gain confidence and collaboration policy prevented the crisis from taking huge reactions all over the world. However, these positive policies of Iran were not enough to remove whole concerns at all in spite of reducing some of them.

Meantime, the USA was in efforts of making available to avoid nuclear activities via some agreements with Iran. However, the US, seeking a settlement with Iran and thinking of preventing nuclear activities, could not find any opportunity to change its attitude because of going to the war with Iraq at the same year (Wald and Brown, 2014). Consequently the EU having undertaken the power of intervention, started to get prepared to intervene to this case as an external actor. In this context, negotiations have begun with Iran about Trade and Consortium Pact in December, 2002. Moreover, Iran was asked to sign additional protocols with UAEA. However, these negotiations were suspended after Iran had rejected the protocol (Sauer, 2008). Therefore, the comprehensive dialogue process that had begun in 1997, after elections of Mohammed Khatami, came to an end in 2003 (Ekinci, 2009).

After Iran had begun the nuclear studies without any declaration to IAEA, there was a panic among many Western experts and they thought that Iran was studying on nuclear in order to produce weapon (Fitzpatrick, 2006). Thus, this event certainly caused Iranian nuclear crisis to break out. Besides, even the positive policies of Iran

were not enough to remove the whole concerns at all. Additionally, the pressure of U.S. considering Iran was still being effective on foreign countries. Inspite of the willingness of U.S. about blocking Iranian nuclear studies, the country could not realize it for the reason of Iraq War (Wald and Brown, 2014).

Next, EU trying to be a diplomatic arranger between Iran and US set out as Iran tended to deal with nuclear policy and kept agenda busy with it. On October 21st 2003, foreign ministers of three EU member countries went to Tehran in order to negotiate directly on Tehran regime and succeed in persuading Iran to sign an agreement named Tehran Declaration (Samore, 2013).

After three foreign ministers visited the country, Iran presented a full declaration about nuclear program. One of the conspicuous cases here was that foreign policy of the EU had been conducted by three powerful countries of the Union such as France, Germany and the United Kingdom. EU/3, which was established by these three foreign ministers, showed that EU had never built or formed such a foreign policy like that. However, as the foreign policy was applied by the Union, other countries were not required to intervene on it individually (Hemmer, 2007). Therefore, after that period, such countries as England did not need to create a private policy over Iran again. In the meantime, although EU focused more on Iran's nuclear program, they resumed the dialogue process about politics and human rights. However, the EU whose primary goal was to stop the nuclear projects clarified that they kept this attitude of theirs despite positive approaches (Goodarzi, 2008).

In November 2004, EU/3 implied that the negotiations would not continue unless Tehran ended the nuclear program (Moller, 2007). Thus, EU/3 tried to enable Iran to be integrated to the international system by trying to get supports from powerful actors such as China, Russian Federation and the US (Dryburgh, 2008). Of course, beyond the policy of the EU, there lied some concerns about Iran's nuclear armament. In 2004, the EU-Iran relations were developed and by December, there were some study groups existing between EU and Iran focused on specific themes, such as nuclear technology transfer, trade and collaboration and security subjects (European Commission, 2014). However, this case would not last so long.

In January 2005, the negotiation process between EU and Iran started to decay. While Iran was demanding to complete the negotiations early, EU meant to extend the period. In fact, after the USA Government suggested that they did not get sufficient amount of security from Iran, the Iranian Government thought that EU leaders who did not collaborate were responsible from these concerns and declared to resume on nuclear studies (Santini, 2010). Against the threat of Iran, EU has used their trumps as pausing the negotiations.

While the mutual showdown continued, the election of Ahmadinejad, who was known as a more conservative politician, to the Iranian presidency started concerns about the fact that the EU-Iranian relations would not go on positively (Samuel, 2012). In order to eliminate these concerns, the EU opened all the doors to Iran and also suggested to maximize the relations with the country to the highest level after 79 revolution. However, EU set out another foreign policy inconsistency, right after this

disclosure, and explained that they supported the UAEA decision referring to the ban of nuclear equipment exportation by the UN Security Council (IAEA, 2006).

Yet, as soon as Ahmadinejad started to his service, he announced that Iran has a right to produce its own nuclear fuel and this droid also involves the process of uranium enrichment (Dryburg, 2008). Ultimately, in the light of these information the council stopped the negotiation process by showing Iran's uranium conversion explanation as a justification. By taking the latest developments as an opportunity, EU achieved to convince Russia and China for the first time of not vetoing the decision of IAEA concerning Iran's discordant behavior to the rules of the agency. Thus, the decision of IAEA Board of Directors has accepted. It is useful to say that one of most prominent features of this period during which five permanent members of UN Security Council (The US, Russia, China, France and UK) and Germany were the most active countries was that Iran oriented policies of the EU started to get closer to the Iranian politics of the US (Ansari, 2007).

As a matter of fact, in spite of all its developed policies on Iran, EU/3, which couldn't make the country to step back, resolved to get the USA, which hadn’t negotiated since 1979, to negotiate with Iran. At the same time, EU was not limited with this attempt, coming to a consensus with the USA, China to implement a new sanction package on Iran (Dorraj and Currier, 2008).

At the beginning of 2007, a new crisis occurred in Iraq after US kidnapped Iranian diplomats. Increased tension caused EU business enterprises to cut the link with Iran because of the possibility of war (Weisman, 2007). Meanwhile, the chronic disease

of the EU not to be able to create a sufficient foreign policy recurred and difference in opinions on policies towards Iran was brought to agenda again. As a matter of fact, although Austria recommended developing a more peaceful approach to Iran, France and the Netherlands opposed this opinion. Moreover, another EU country Spain, announced that he was against further sanctions in October (Sauer, 2008). After that, the US and EU had decided to follow different kind of politics in order to turn Iran back from its nuclear determination, so that despite all the differences in opinions in EU and rising tensions in US, some positive developments began to emerge.

After Ahmadinejad went to New York as speaker, tension in the country reduced a little bit after Putin promised about providing nuclear fuel to Iran. In the meantime, the policy of EU was reflected as not criticizing Iran harshly on the new report that was presented by UAEA (Keskin, 2013). However, after UN Security Council had decided against Iran in 2008, Iran, which became fractious, declared to not negotiate with EU anymore and would continue the relations over UAEA (Ronen, 2010). This event greatly weakened EU's global actor position and reduced the prestige in Iran's perspective.

As a result, Iran has always been an important actor for EU, with its rich fossil resources, dynamic economy and young population. However, EU policies towards Iran have varied from the current period of time to the various interests of the EU. Bilateral relations at the highest point before revolution were conducted at the lowest level after revolution. With the process of critical dialog after 1992, the EU started to implement policies comprising imperative precautions to Iran. Along with Khatami's accession to power in 1997, the period of the expanding scope of

corporation and comprehensive dialogue process started. However, with the occurrence of Iranian nuclear activities in 2003, this period came to an end. EU, thinking that the Iran problem could not be solved with only military measures, started to follow conditional engagement after the nuclear crisis occurred and continued to emphasize the importance of the support in reform movements. During all this time, the EU, which is an oil importer, had to decrease and sometimes had to completely finis its trading relations with Iran. This situation damaged the formation of cooperation between the community and Iran to a large extent.

CHAPTER 6

INTRODUCTION OF THE MATHEMATICAL MODEL

In this chapter a mathematical model is presented. In order to eliminate the supplier countries properly and to gain the ability of selecting the most suitable countries for the oil importation of EU, it is decided to use a mathematical model. In the light of the wanted properties at the model, it is found suitable to use the GAMS Model at this thesis. More specifically, by using GAMS Model, it is aimed to answer the question of how much to supply from each country in order to fill the gap arising from the embargo on Iran. According to the latest data preceding the enforcement of sanctions on Iran, it was announced that 5, 98% oil demand of EU was met from this country (European Commission, 2013). For that reason, at the model, it is preferred to select the oil supplier counties similar with the countries that exported oil to EU in the year of 2011. Thus, it is aimed to mention the same conditions for EU, which the Union had before the embargo on Iran.

As a matter of fact, there are more oil supplier countries exist which also can be included in the model. However, it is thought that the energy issues do not rely on to decide on the possible energy supplier countries to ply a trade with them. Having said that, the energy relations are also tied to the politics as a whole. In addition, it is also necessary to take into consideration of the transportation cost of the supply and the risk of the supplier country when energy issues are mentioned. For that reason, the selected countries are limited as EU's oil imported countries before the embargo.

Inasmuch as, it is advocated that EU will not strictly change its supplier countries in a very short period of time.

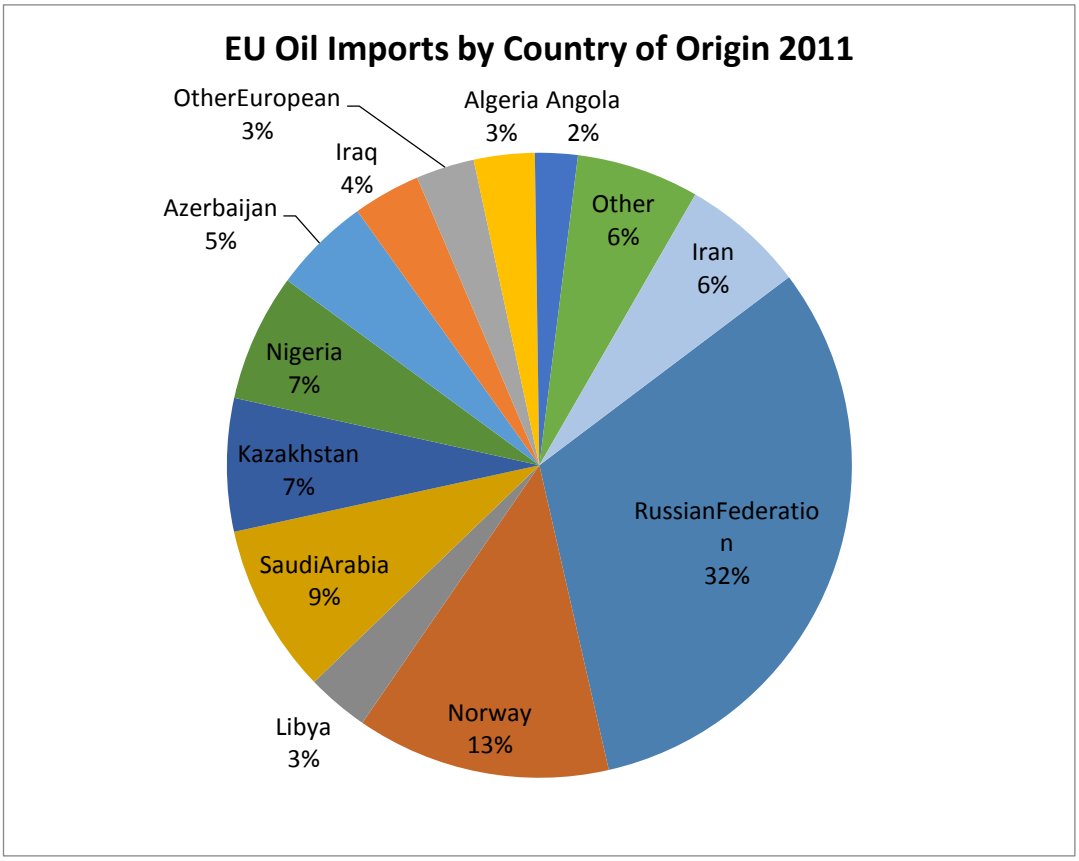
The mathematical model is designed to select the best options for EU by taking four indicators as an input. These are the cost of the oil importation of every selected countries for EU, the risk of each supplier country, EU oil importation percentage distribution per country and current oil supply pattern of EU. Here, resources of the used data for indicators are going to be mentioned in the next sections. Nevertheless, it had better to remark that the state fragility index is used in the aim of measuring risks of selected countries viably.

Several different dependence rates on supplier countries are experimented by using the model and the EU's dependency on OPEC countries is also specified separately at this model. Moreover, several scenarios will be developed to observe and evaluate the situation of EU in different cases. Decision variables in the mathematical model aims to decide on new oil supply plan on the EU in the light of costs, risk data, the resource availability and the foreign relations of the selected supplier countries with EU. Considering the supply plan, it would be helpful to mention the total risk level of the countries, associated total cost of the oil importation and average of planned oil importation per country and the decision of supplier countries. Consequently, they are taken as model indicators. As mentioned in the previous sections, thanks to the support of U.S., Iran met with the nuclear energy in 1950s. This promoter behavior of U.S. continued until the occurrence of the Khomeini administration in 1979. After Iran had taken the consulate of the United States as hostage (known as the "Hostage Crisis", which occurred in the same year with the change of administration in Iran) the good relations between Iran and the U.S was broken. After this incident the

embargo decision on Iran was omitted by the U.S. The effects of the deterioration of U.S. relations with Iran still continues the present time. Thus, the EU has increasingly weakened its relations with Iran because of the impact of U.S. The nuclear ambitions of Iran has caused the most devastating impact on the relations among Iran and EU. After the 8 year continuing Iran-Iraq war, Iran put the nuclear energy on its agenda again. However, the emanation of Iranian secret uranium enrichment activities, which was not reported to the IAEA, caused a nuclear crisis in 2002. This disclosure has led an increasing insecurity through Iran from the point of EU. Later on, in spite of its willingness about to make a collaboration with IAEA in order to fix its relationship with EU, this behavior of Iran did not last very long. In January 2006, Iran has informed to the IAEA about its willingness to restart Iranian research and development activities which the country agreed to stop voluntarily before. (IAEA, Updated brief by Deputy Director General for Safeguards, 2006). After Iran's statement, the country has become a threat in the eyes of EU. Thus, with a rapidly taken decision, all the directly or indirectly sale of sensitive nuclear materials, technology and ballistic missiles have been banned for the country (Ekinci, 2009). Also, the economic and trade sanctions on Tehran has been expanded. In the forthcoming years, the harsh feel of EU and U.S. against Iran has become even more sharply. In June 2010, UNSC's sanctions, which targeted Iranian nuclear activities and also more stringent financial constraints, extended cargo controls and the arms embargo, were adopted (Turkish Foreign Ministry, 2011). Iran, not wanting to take a step back in spite of all these restrictions, was confronted with the intervention of the United States immediately after. Subsequently, when USA convoked the countries to abandon oil purchases from Iran, EU announced that they would implement the embargo as from July 1, 2012. As understood from here, the oil trade relations have

continued between EU and Iran since 2012. After the decision of embargo, EU had had to supply its oil demand that was met by Iran from the other countries. The purpose of this thesis is to create a profitable and reliable supply plan for EU via eliminating the supplier counties by using the reformed mathematical model.

Figure 4.



[2]

Source: European Commission

[2] *Other= Other African Countries, Mexico, Venezuela, Kuwait, Congo, Congo DR, Cameroon, Colombia, Canada, Abu Dhabi*

6.1 Notation and Model:

The following notation is used for the mathematical program:

6.1.1 Sets:

(İ)= source countries, As Russian Federation, Norway, Libyan Arab Jamahiriya, Saudi Arabia, Kazakhstan, Nigeria, Azerbaijan, Iraq, Other European, Algeria, Angola, Other African, Mexico, Venezuela, Kuwait, Congo, Cameroon, Gabon, Colombia, Canada, Abu Dhabi, Congo DR

(j)= demand countries, EU

6.1.2 Parameters:

c(i,j) = cost of supplying oil from country i to country j

r(i) =risks of source countries

d(j)= demands of countries

s(i)= supply of country i

o(i)= current percentage of total demand met from country I

6.1.3 Scales:

We=importance of cost in terms of dollars

Wr =importance of risk costs

p = allowable percentage of demand met from OPEC countries

6.1.4 Decision Variables:

Variables:

z = objective function value

Positive Variables:

x (i, j)= amount of demand of country j satisfied from country i

per (i)= new percentage of total demand met from country i

The mathematical program model is as follows:

Objective Function:

The objective function try to minimize the weighted sum of cost and the risk of the supply plan. The total cost consist of sum of the unit price and the imported oil amount from the each supplier country.

$$z = \mathrm{e} = \mathrm{w_e} \sum_{\mathrm{i,j}} \mathrm{c_{(i,j)}}\, \mathrm{x_{(i,j)}} + \mathrm{w_r} \sum_{\mathrm{i,j}} \mathrm{r_i x_{(i,j)}}$$

$$\mathrm{c_1(i)} = \sum_{\mathrm{i}} \mathrm{x_{(i,j)}} = \mathrm{d(j)} = \mathrm{g}$$

$$\mathrm{c_2(j)} = \sum_{j} x_{(i,j)} = s(i) = l$$

$$c_3 = \sum_{j} x_{(Algeria,J)} + x_{(Angola,j)} + x_{(Iraq,j)} + x_{(Kuwait,j)} + x_{(Libya,j)}$$

$$+ x_{(Nigeria,j)} + x_{(SaudiArabia,j)} + x_{(AbuDhabi,j)} + x_{(Venezuela,j)} = l$$

$$= p \sum_{j} d_{(j)}$$

$$c_4 = \sum_j x_{(i,j)} = l = 0{,}01 \times a \times o(i) \times d('EU')$$

➔ *"a" denotes that the deviation of the current supply amount from each country. The model will be tested by using several different values of v.*

Constraint set c1 guaranties that the demand of EU wholly supplied from the selected supplier countries. (c1)

Constraint set c2 states that no country can supply more than its capacity. (c2)

Constraint set c3 guaranties that any of the selected countries that used in the model, do not exceed allowable percentage of total demand met from OPEC countries. (c3)

Constraint set c4 remarks that, any of the supplier countries do not exceed allowable percentage of total demand met from entire selected countries (c4)

6.2 Model Detail

The reason of selecting 4 constraints of the model is mentioned below.

c1. -> It is advocated that the selected countries, which had trade relations with EU before the Iranian embargo, can't be changed by EU in a short period of time. For that reason, it is believed that EU will continue to meet its oil demand from these countries. Thus, it is found more realistic to use the selected countries at the model.

c2. -> It is maintained that in case of having more available reserves to export, huge amount of investment is needed to build more capacity Besides, a short period of time will not suffice to realize this capacity enlargement. By reason of making this

thesis in order to estimate the situation of EU in the near future, the future projects of selected countries are not involved in this thesis.

c3. -> By taking into the consideration that OPEC consists of the world's biggest oil suppliers, it is believed that any of the selected countries can't exceed the total demand met from OPEC countries.

c4. -> It is advocated that it is necessary to diversify the supplier countries to provide the security of supply. For that reason, the model is determined according to the supplier diversification.

6.2.1 Input Data

The data of the selected countries are taken from the input of Registration of Crude Oil Imports and Deliveries in the European Union that published by European Commission in 1-12/2011. It is preferred to select the oil supplier counties similar with the countries that exported oil to EU in the year of 2011. Thus, it is aimed to mention the same conditions for EU, which the Union had before the embargo on Iran. For that reason, the oil demand of EU and the current importation percentage from each country are also taken from the same source of the same period of time. The unity of supply of the selected countries and the oil demand of EU are preferred to be taken as billion barrels (bbl).

However, in spite of being one of the oil suppliers of EU in 2011, it is found beneficial to remove Syria, Tunisia, Egypt and Brazil from the selected supplier

countries. Syria is preferred to be removed from the model, because of the existence of crisis and the civil war in the country. Tunisia and Egypt are removed for the reason of being effected by the Arab Spring, which influenced their infrastructure enlargement badly. Brazil, which is in the willingness of produce its own oil, leans to its descried oil reserves that are located in the sea. In the light of this revelation, the country has started to make pre-salt oil investment. For that reason, when the data of Brazil was analyzed, it is foreseen that the country will not able to sale sufficient amount of oil. Apart from aforementioned countries, other Latin America Countries, Other Middle East countries and Other FSU Countries are not included in the model. As, only the major data are available both in BP and EIA. Moreover, the percentage of these countries is found not all that significant Hence, it is believed that these countries would not affect the outcome to a large extent. Lastly, the countries, which have less than 0, 1% at the EU oil importation rate, are not included in the model. Hence, it is thought that the impacts of these countries would also not be very effective. In addition, a calculation will be made both for estimating the data of Other EU countries and Other African Countries. In order to assess the oil supply, total country risk and the oil cost of the Other African, the data, which was procured from adding up the data of each country, will be averaged and the same approach will be used to achieve the data of Other EU countries.

The cost of supplying oil is preferred to taken from the latest data of European Commission. Because, it is believed that the cost will increase in every year and by taking into the account of the latest data of the prices will ease to achieve more realistic outcomes. However, the cost data of Papua New Guinea, Yemen, Australia

and Argentina are not available in the latest input. For that reason, these data are taken from European Commission's the cost data of 2011.

In order to measure the risk of supplier countries, state fragility index is used. However, 2013 index for countries was not available at the latest data list. For that reason, 2013 data will be tried to be estimated by reviewing the data of 2011 and 2012. In that estimation, an importance will be attached to the current politic situations. Hence, it is found suitable to give 18 for Syrian fragility index because of the civil war in the country, and also 10 is given for Tunisian fragility index for the Supply of the country. The data was taken the source of Energy Information Administration (EIA). The reason of non-availability of 2014 or 2013 data on the database of reliable sources, the input of 2012 is used in the model. To calculate the supply of each country, oil consumption amount of every country is subtracted from its oil production amount. Thus, it is thought to reach the available oil amount that could be exported.

6.3 Experimental Design:

Several different scenarios are developed for the model. Scenarios are developed via changing values of dollar costs and risk cost while increasing the value of allowable percentage of deviation from current supply plan. The given values of the importation of dollar costs (we) and risk costs (wr) are divided into three groups as listed below;

1) we=10 , wr=1

2) we=1 , wr=5

3) we=1 , wr= 15

And each calculation for the above listed values of the importation of dollar costs and risks cost groups are done for every given values of allowable percentage of deviation from current supply plan (a) which is listed below;

a) (a) =1,25

b) (a) =1,5

c) (a) =2

d) (a) =2,5

Apart from these scenarios, three other scenarios are developed in order to experiment the reaction of EU's oil importation in the situation of removing the three biggest oil suppliers of EU, which are Russia, Norway and Saudi Arabia respectively.

Totally, 15 scenarios will be developed in order to form the oil supplier plan for EU. The analysis of scenarios are comprehensively mentioned at under the headline of 'Analysis of Results '

6.4 Analysis of Results:

15 scenarios are examined in the mathematical model. The scenarios are developed by varying the numerical values of importance of cost in terms of dollars (We), importance of risk costs (Wr) and the numerical values of allowable percentage of deviation from current supply plan (a).

In the first scenario, allowable percentage of deviation from current supply plan (a) will be given as 1,25%, of importance of cost in terms of dollars (We) will be taken as 10 and importance of risk costs (Wr) will be accepted as 1. In the light of the given outcomes from the mathematical model, the top three oil suppliers of EU doesn't change and maximum oil exportation are done by Russian Federation, Norway and Saudi Arabia respectively. In spite of taking the risk value (Wr) very low, it could not enough to include Congo DR, which has the biggest value of country risk compared to the other selected suppliers, in EU's supplier list. Except Congo DR, all the selected countries are in on the cycle of EU's oil importation. Thus, according to the results, it can be said that this scenario supports the oil supplier diversification of EU.

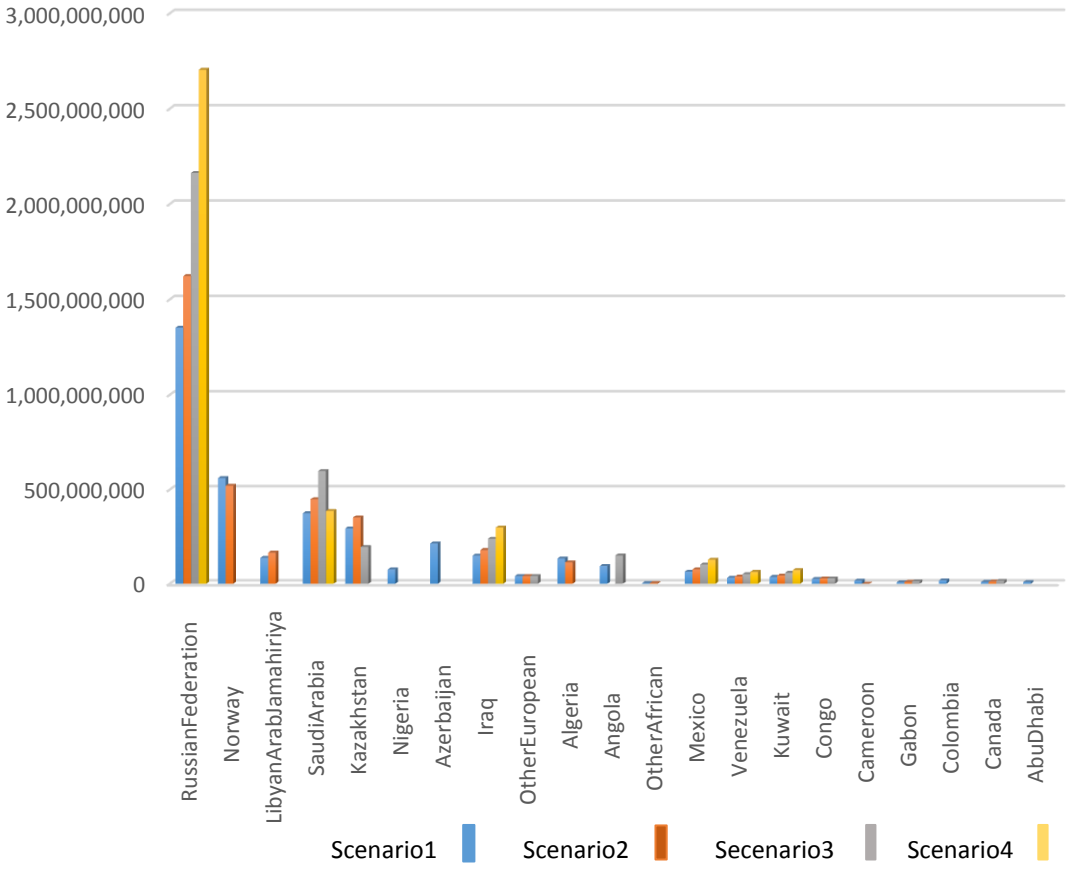
In the second scenario, allowable percentage of deviation from current supply plan (a). will be given as 1,5%, while the values of importance of cost in terms of dollars (We) and importance of risk costs (Wr) will be accepted are taken similarly to the first scenario. (we:10, wr:1). In this scenario, the first three supplier countries of EU did not change over. Generally the mathematical model eliminates the costly countries, and thus Nigeria, Azerbaijan, Algeria, Cameroon, Colombia, Abu Dhabi

are removed from the supplier countries. Similarly to the first scenario, Congo DR could not be included in the list. According to the outcomes, it is experimented that the total percentage of Norway and Angola is decreased for the reason of their high costs while, the total exportation value of the other selected countries is increased. Moreover, according to the second scenario EU balanced its oil demand by increasing the imported oil amount from Russia and Kazakhstan substituting for removed countries.

In the third scenario, allowable percentage of deviation from current supply plan (a) will be increased to 2%, while the value of importance of cost in terms of dollars (We) and the value of importance of risk costs (Wr) are accepted as similar as their selected values at the 1st and 2nd scenario. Here, the first three suppliers of EU has changed for the first time and Russia remained the main supplier while Saudi Arabia became the second and Iraq became the third biggest supplier of the EU. According to the given outcomes it is seen that Norway, which is the second biggest supplier of EU, Libya, Nigeria, Azerbaijan, Algeria, Cameroon, Colombia and Abu Dhabi are excluded for the reason of their costly oil prices. Similarly to the other two scenarios, Congo DR could not be included in the list due to its upper country risk. In this scenario, it will be experimented that by virtue of removing Norway, Iraq came into play and the country increase its oil production and became the third biggest oil supplier of EU. Moreover, there is a great increase occurred in the European oil importation level from both Russia and Saudi Arabia and especially Russia doubled its exportation to EU compared to the first scenario.

In the fourth scenario, allowable percentage of deviation from current supply plan (a). will be risen to 2,5, while the values of importance of cost in terms of dollars (We) and importance of risk costs (Wr) are taken similarly to the first scenario. (we:10, wr:1).In this scenario the main oil suppliers of EU became Russia, Saudi Arabia and Iraq respectively. For the reason of increasing the value of allowable percentage to a large extent, the mathematical model eliminates every costly country among the selected countries and therefore Norway, Libya, Kazakhstan, Nigeria, Azerbaijan, Other European Countries, Algeria, Angola, Other African Countries, Congo, Cameroon, Gabon, Colombia, Canada, Abu Dhabi and Congo DR are removed. Here, similarly to the previous scenario, the oil importation amount of Iraq showed an increasing tendency in conjunction with the elimination of Norway. Moreover, as the allowable percentage increases, the percentage of Russia considering the oil exportation to EU, is increasing as well.

Figure 5:
Scenario 1-Scenario 2-Scenario 3-Scenario 4



In the fifth scenario, allowable percentage of deviation from current supply plan (a).will be given as 1,25%, importance of cost in terms of dollars (We) will be taken as 1 and importance of risk costs (Wr) will be accepted as 5. According to overcomes, the countries, which have higher country risk, are eliminated from the supplier countries. Thus, only Iraq and Congo DR are removed from the list. In addition, there are no significant changes observed in this scenario that the first three suppliers of EU remained the same as current EU's main suppliers. In detail, Russia, Norway and Saudi Arabia stayed the EU's main oil supplier countries respectively. Besides, the overcome values of these three countries stayed the same with the first

scenario, which means, even the importance of cost is decreased as ten folds it won't cause a significant effect on EU's supplier plan.

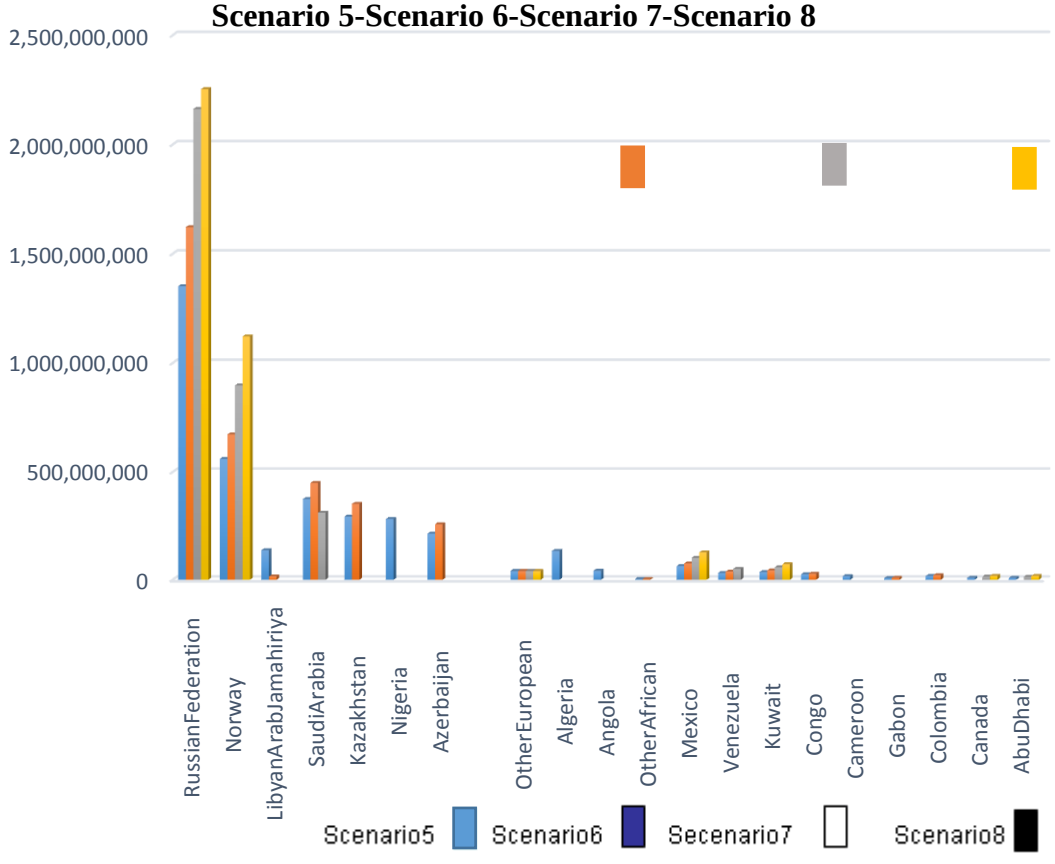
In the sixth scenario, allowable percentage of deviation from current supply plan (a) will be risen to 1,5%, while the selected values of both importance of cost in terms of dollars (We) and importance of risk costs (Wr) are left the same as the previous scenario. Similarly as 1st, 2nd and 5th scenarios, the main three suppliers of EU remained the same. According to the consequences given from the mathematical model, most of the risky countries are removed from the list. Namely, Nigeria, Iraq, Algeria, Angola and Cameroon are excluded for the reason of their higher country risks. Moreover, Canada and Abu Dhabi are also removed from the supplier plan in spite of having very low country risks. In this model, it will be experienced that the oil demand of EU is met by way of increasing the importation rate of remainder countries at the supplier plan. Besides, the oil exportation percentage of the rest of countries, which have higher country risk compared to others, showed a decreasing tendency.

In the seventh scenario, allowable percentage of deviation from current supply plan (a) will be given as 2%, , while the values of importance of cost in terms of dollars (We) and importance of risk costs (Wr) are taken similarly as the sixth and fifth scenario. (we:1, wr:5). According to this scenario, the mathematical model eliminated all of the risky countries which have the risk value as 9 and more than 9. However, in spite of having the same risk value with Kazakhstan, Saudi Arabia is not excluded from the supplier plan for the reason of having cheaper price from

Kazakhstan. Last, the primary suppliers of EU did not change in this scenario similarly to 1st, 2nd, 5th and 6th scenario.

In the eighth scenario, allowable percentage of deviation from current supply plan (a) will be risen to 2,5%, the value of importance of cost in terms of dollars (We) and the value of importance of risk costs (Wr) are taken similarly as the sixth , fifth and seventh scenario. (we:1, wr:5). As regards to this scenario, it is seen that all of the high risky countries are eliminated. The main oil suppliers of EU are changed as Russia, Norway and Mexico. Except these three countries, the supplier plan also included Other EU countries, Kuwait, Canada and Abu Dhabi. The percentage of Mexico showed a rapidly increasing tendency. For that reason, it is thought that the country closed the oil importation deficit of Saudi Arabia.

Figure 6:
Scenario 5-Scenario 6-Scenario 7-Scenario 8



In the ninth scenario, allowable percentage of deviation from current supply plan (a) will be given as 1, 25%, importance of cost in terms of dollars (We) will be taken as 1 and importance of risk costs (Wr) will be accepted as 15. In this scenario, for the reason of giving more attention of the country risks, the two most risky countries are eliminated from the supplier plan. Namely, Congo DR with the risk value as 23 and Iraq with the risk value as 20 are removed. Apart from that, all the selected countries are involved at the supply plan and the main three oil suppliers of EU stayed the same similar with current oil supplier of EU.

In the tenth scenario, allowable percentage of deviation from current supply plan (a) will be risen to 1,5%, while the values of importance of cost in terms of dollars (We) and importance of risk costs (Wr) are taken similarly as 9th scenario (we:1, wr:15). In this approach, Nigeria and Cameroon are removed as compare to the ninth scenario. Except Other European Countries and Other African countries, all of the share of selected countries increased when compared to 9th scenario. The primary oil supplier of EU stayed as same as current main three oil suppliers of EU.

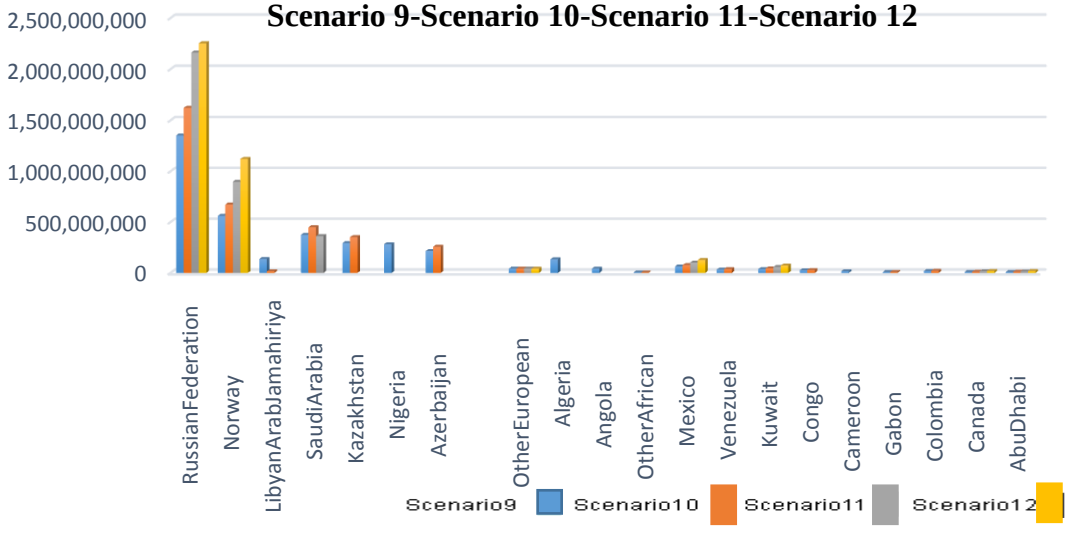
In the eleventh scenario, allowable percentage of deviation from current supply plan (a) will be taken as 2 while the values of importance of cost in terms of dollars (We) and importance of risk costs (Wr) are taken similarly as 9th and 10th scenario. (we:1, wr:15). According to the outcomes, the main three oil suppliers of EU remained the same. In comparison with the seventh scenario, which has all the same given values like this scenario, except (wr), it is observed that Venezuela is not included in this supplier plan. Moreover, the oil amount that met by Venezuela is mainly provided

from Saudi Arabia. For that reason, the percentage of Saudi Arabia is higher than that of tenth scenario.

In the twelfth scenario, allowable percentage of deviation from current supply plan (a). will be increased to 2,5%, while the values of importance of cost in terms of dollars (We) and importance of risk costs (Wr) are taken similarly as 9th and 10th scenario. (we: 1, wr:15). According to this scenario, only Saudi Arabia will be removed from the supplier plan as compared with the eleventh scenario. The reason of eliminating this country is its having the highest risk value among other remainder countries. In the light of outcomes, EU balanced its oil demand by increasing the amount of every remainder countries in order to meet the oil percentage that is taken from Saudi Arabia. Thus, the main oil supplier countries of EU changed as Russia, Norway and Kuwait respectively.

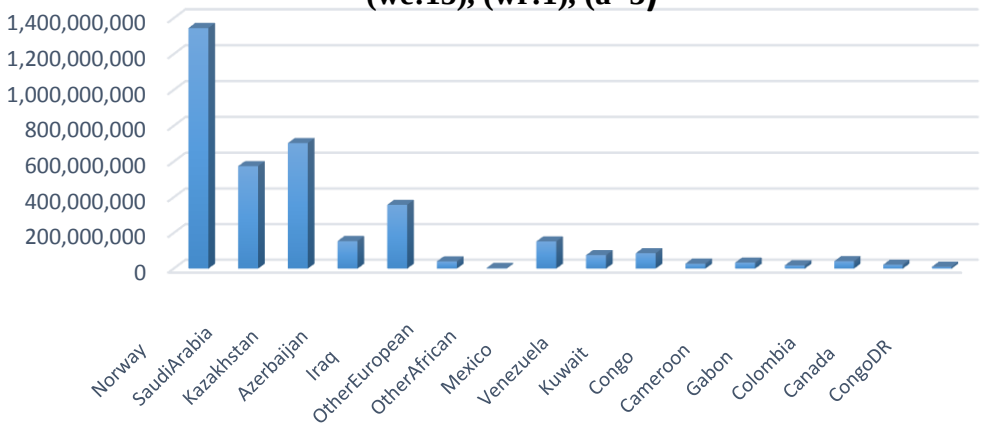
As from this part, the scenarios are developed in order to observe the differences in the oil supplier plan of EU in case of removing each main three supplier respectively from the plan.

Figure 7:
Scenario 9-Scenario 10-Scenario 11-Scenario 12



Thirteenth scenario will be developed in order to observe the differences in the oil supplier plan of EU in case of removing Russia, which is the primary oil supplier country of EU. At first, the changes in the supplier plan will be sighted on the conditions of taking the value of allowable percentage of deviation from current supply plan (a) as 3%, (We) as 15 and (Wr) as 1. The reason for increasing the value of allowable percentage to 3% is found infeasible up to this value. Thus, EU only can able to sustain its oil importation by expanding the value of (a) to 3%, which is the limit value for achieving a feasible overcome from the mathematical model. In this approach, the main supplier countries aliened from major to minor as Norway, Kazakhstan and Saudi Arabia. Apart from the first three main supplier, thirteen more countries found feasible for this approach. Secondly, the mathematical model will be run with the values of 1 for (We) and 5 for (Wr) while deactivating (c4) from the mathematical model .Here, it is seen that number of countries decreased to three. In this circumstances, Norway became the major oil supplier of EU, while Canada being second and Mexico being third.

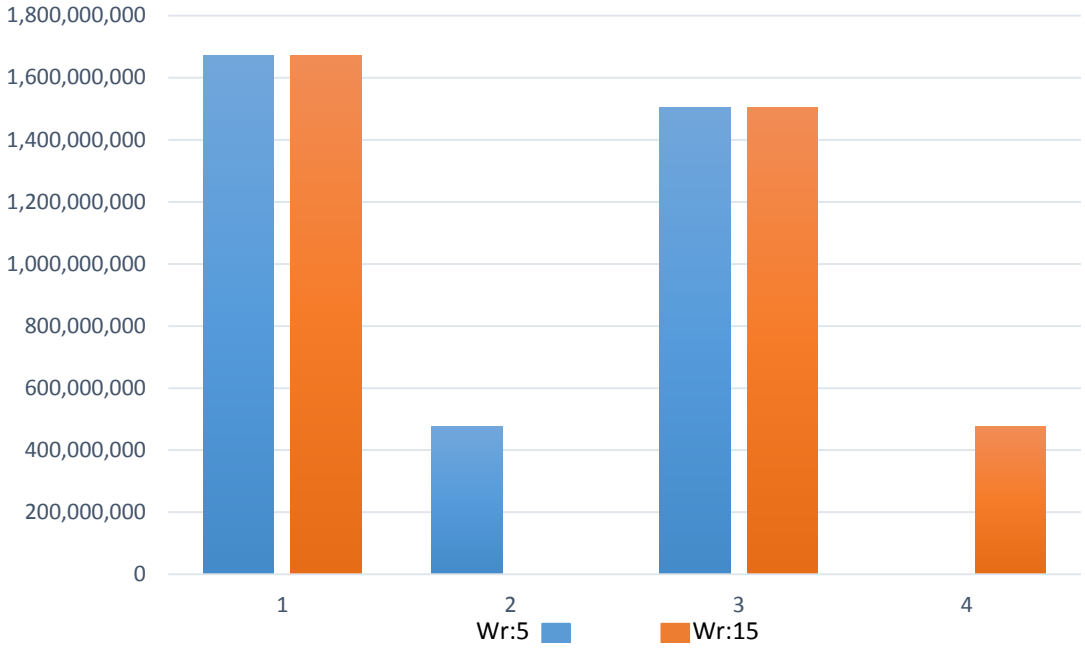
Figure 8:
Scenario 13
(we:15), (wr:1), (a=3)



When the value of (wr) is increased 5 to 15, Abu Dhabi took the place of Mexico, while Norway and Canada remained untouched. Thus, it is clarified that in spite of being more costly than Mexico, Abu Dhabi is preferred for having less risk among other countries.

Figure 9:

Scenario 13 (excluding "a")

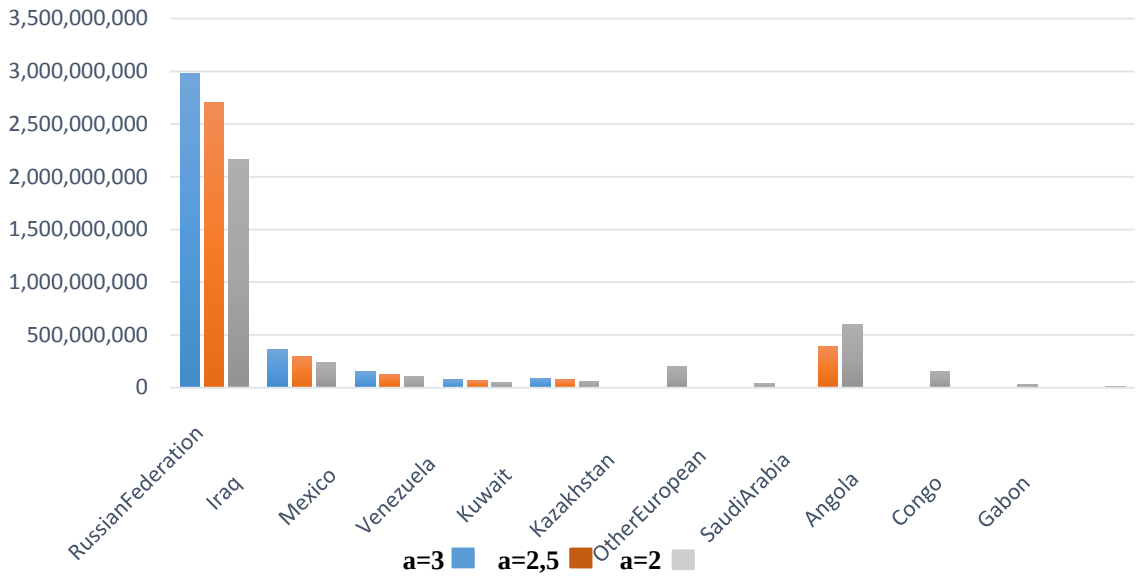


The fourteenth scenario will be formed in the aim of experiencing the possible changes in the supply plan of EU in the case of the disappearance of the second biggest supplier of EU. Differently from the thirteenth scenario, this approach is found feasible after taking 2% as allowable percentage (a). For that reason, this approach is redoubled for three times by rising the value of (a) 0,5% from each scenario. Primarily, the value of (a) is accepted as 2, while the value of (wr) is taken as 1 and the value of (we) is given as 15. Under these circumstances, 11 countries are found suitable for this approach. Here, while Russia remained as a major oil supplier of EU, Saudi Arabia became the second biggest and Iraq became the third biggest oil supplier of EU. On the other hand, in this approach great amount of oil is provided

from Russia that there is approximately a four times difference occurred among the imported oil amount from Russia and Saudi Arabia. When the value for allowable percentage (a) is increased to 2,5%, it is observed that the number of suitable countries dropped to 6. In this approach, the three biggest oil suppliers of EU remained the same as the previous approach. On the other hand, Europe's dependency on Russia increased that the imported oil amount from Russia rose nine fold higher than the imported oil amount from Saudi Arabia. At last, the value of (a) is risen to 3% and the consequences are sighted. According to this approach, the number of suitable countries dropped to 5. Moreover, Iraq took the place of Saudi Arabia and became the second biggest supplier of EU. While, Saudi Arabia is eliminated from the oil supplier plan of EU, Mexico substituted the previous place of Iraq, and became the third largest oil supplier of EU. . Further, the given values are changed as 1 for (We) and 15 for (Wr) and the model is run by deactivating (c4).According to the outcome, the selected countries dropped from 21 to 5 that Canada became the primary supplier of EU, while Abu Dhabi became the second and Mexico became the third biggest supplier of EU. Russia and Other European Countries are also involved in the remainder countries. However, their percentage is low for the reason of having higher risk values among the others.

Figure 10:

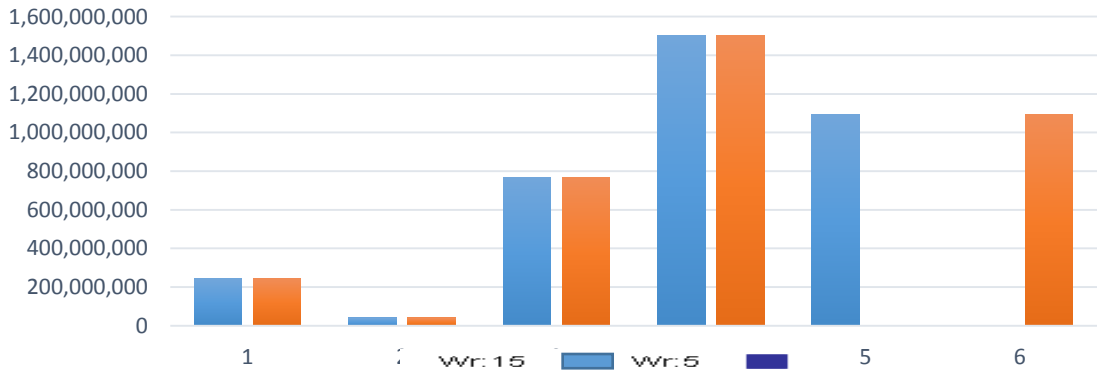
Scenario 14 (wr:1) , (we:15)



Following, (We) is left untouched and (Wr) is decreased to 5. Different from previous approach, Kuwait took the place of Abu Dhabi and became the second biggest supplier of EU, while other remainder countries stayed exactly the same with the previous approach.

Figure 11:

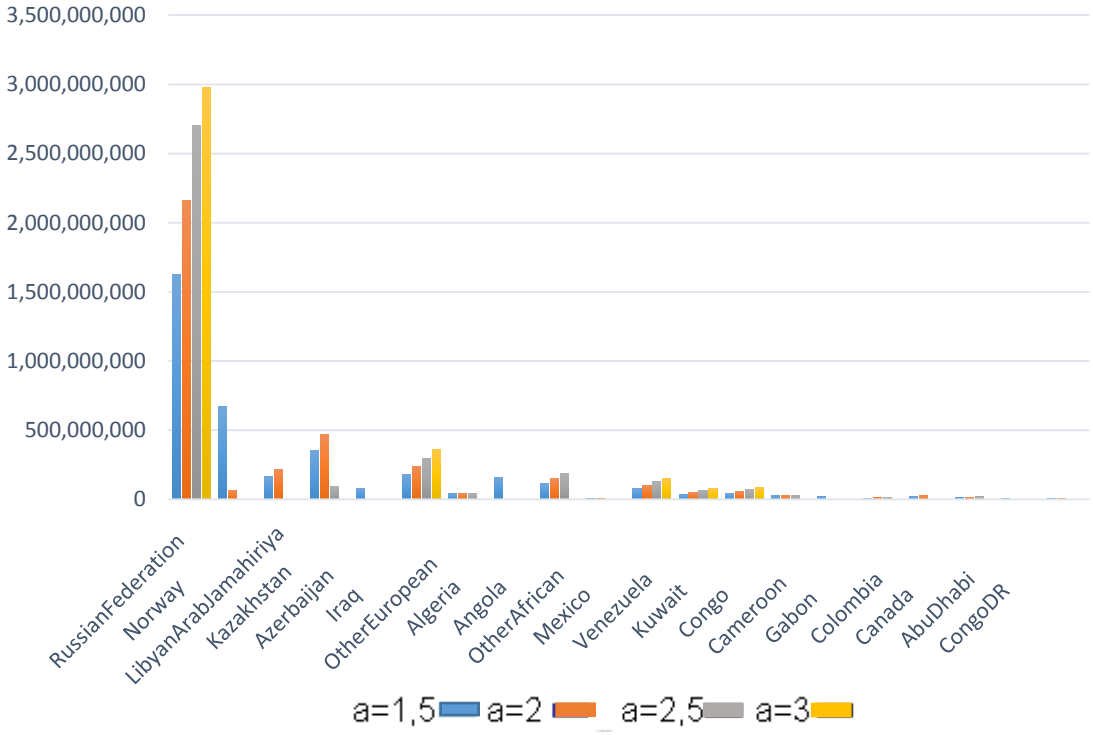
Scenario 14 (excluding "a")



The last scenario is developed in order to observe the differences in the oil supplier plan of EU in case of removing Saudi Arabia, which is the third biggest oil supplier country of EU. In this approach, at first, "a" is risen starting from 1,5% up to 3% (1.5, 2, 2.5, 3 respectively) while (We) is taken as 15 and (Wr) is given as 1, then the consequences are observed. The number of suitable countries are higher when a is taken 1,5 which means EU can make more diversification by limiting the percentage of taken oil from its suppliers. Moreover, in this circumstances Kazakhstan took the place of Saudi Arabia and became the third biggest oil supplier of EU, while Norway remained as the second biggest supplier. Moreover, when the value of "a" is increased to 2, Kazakhstan reached to become secondary supplier of EU, following by Libya. Both of the overcomes of 3rd and 4th approach ("a" was taken as 2,5 at 3rd, 3 at 4th approach) Iraq reached to become the secondary oil supplier of EU. Up on comparing 3rd and 4th approach, it is seen that when "a" is increased, the third biggest oil supplier of EU changed that Angola, which was the 3rd biggest oil supplier at 3rd approach, lost its seat to Mexico at 4th approach. Additionally, in whole of four approach, it is observed that Russia remained the major oil supplier of EU.

Figure 12:

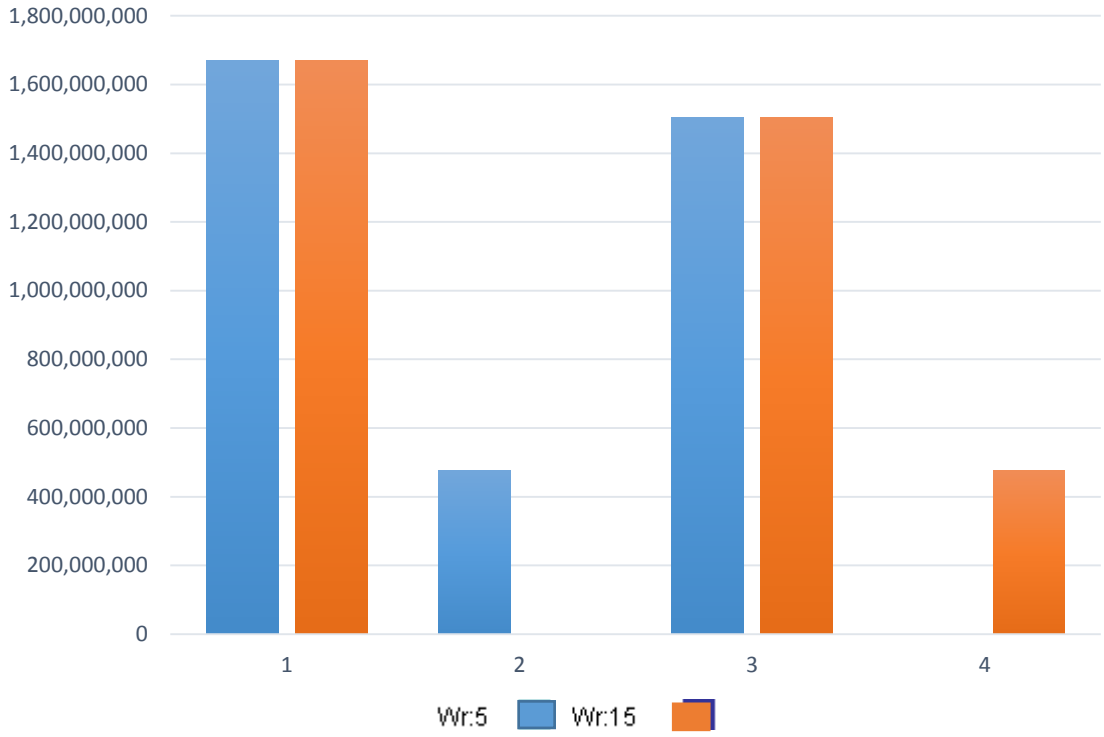
Scenario15 **(wr=1), (we=15)**



Secondly, the mathematical model is run by deactivating (c4) with the values of 1 for (We) and 15 for (Wr) and the result is sighted. Following, (We) is left untouched and (Wr) is decreased to 5.Both of the last two circumstances, the same results are procured with scenarios 13.

Figure 13:

Scenario 15 (excluding "a")



6.4.1 General Analysis

In this part a general analysis of the total consequences of the model is made by reviewing all of the scenarios, as mentioned below.

1) When the allowable percentage of deviation from current supply plan (a) is increased, the diversification of supply plan decreases gradually.
2) If importance is not attached to risk (Wr), the model treats costs oriented which means higher costs are left out and suitable countries are selected with reference to their low cost, which is limited according to the dimension that current demand allows

3) When value of importance of risks (Wr) and the value of importance of costs (we) are left untouched while the allowable percentage (a) is increased, the imported oil amount from Russia is increasing in order to balance the demand of importation.
4) If importance is not attached to cost (We), the model treats risk oriented. However, when the value among the importance of risk (Wr) and the importance of cost (We) decreases, the model behaves more cost oriented.
5) In case of removing one of the third biggest oil supplier from the supplier plan, the oil demand is meet mostly from only one country which rise the dependency on another oil supplier country.

CHAPTER 7

CONCLUSION

In spite of being in good relations with the world powers, the balances changed on Iran after the Iranian revolution in 1979. By losing the support of U.S., Iran drew reaction of EU as well in as much as being forced to make collaboration with U.S. Beyond these, the nuclear aim of Iran and the country's efforts about developing nuclear projects induced Iran to become a complete target. Not with standing, all of the showed reactions to Iran are not without reason that after the disclosure of secret uranium enrichment projects and nuclear studies of Iran, both of the U.S. and EU thought that they are right to show reactions against Iran. Despite facing with a lot of implications, the insisting behavior of Iran concerning nuclear energy, rose the concerns that the many of the countries started to think that nuclear weapons are developed in Iran. For the reason of Iran's "do not step back" policy from its nuclear aim, the approval of Iranian sanctions was actualized. The EU, which is a great amount of oil importer, was also affected from the Iranian embargo so much that the Union had to front other oil supplier countries in order to meet its oil demand, which it used to meet from Iran before the embargo. Thus, the oil supplier plan of EU was revised. Up to comparing the supplier plan of EU before and after the Iranian embargo, it was seen that the dependency of EU on Russia was increased in 2013 owing to the decrease in the supplier diversification of EU. Wıth reference to all achieved overcomes from all of the scenarios, this thesis supports that it is important to limit the oil procurement via decreasing the allowable percentage (a) of oil importation from one country constraint. Thus, the supplier diversification target of

EU will be reinforced. In case of given importance of oil costs more than country risks, it was observed that the model showed a tendency to procure the oil from less costly countries. However, despite having more risks, some countries can be chosen as one of the suitable oil suppliers for EU. For that reason, it is believed that EU can secure the oil supply if the union develops a cost oriented supplier plan. Oppositely, if a risk oriented oil supplier plan is developed, more costly countries can be involved the supplier plan which makes the oil procurement of EU more costly. For that reason, it is believed that it is better to give close importance both for the risk and the cost for EU while developing its oil supplier plan. Additionally, in case of removing Norway and Saudi Arabia from the supplier plan of EU, this will increase the EU dependence on Russia. On the other hand, it is observed that the elimination of Russia, which is one of the targets of EU until 2050, will cause Norway to take the place of Russia. For that reason, this change doesn't count one of the supporter actions of EU's oil supplier diversification target. Finally, it is found logical to meet the oil importation percentage of Iran by increasing the oil importation rate of countries, which are found suitable by taking into account of their oil cost and country risk and, in order to avoid increasing the dependency on any country and not to lower the supplier diversification, it would be better to spread the Iranian importation amount between the selected countries.

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ANNEXES

Annex-1: Registration of Crude Oil Imports and Deliveries in the European Union (EU27)-Period: 1-12/2013

Region	Country of Origin	Volume(1000 bbl)	Total Value($ 1000)	CIF price (2)($/bbl)	% of Total Imports
Middle East	Abu Dhabi	1 531,	172 526,	112,7042412	0,04 %
	Iraq	121 697,	12 850 705,	105,596103	3,41 %
	Kuwait	35 042,	3 717 187,	106,0772667	0,98 %
	Oman	2 003,	218 494,	109,0661264	0,06 %
	Qatar	2 098,	233 946,	111,5088942	0,06 %
	Saudi Arabia	323 892,	34 940 914,	107,8781648	9,07 %
	Syria	19,	1 762,	94,14423077	0,00 %
	Other Middle East Countries	1 199,	128 983,	107,5754796	0,03 %
Middle East		**487 481**	**52 264 517**	**107,213396**	**13,65 %**
Africa	Algeria	146 828,	16 173 723,	110,1541094	4,11 %
	Angola	100 344,	10 897 561,	108,6017302	2,81 %
	Cameroon	16 083,	1 773 156,	110,2487135	0,45 %
	Congo	7 647,	827 912,	108,2729178	0,21 %
	Congo (DR)	3 100,	339 200,	109,4269593	0,09 %
	Egypt	35 074,	3 777 846,	107,7118119	0,98 %
	Gabon	14 495,	1 564 944,	107,9659443	0,41 %
	Libyan Arab Jamahiriya	204 002,	22 351 249,	109,5641207	5,71 %
	Nigeria	296 800,	33 600 396,	113,2087903	8,31 %
	Tunisia	6 738,	727 476,	107,9585963	0,19 %
	Other African Countries	78 261,	8 611 995,	110,0417941	2,19 %
Africa		**909 372**	**100 645 457**	**110,6758107**	**25,47 %**
Asia	Other Asian Countries	345,	37 705,	109,2898551	0,01 %
Asia		**345**	**37 705**	**109,2898551**	**0,01 %**
FSU	Azerbaijan	152 340,	17 152 860,	112,5960113	4,27 %
	Kazakhstan	211 008,	23 132 526,	109,6284233	5,91 %

	Russian Federation	1 132 487,	122 055 050,	107,7761132	31,72 %
	Ukraine	570,	65 007,	114,1200585	0,02 %
	Other FSU countries	3 862,	418 663,	108,4179691	0,11 %
FSU		**1 500 267**	**162 824 106**	**108,5301179**	**42,02 %**
Europe	Norway	389 882,	43 261 115,	110,9594443	10,92 %
	Other European countries	109 042,	11 668 973,	107,0134887	3,05 %
Europe		**498 924**	**54 930 087**	**110,0970386**	**13,97 %**
America	Brazil	12 613,	1 304 314,	103,4088923	0,35 %
	Canada	17 910,	1 971 984,	110,1059243	0,50 %
	Colombia	35 924,	3 721 902,	103,6051191	1,01 %
	Ecuador	1 439,	144 917,	100,7296143	0,04 %
	Mexico	64 170,	6 477 160,	100,9374274	1,80 %
	United States	2 132,	238 633,	111,9160417	0,06 %
	Venezuela	32 378,	3 181 367,	98,25716622	0,91 %
	Other Latin America countries	7 664,	844 030,	110,1291297	0,21 %
America		**174 230**	**17 884 306**	**102,6477399**	**4,88 %**
World		**3 570 619**	**388 586 179**	**108,8288073**	**100, %**

Source: European Commission, Directorate-General for Energy

Annex:2 Registration of Crude Oil Imports and Deliveries in the European Union (EU27)-Period: 1-12/2011

Region	Country of Origin	Volume(1000 bbl)	Total Value($ 1000)	CIF price (2)($/bbl)	% of Total Imports
Middle East	Abu Dhabi	7 114	803 834	112,99	0,19%
	Iran	218 374	23 459 966	107,43	5,98%
	Iraq	119 296	12 943 645	108,5	3,27%
	Kuwait	28 896	3 090 540	106,95	0,79%
	Oman	1 556	165 403	106,33	0,04%
	Qatar	1 166	128 595	110,29	0,03%
	Saudi Arabia	299 330	32 692 569	109,22	8,20%
	Syria	34 126	3 601 051	105,52	0,94%
	Yemen	600	65 640	109,4	0,02%
Middle East		**710 457**	**76 951 242**	**108,31**	**19,47%**
Africa	Algeria	107 349	12 183 030	113,49	2,94%
	Angola	75 127	8 313 226	110,66	2,06%
	Cameroon	13 224	1 480 087	111,92	0,36%
	Congo	20 452	2 236 102	109,34	0,56%
	Congo (DR)	3 697	409 782	110,84	0,10%
	Egypt	37 991	4 103 808	108,02	1,04%
	Gabon	6 200	653 725	105,44	0,17%
	Libyan Arab Jamahiriya	110 014	11 345 323	103,13	3,01%
	Nigeria	225 618	25 716 033	113,98	6,18%
	Tunisia	8 790	974 398	110,86	0,24%
	Other African Countries	63 069	7 152 606	113,41	1,73%
Africa		**671 530**	**74 568 119**	**111,04**	**18,40%**
Asia	Australia	397	48 037	121	0,01%
	Papua New Guinea	2 574	279 122	108,44	0,07%
Asia		**2 971**	**327 159**	**110,12**	**0,08%**
FSU	Azerbaijan	171 688	19 866 180	115,71	4,70%
	Kazakhstan	234 585	26 290 875	112,07	6,43%
	Russian Federation	1 081 316	118 873 398	109,93	29,63%

	Ukraine	688	77 985	113,35	0,02%
	Other FSU countries	100 980	11 031 824	109,25	2,77%
FSU		**1 589 256**	**176 140 263**	**110,83**	**43,54%**
Europe	Norway	448 614	51 168 036	114,06	12,29%
	Other European countries	103 031	11 135 706	108,08	2,82%
Europe		**551 644**	**62 303 742**	**112,94**	**15,11%**
America	Argentina	100	9 660	96,6	0,00%
	Brazil	24 052	2 644 689	109,6	0,66%
	Canada	7 373	847 784	114,98	0,20%
	Colombia	13 802	1 468 596	106,4	0,38%
	Ecuador	583	57 562	98,67	0,02%
	Mexico	50 596	5 201 145	102,8	1,39%

Source: European Commission, Directorate-General for Energy