IMPORTANCE OF NATURAL GAS RESERVES FOR TURKMEN ECONOMY

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ABSTRACT

IMPORTANCE OF NATURAL GAS RESERVES FOR TURKMEN ECONOMY

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Turkmenistan became a sovereign state in 1991 and since then it has been pursuing a market based economic policy. As a result of massive energy reserves, extractive sectors and specifically natural gas sector of Turkmenistan have been the driving force of its sustained and high economic growth so far. This study examines the importance of natural gas reserves for Turkmen economy and derives policy recommendations for having sustained export revenues and high economic growth. In doing so, future demand for Turkmen natural gas is investigated using and comparing data about future natural gas demand of Turkmenistan's potential markets and future natural gas supply of Turkmenistan's competitors. The study concludes that it is quite likely that there may be sustained demand for Turkmen natural gas until about the middle of the century. However, for avoiding the vulnerabilities of being dependent on a single resource Turkmenistan must make optimal use of its present export revenues from natural gas and ensure that it will have sustained and diversified exports in the future.

Keywords: Turkmen economy, energy, natural gas, LNG, natural gas pipelines

ÖZ

DOĞAL GAZ REZERVLERİNİN TÜRKMENISTAN EKONOMISI AÇISINDAN ÖNEMİ

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Türkmenistan 1991 senesinde bağımsız devlet statüsüne kavuşmuştur ve o tarihten beri piyasaya dayalı ekonomi politikası izlemektedir. Çok büyük miktarda enerji rezervinin bulunmasından dolayı maden sektörleri ve özellikle doğal gaz sektörü Türkmenistan'ın şu ana kadarki yüksek ve istikrarlı büyümesinin itici gücü olmuştur. Bu çalışma doğal gaz rezervlerinin Türkmenistan ekonomisi açısından önemini incelemekte ve istikrarlı ihracat gelirleri ile yüksek ekonomik büyüme elde etmek için politika önerileri türetmektedir. Bunun için Türkmenistan'ın potansiyel pazarlarının gelecekteki doğal gaz talebi ve Türkmenistan'ın rakiplerinin gelecekteki doğal gaz arzı verileri karşılaştırmalı olarak kullanılarak Türkmen doğal gazının gelecekteki talebi araştırılmıştır. Bu çalışma asrın ortalarına kadar büyük ihtimalle Türkmen doğal gazına devamlı talep olacağı sonucuna varmıştır. Ancak Türkmenistan tek kaynağa bağımlı olmanın getirdiği kırılganlıkları ortadan kaldırabilmek için halihazırda doğal gazdan elde ettiği ihracat gelirlerini optimal bir şekilde kullanmalı, gelecekte sürekli ve çeşitlendirilmiş ihracat yapmayı teminat altına almalıdır.

Anahtar Kelimeler: Türkmen ekonomisi, enerji, doğal gaz, sıvılaştırılmış doğal gaz, doğal az boruları

To my family...

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Bcm	Billion cubic meters
Bcm/a	Billion cubic meters per annum
BP	British Petroleum
Btu	British thermal unit
CAC	Central Asia – Center
CIA	Central Intelligence Agency
CNPC	China National Petroleum Corporation
EU	European Union
GDP	Gross domestic product
IEA	International Energy Administration
MFAT	Ministry of Foreign Affairs of Turkmenistan
Mtoe	Million tons of oil equivalent
OCA	Olympic Committee of Asia
OECD	Organization for economic cooperation and development
SCPX	South Caucasus Pipeline Expansion
TANAP	Trans Anatolian Pipeline
TAPI	Turkmenistan – Afghanistan – Pakistan – India
Tcm	Trillion cubic meters
TCP	Trans Caspian Pipeline
UNDP	United Nations Development Program
US EIA	United States Energy Information Administration

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CHAPTER 1

INTRODUCTION

After the collapse of the Union of Soviet Socialist Republics (USSR) in 1991, fifteen independent countries came into existence. Five of those countries, which are geographically located in Central Asia constitute Central Asian countries. Those countries are Turkmenistan, Kazakhstan, Uzbekistan, Kyrgyzstan and Tajikistan. All of those countries are rich in energy resources. Turkmenistan, Kazakhstan and Uzbekistan are rich in hydrocarbons whereas Kyrgyzstan and Tajikistan are rich in hydroelectricity. Turkmenistan ranks in the fourth place in the world with respect to global natural gas reserves (BP, 2015a). Kazakhstan ranks in the twelfth place in the world in terms of its proven crude oil reserves (US EIA, 2015a). Uzbekistan produces considerable amount of natural gas but due to its high population, country consumes 84 percent of its overall domestic production of natural gas. Other than that, Uzbekistan is among the five countries in the world with respect to proven reserves of gold, and among the ten leading countries in production of gold (Uzinfoinvest, 2015). Other than energy resources, the geopolitical location of Central Asian countries is another important feature of those countries. Central Asia is neighboring with Russia which is the second-largest producer of dry natural gas and third-largest liquid fuel producer in the world (US EIA, 2014a) and at the same time it neighbors with Iran which holds the world's fourth-largest proven crude oil reserves and the world's second-largest natural gas reserves (US EIA, 2014b). In addition to that, Central Asia is neighboring with the fastest growing country China, which is the second biggest economy in the world after the USA (World Bank, 2015a).

After Central Asian countries gained independence, massive energy reserves and above mentioned geopolitical location have led Central Asian countries to become the focus of interest in the international arena. Similar focus of interest on Central Asia in the international arena was a hundred years ago in which the Russian Empire and the British Empire scrambled for imperial supremacy over Central Asia.

During the period of the Soviet Union, all countries of the Soviet Union were part of a large integrated system. In other words, they were well intertwined components of one system. As a result, each country served as the supplier of a specific commodity. For example, Turkmenistan was a major supplier of natural gas and cotton. Kazakhstan served as the source for food and natural resources like oil and coal, and Uzbekistan was the main supplier for minerals. Each country specialized in a specific area and gained economies of scale especially in that particular area. After becoming independent countries, this type of composition led to some difficulties for Central Asian countries and each of those countries had to take care of itself. As a result of the different economic specialization of each Central Asian country, their economies were adversely affected after the dissolution. Impact of being independent states on the economies of those countries is a vast area that needs to be investigated.

Among those countries, the case of Turkmenistan's natural gas is particularly interesting. Turkmenistan is neighboring with Kazakhstan which is one of the richest countries in the world in terms of oil reserves. Geographical proximity with Kazakhstan and Iran along with being one of the littoral countries of Caspian Sea which is known to contain considerable amounts of energy resources may lead Turkmenistan to become an energy center by realization of planned gas pipeline projects. Moreover, Turkmenistan is located right in the middle of the Silk Road which starts in China and ends in Europe. Since 2009, Turkmenistan has been selling natural gas to China and it is quite probable that Turkmenistan may sell natural gas to Europe in the future which will possibly reinvigorate the Silk Road. Another major potential market of Turkmenistan may be India in its south-east, with its increasing population and natural gas demand. At the same time with its huge energy reserves of 17.5 trillion cubic meters of natural gas, which corresponds to nearly 10 percent of world reserves (BP, 2015a), Turkmenistan is a junction point at east-west and north-south directions. In brief, if all planned projects are realized Turkmenistan is going to supply natural gas to east, south and west directions making Turkmenistan an important actor in global energy trade.

A very comprehensive study on Central Asian countries from the perspective of globalization using geopolitics and economic development as reference points is Laruelle and Peyrouse (2012) where the spectrum of their research encapsulates a broad area.

There is vast literature about the Central Asian oil including Kleveman (2004); Davis and Azizian (2006); Johnson (2007); Olcott (2010); Palzuelos and Fernandez (2012). However, literature on Turkmen natural gas is quite limited in number and in context. Moreover, Turkmenistan's natural gas sector has been investigated mostly from an international relations point of view. There is no extensive research about the effect of its natural gas on the Turkmen economy. Since energy is very important for the economy of any country, being a major consumption item and the main input of production, impact of natural gas on the Turkmen economy needs to be examined extensively. The most recent literature on Turkmen natural gas from an economic point of view includes Toreyev (2005), Ussanepesow (2008), Arinç and Elik (2010), Horak (2012), Lee (2014) and Cobanli (2014).

Toreyev (2005) provides a general assessment of the alternative routes which transport Turkmenistan's natural resources abroad and arrives at a conclusion that Turkmenistan is exporting natural gas at a rather low price when compared with average prices of natural gas contracts in the world. According to the author, in order to avoid this inequality in relative prices, Turkmenistan should initiate new energy transportation routes which would eventually decrease Turkmenistan's dependence on Russia (Toreyev, 2005). After Toreyev's work, beginning from 2007 many new developments in politics, international relations, and economics have taken place and most importantly new natural gas reserves have been discovered. Under directives of new president Gurbanguly Berdimuhamedov, Turkmenistan started to pursue a more outward oriented foreign policy in its foreign relations and in terms of economics, it started to pursue a more outward-oriented growth strategy in 2007. Ussanepesow (2008) makes a general overview of Turkmenistan's natural gas sector in context of economics, concentrating on the implementation of the 15 year development plan of 1993, which emphasized the need for investigation of the feasibility of the alternative potential routes and came to a conclusion that the realization of this plan is partly achieved. This study does not touch upon the impact of natural gas on the international economic relations of Turkmenistan (Ussanepesow, 2008).

Arinç and Elik (2010), analyze Turkmenistan and Azerbaijan in context of European gas supply security. Throughout the study Turkey is a main reference point as a potential

future energy hub, being very close to about 70 percent of the world's oil and gas reserves in its east, north and south, and having one of the world's largest energy markets in its west. Arinç and Elik conclude that Turkmenistan has the necessary resources to meet the natural gas demand of Europe, Russia, Iran and China. Furthermore the main impediment for Europe is the lack of reliable transportation routes and transport via Turkey through Azerbaijan is the most desirable from a security of supply perspective. A major drawback of this study is the exclusion of India. When considering the future customers of Turkmen natural gas, it's inevitable to take into consideration India, which is a country experiencing dramatic increase in consumption of natural gas and which has the second largest population in the world. Horak (2012) analyzes Turkmenistan's shifting energy geopolitics between 2009 and 2011 from the perspective of Europe, giving special attention to especially Turkmenistan's bilateral relations with Europe, China and other East Asian countries like Pakistan and India. Horak (2012) concludes that, if Europe does not take the necessary measures to obtain maximum benefit from Turkmen gas, most of Turkmenistan's gas will flow to other places rather than Europe, with no chance of retrieving it.

Lee (2014) examines Turkmenistan's policies of diversifying its gas export routes and concludes that until 2009, competition over the natural gas reserves of Turkmenistan has enhanced the bargaining power of Turkmenistan and since 2009, Turkmenistan is in the process of replacing the major buyer Russia with China as a new major buyer (Lee, 2014). Cobanli (2014) investigates the selected pipeline projects' (Turkmenistan-China pipeline, Trans-Caspian pipeline, Turkmenistan-Turkey pipeline and Southern Corridor) impacts on bargaining power of the players in the Eurasian gas trade and especially on Turkmenistan and concludes that among above mentioned routes, Turkmenistan – China pipeline is the best diversification option for the Central Asian countries in strengthening their bargaining power. Among the rest of three pipeline projects, Trans – Caspian pipeline is the most feasible route for Turkmenistan in order to export its natural gas to West. In this research author does not touch upon the TAPI pipeline, which is another major alternative route for transportation of Central Asian, and especially Turkmenistan's natural gas.

Considering the importance of energy resources for an economy and the drawbacks of the earlier studies, it is necessary to examine the natural gas sector of Turkmenistan from an economic point of view by a more comprehensive approach by taking into account the discoveries of new reserves of natural gas, Turkmenistan's geopolitical location and Turkmenistan's shift to more outward oriented policies.

A country which is dependent on a single energy resource may be subject to some drawbacks such as demand and price fluctuations, dependence on one buyer and vulnerability to accident and/or sabotage. The extent of threat that Turkmenistan may be exposed to because of those drawbacks must also be taken into consideration in order to provide a complete assessment of Turkmenistan's natural gas sector. However, with the exception of vague contribution of Lee (2014), this issue is not investigated extensively in existing literature.

Within this context, the aim of this thesis is to determine the importance of natural gas reserves on the Turkmen economy with special emphasis on the positive and negative impacts of natural gas of Turkmenistan on Turkmenistan, and to derive policy recommendations for maximizing the benefits of energy resource ownership and minimizing the negative impact of dependence on a single resource. This thesis covers the period between 1992 and 2013 and projections until 2040. Study attempts to determine the potential demand for Turkmen natural gas together with the potential supply of Turkmen natural gas and the potential supplies of competitive suppliers in order to observe whether there will be continuous demand for Turkmen natural gas until 2040. The potential threat that Turkmenistan may be subject to because of its dependence on a single energy resource is investigated by reviewing the existing literature and policy recommendations are derived within this framework.

The second chapter is devoted to the analysis of Turkmenistan's economy with strong emphasis on the natural gas sector. First of all, macroeconomic indicators of Turkmen economy and basic indicators of Turkmenistan's natural gas sector, such as production, consumption, import and export levels of natural gas are presented. Then, present and potential natural gas transportation routes originating from Turkmenistan are analyzed.

In this part, feasibility of those alternative energy transporting routes is assessed and their advantages and costs for Turkmen economy are evaluated.

The third chapter concentrates on potential demand for Turkmenistan's natural gas within present and potential world energy outlook. In order to determine the potential demand for Turkmen natural gas; Russia, China, Europe, India, Iran and lastly Turkey are taken into consideration. Those countries are chosen for their geographical proximity to Turkmenistan as well as the sustained and rapid increase in their natural gas demand. Since Turkmenistan gained its independence in 1991, economic relations between energy demanding countries and Turkmenistan is rather a new concept except for the case of Russia.

The fourth chapter explores and assesses the supply and trade potentials of the major producers of natural gas in the neighborhood of Turkmenistan i.e. Turkmenistan's competitors, namely Russia, Iran, Qatar, Kazakhstan and Uzbekistan. Planned natural gas transporting routes of each country are also investigated from the perspective of their technical properties, capacity and significance to Turkmenistan.

The fifth chapter, brings together the projected pattern of global demand and supply of natural gas until 2040 and determines Turkmenistan's potential share in the global supply of natural gas. This chapter also provides an overview on the negative impacts of single resource ownership and evaluates the extent of these negative impacts on Turkmen economy. Lastly, this chapter provides policy recommendations to ensure sustained demand for Turkmen natural gas and to make optimum use of revenues from natural gas exports for avoiding the possible negative impacts of Turkmenistan's single resource ownership.

The sixth chapter is the conclusion, in which all the findings of this thesis are briefly summarized.

CHAPTER 2

TURKMENISTAN AND NATURAL GAS

The State of Turkmenistan gained its independence from USSR on 27 October 1991. Turkmenistan is bordered by Kazakhstan on the northwest, Uzbekistan on the northeast, Afghanistan on the southeast, Iran on the south and southwest, and the Caspian Sea on the west. Turkmenistan's territory is about 491 210 km^2 (MFAT, 2015). Turkmenistan is made up of five provinces and its capital is Ashgabat. Turkmenistan gained its Neutrality Status[1] in 12 December 1995, by the unanimous approval of 185 member countries of United Nations. Turkmenistan conducts its external policy based on the conditions of its Neutrality Status (UN, 1995).

Turkmenistan ranks in the fourth place in the world with respect to its natural gas reserves, which constitutes nearly 10 percent of world reserves (BP, 2015a). Energy is one of the major factors which shapes and influences the economy of every country on earth. Energy resources, particularly fossil fuels are in limited amount and this reality further accentuates the importance of energy resources for all countries in the world. Throughout history global energy requirements have been increasing exponentially (Jefri and Zahed, 1991). This makes Turkmenistan vital actor in global energy trade and especially natural gas trade. Natural gas reserves of Turkmenistan is the major driving force behind the economic development and progress of country. By virtue of its sustained, high exports of natural gas abroad, per capita income of Turkmen citizens increased considerably.

From 1991 to 1997, Turkmenistan exported natural gas only to Russia, and since 1997, has also been exporting natural gas to Iran. Beginning from 2009, Turkmenistan has been

[1] *"The legal status arising from the abstention of a state from all participation in a war between other states, the maintenance of an attitude of impartiality toward the belligerents... of this abstention and impartiality. Under international law this legal status gives rise to certain rights and duties between the neutral and the belligerents"* (Britannica, 2015).

selling natural gas to China and it is quite probable that Turkmenistan may sell natural gas to India, as well as Europe in the future which will possibly reinvigorate the Silk Road again. As a result, Turkmenistan is a junction point at east-west and north-south directions, taking firm steps forward in order to become the energy center of Central Asian region, paying special attention to its Neutrality status

2.1. Economic Outlook

Turkmenistan's economy is in process of integration with the international markets, i.e. Turkmen economy is adopting market based economic policy and eluding from the legacy of Soviet regime. Under the directives of Turkmenistan's President Gurbanguly Berdimuhamedov Turkmenistan's integration into international markets has accelerated. Table 1and Figure 1 present main macroeconomic indicators of Turkmenistan's economy for the 1997-2014 period.

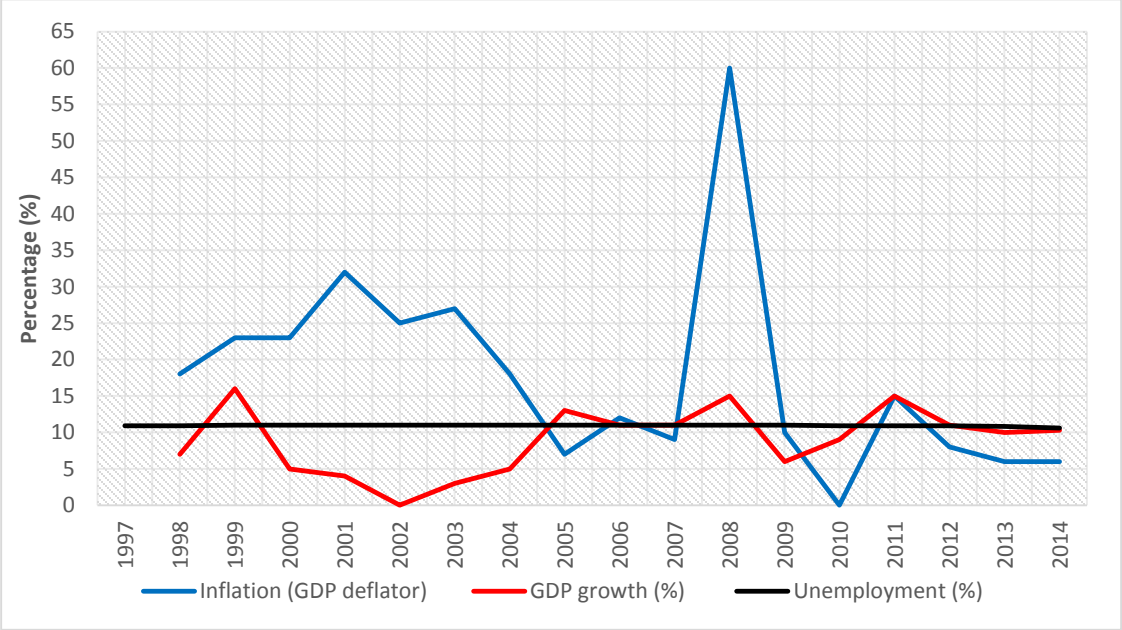
Table 1 Macroeconomic indicators of Turkmenistan's economy

Years	Inflation rate % (GDP deflator) (1)	GDP growth rate* (%) (1)	Unemploy-ment rate (%) (2)	Government revenue (Million Turkmen Manat) (3)	Government gross debt (million Turkmen Manat) (3)	GDP (million US Dollar) (1)
1997	62	-11	10.9	24 854	1 125	2 450
1998	18	7	10.9	25 379	1 803	2 606
1999	23	16	11	21 709	2 111	2 451
2000	23	5	11	23 584	2 272	2 905
2001	32	4	11	21 814	1 940	3 535
2002	25	0	11	18 221	1 726	4 462
2003	27	3	11	23 068	1 586	5 977
2004	18	5	11	20 259	1 330	6 838
2005	7	13	11	20 475	961	8 104
2006	12	11	11	20 202	742	10 278
2007	9	11	11	17 349	652	12 666
2008	60	15	11	20 867	1 390	19 271
2009	10	6	11	20 427	1 403	20 214
2010	0	9	10.9	16 111	2 597	22 148
2011	15	15	10.9	18 265	8 372	29 233
2012	8	11	10.9	21 000	18 106	35 164
2013	6	10	10.8	17 435	24 632	41 013
2014	6	10	10.6	--	--	47 930

Source: Based on data from (1) World Bank, (2015b), (2) State Committee of Turkmenistan about Statistics (2015), 3: International Monetary Fund (2015). Accessed 05/07/2015; * Based on real GDP, where 2005 is base year.

As can be followed from Table 1 and Figure 1, since the end of 1990's, Turkmenistan has achieved sustained high growth rates excluding 2002. Between 1998 and 2014, the average growth rate of Turkmenistan was 8.9 percent. As can be deduced from Table 1, within 16 years GDP has increased 18 fold. This trend has not shown any oscillation even during the global financial crisis of 2008.

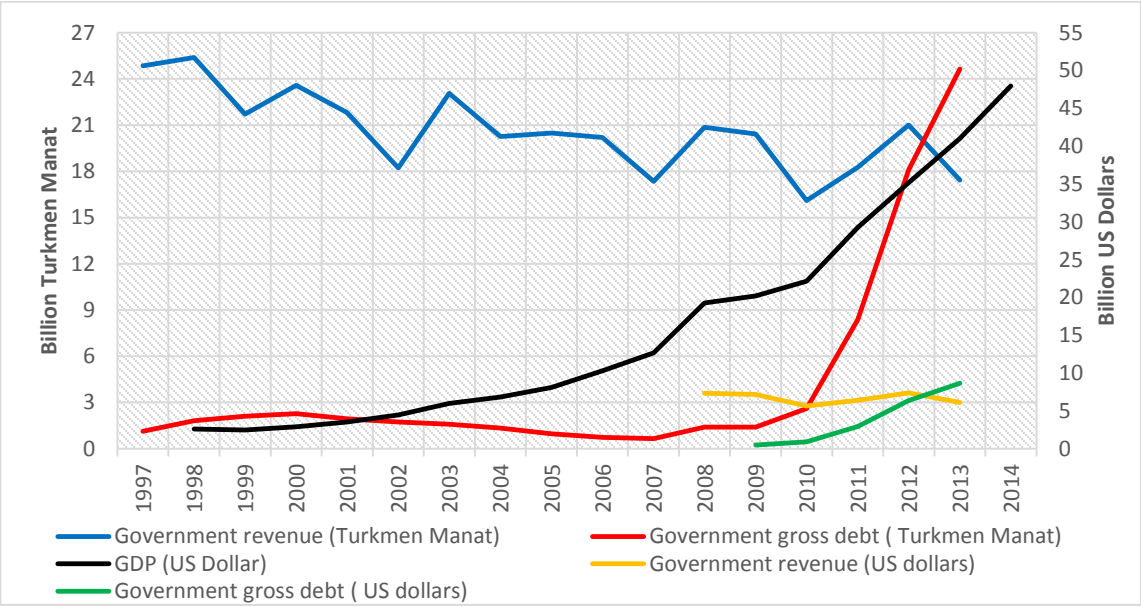
The growth of Turkmen economy in 2014 was 10.3 percent and this progress was based on growth of extractive and non-extractive sectors together. This double digit growth rate in 2014 was achieved despite the approximately 45 percent decline in global oil price, which is also reflected on the price of Turkmen natural gas. Growth rate of non-extractive sectors was 13 percent in 2014, outstripping the rate of the growth of the hydrocarbon sector, which is the main driver of overall economic dynamism. In 2014, per capita GDP of Turkmenistan in current US dollars was 9 032 dollars and per capita GDP in Purchasing Power Parity (PPP) was 15 474 dollars (Word Bank, 2014).



Source: Based on data from Table-1. Accessed 11/07/2015

Figure 1 Inflation, unemployment and growth rate of Turkmenistan

In addition to the high economic growth rate, Figure 1 also shows trend of inflation rate and unemployment rate of Turkmenistan. Before (1997-2014), between 1991 and 1997, inflation rate of Turkmenistan skyrocketed (hyperinflation). For instance, inflation rate was about 3 100 percent in 1992 and 1 134 percent in 1993 (World Bank, 2015b). Hyperinflation was due to the shift from common Soviet currency to Turkmen Manat. Within the period under study, only in 2008 the inflation rate of Turkmen economy has escalated to 60 percent and the reasons were the devaluation of Turkmen Manat and increase in the price of gasoline and diesel fuel in 2008. It can be said that Turkmen authorities have managed to mitigate the fluctuations of economic indicators such as the inflation rate over the period under study. In addition, registered unemployment rate of Turkmenistan has shown a stable trend throughout the time, ranging between 10 and 11 percent.



Source: Based on data from Table-1. Accessed 11/07/2015

Figure 2 GDP, revenue and gross debt of Turkmenistan

From 1997 to 2013, government revenue decreased by 30 percent from 24.8 billion Turkmen Manat to 17.4 billion Turkmen Manat. During the same period, gross debt of the country was stable until 2010. However, since 2010, government gross debt has increased dramatically due to the large scale investments in natural gas sector and in the

construction site for the preparation of 5th Asian Indoor Games[2] which is going to be conducted in 2017. This trend in government debt is clear in Figure 2 both in terms of Turkmen Manat and in US dollars.

Turkmenistan's national currency is Turkmen Manat and it came into use in 1993. Turkmenistan follows fixed exchange rate regime policy. Until 2008, there were two exchange rates of dollar to Turkmen Manat. The first one was determined by Central Bank of Turkmenistan as 1 US dollar = 1.05 Turkmen Manat, which was fixed to that ratio and the second was determined by market (black market) that was around 1 US dollar = 4.50 Turkmen Manat. In 2008 Central Bank of Turkmenistan has unified these exchange rates as 1 US dollar = 2.85 Turkmen Manat. Between 2008 and 2014, Central Bank of Turkmenistan preserved that exchange rate. Starting from 1 January 2015, Turkmen Manat was devalued about 22 percent and new exchange rate became 1 US dollar = 3.5 Turkmen Manat (Central Bank of Turkmenistan, 2015). This measure has been taken because of two reasons. First reason was to overcome the undesirable consequences of the sharp decrease in energy prices beginning from mid-2014, due to international developments. Second reason was to avoid the substantial capital outflows to Russia from Turkmenistan. The capital outflow to Russia was triggered by the major devaluation in Russian ruble, leading real estate prices in Russia to decline considerably for foreigners and thus appealing Turkmen citizens to buy real estate in Russia.

Due to its major importance for the Turkmen economy natural gas sector is analyzed extensively in the following section. However it is worthwhile to explain the basic feature of the oil sector which is comparatively less important for the Turkmen economy in this section. Turkmenistan is less equipped with oil, when compared with its natural gas reserves. Main oil reserves are located in the western (including Turkmen part of Caspian Sea) and eastern part of the country. Turkmenistan's proven oil reserves are 600 million barrels (BP, 2014). Crude oil is refined in Turkmenistan at two plants. First one is the Turkmenbashy oil refinery which is located in the western part of the country. The second one is the Seidi oil refinery which is located in the eastern part of the country.

[2] 5th Asian Indoor Games is going to take place in the Olympic village, a multi-purpose sports facility which is being constructed in the capital of Turkmenistan, Ashgabat. The complex will feature 30 venues, and total cost of construction is estimated at 5 billion US dollars (OCA, 2015)

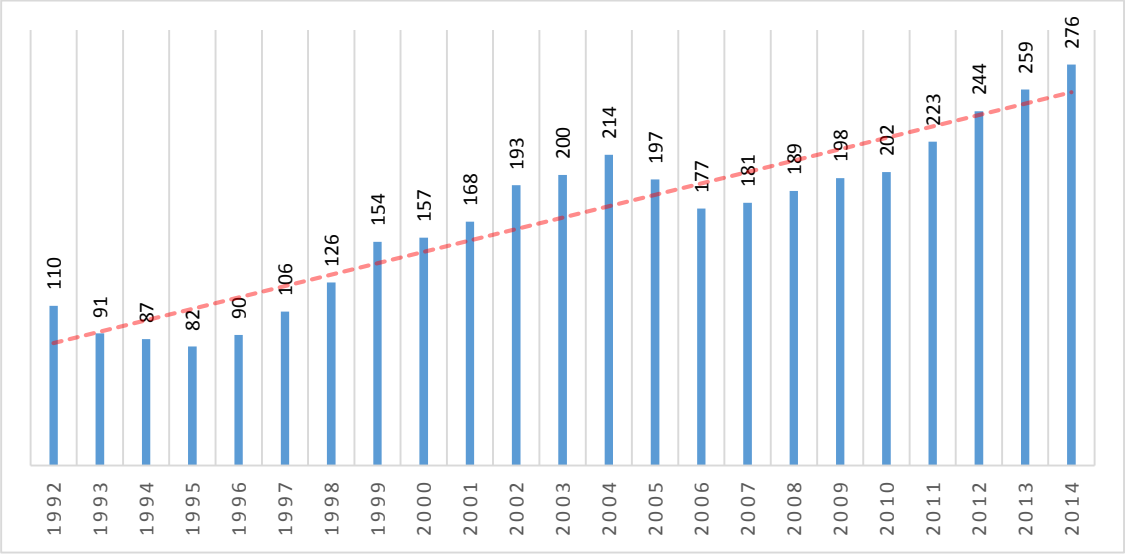
Turkmenbashy oil refinery complex is Turkmenistan's main producer of petrochemical products which is located by the Caspian coast. This complex was built during the Second World War and was put into operation in 1943. Since 1990s, Turkmenbashy oil refinery complex has been in different phases of reconstruction and modernization. The first stage of reconstruction of this complex took place from 1999 to 2004. The overall cost of this reconstruction was about 1.6 billion $. After the modernization, oil refining capacity grew by two million tons and reached the design level of 6 million tons per year and oil refining depth[3] (conversion factor) grew from 64 percent to 82 percent. As of the end of 2011, the capacity of enterprise was 20 million tons. In June 2012, the president ordered the start of the second stage of refurbishing of Turkmenbashy oil refinery complex. The program aimed at raising the current existing conversion ratio by 20 percent and bringing the quality of motor gasoline to EU standards (Petrofinder Editors, 2013).

During the Soviet era of 1970's Turkmenistan reached its highest level of oil production which was about 15.5 million tons. Production of crude oil gradually decreased through the next 20 years and significantly dropped after the dissolution of the USSR. In 1995, Turkmenistan had the lowest level of production which was 4.55 million tons annually. From the beginning of the 2000's the industry managed to recover and reached the production level of 10 million tons per annum (Petrofinder Editors, 2013). Figure 3 shows annual oil production of Turkmenistan per day for the 1992-2014 period. It can be noticed from this figure that the trend of oil production of Turkmenistan has increased through time.

Turkmenistan pursues an ambitious strategy for developing its oil sector. The Oil and Gas Development Program Until 2030, approved in October 2006, envisages significant increase in oil production and production of refined products as well as export of final products. If the current production level of oil continues, reserves of Turkmenistan is going to run out in the foreseeable future; therefore Turkmenistan is in search of developing ways to get fuel from natural gas. For example, a framework agreement was signed between Turkmengaz State Concern and South Korean consortium in April of 2015 in South Korea. According to this framework agreement, LG and Hyundai

[3] A refining indicator defined as the percentage ratio of obtained petroleum products, not including bulk fuel oil, to the original quantity of crude oil.

companies of South Korea are going to build a plant for the production of synthetic liquid fuel through natural gas processing in Turkmenistan.



Source: Based on data from US EIA (2013) Accessed 27/07/2015

Figure 3 Total oil production of Turkmenistan (thousand barrels per day)

2.2. Natural gas sector

Turkmenistan is the richest country in Central Asia with respect to its natural gas reserves, holding about 17.5 trillion cubic meters of natural gas which corresponds to 10 per cent of overall natural gas reserves of the world. (BP, 2014). Turkmengaz State Concern and Turkmen State Agency for Management and Use of Hydrocarbon Resources[4] are responsible for the operations of natural gas. Former institution is in charge of the management of operations which relate to natural gas sector of Turkmenistan and the latter institution is responsible for the management of the underground treasures. This section is devoted to the presentation of basic indicators of natural gas sector, as well as present and potential natural gas transportation routes of Turkmenistan and to the evaluation of impact of natural gas reserves on the economy.

[4] According to the Constitution of Turkmenistan, underground treasures of Turkmenistan belong to all citizens of Turkmenistan, in other words, underground treasures of Turkmenistan cannot be operated by private foundation of Turkmenistan.

2.2.1. Basic indicators

Turkmen economy depends heavily on natural gas production and exports. Table 2 presents basic indicators of natural gas sector and additionally total export and total import values of Turkmenistan for 1991-2013 period. Due to lack of reliable information, data about natural gas sector includes period between 1992 and 2013. Due to the same reason, data about imports and exports of goods and services starts from 1991 and ends in 2012.

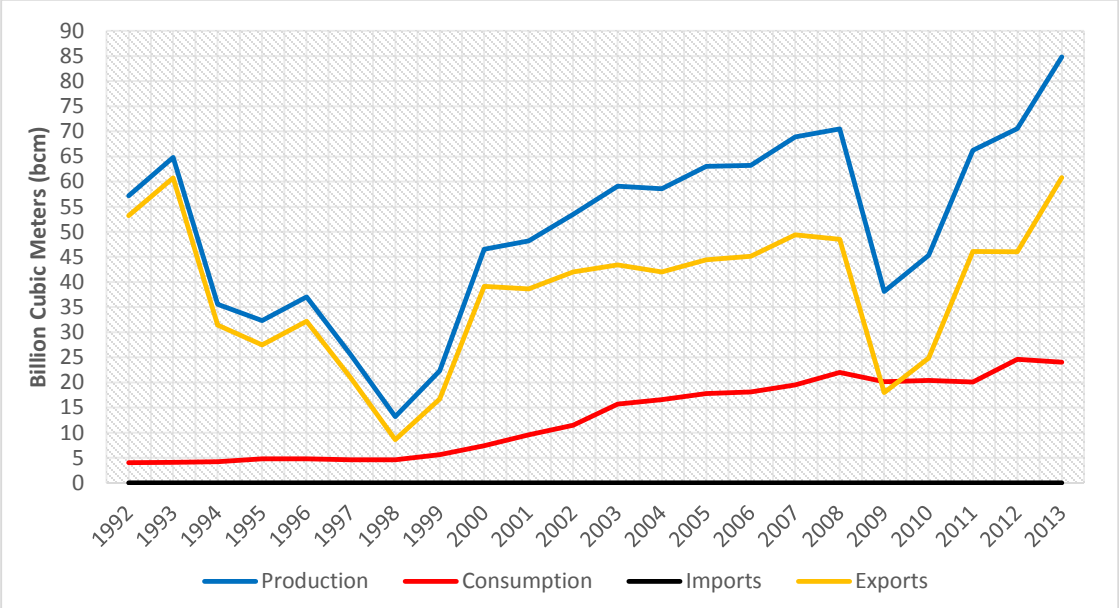
As shown in Figure 4, Turkmenistan meets all its internal natural gas demand from domestic production. Turkmenistan reached peak level of its natural gas production in 1989, which was about 89.9 bcm.

Table 2 Indicators of natural gas sector and foreign trade of Turkmenistan

Year	Production of natural gas (bcm) (1)	Consumption of natural gas (bcm) (1)	Share of exports in total production of natural gas (%)	Export of natural gas (bcm) (1)	Total imports (billion US dollars) (2)	Total export (million US dollars) (2)
1991	--	--		--	857	1 238
1992	57.2	4.0	93	53.2	1 222	2 149
1993	64.8	4.1	94	60.7	1 951	2 693
1994	35.6	4.2	88	31.4	2 185	2 176
1995	32.3	4.8	85	27.5	2 090	2 084
1996	37.0	4.8	87	32.2	1 794	1 775
1997	25.5	4.6	82	20.9	1 679	1 046
1998	13.2	4.6	65	8.6	1 845	851
1999	22.3	5.6	75	16.7	2 046	1 376
2000	46.5	7.4	84	39.1	2 351	2 774
2001	48.2	9.6	80	38.6	2 717	2 877
2002	53.5	11.5	79	42.0	2 383	3 081
2003	59.1	15.7	73	43.4	3 384	3 725
2004	58.6	16.6	72	42.0	4 071	4 216
2005	63.0	17.8	70	44.4	3 872	5 270
2006	63.2	18.1	71	45.1	3 589	7 512
2007	68.8	19.5	72	49.4	4 901	9 548
2008	70.5	22.0	69	48.5	7 781	12 345
2009	38.1	20.2	47	18.0	9 145	15 079
2010	45.3	20.9	55	24.9	10 044	17 234
2011	66.2	20.1	70	46.1	12 726	21 836
2012	70.6	24.6	65	46.0	15 611	25 761
2013	84.9	24.0	72	60.8	--	--

Source: Based on data from (1) US EIA (2013); (2) World Bank (2015b). Accessed 28/07/2015

After that peak level in 1989, both production and export levels have steadily decreased due to delays in payments[5] for exported natural gas until 1998. With respect to its peak production level of 1989 Turkmenistan's production decreased about 85 percent in 1998. Since then as a result of new launched natural gas transporting pipeline between Turkmenistan and Iran, both production and export of natural gas has achieved steady increase. This increasing trend was disrupted in 2009 due to explosion in the Central Asia-Center Gas Pipeline system. Towards the end of that year explosion in the Central Asia-Center Gas Pipeline was fixed, however previous transportation capacity has not been achieved.



Source: Own calculations based on the US EIA (2013). Accessed 20/03/2015

*Data are converted from cubic feet to cubic meter by author

Figure 4 Indicators of natural gas sector of Turkmenistan

On 3 April 2006, Turkmenistan and China signed a framework agreement about the construction of Central Asia-China Gas Pipeline. Construction of the pipeline is completed and flow of natural gas started in 2009. By virtues of these developments both export and production of natural gas has again increased without big disruptions in the export of natural gas due to the explosion in Central Asia-Center gas pipeline system in

[5] Due to economic contractions in both Russia and Ukraine Turkmenistan was not able to receive timely payments.

2009. Even in 2013, (with its production level of 84.8 bcm), Turkmenistan is behind its record production level of 1989 by about 5 bcm.

Between 1992 and 2013, internal consumption of natural gas has shown a steady increasing trend. Especially after 2000s, internal consumption of natural gas started to increase considerably as a result of economic growth. From 1992 to 2013 overall internal consumption of natural gas has increased by 501 percent (more than six fold) and main driver of increase in internal consumption of natural gas is the electricity production, since natural gas is used as an input in production of electricity. After 2000s and particularly in the recent years Turkmenistan has increased its electricity production and at the same time increased its electricity export.

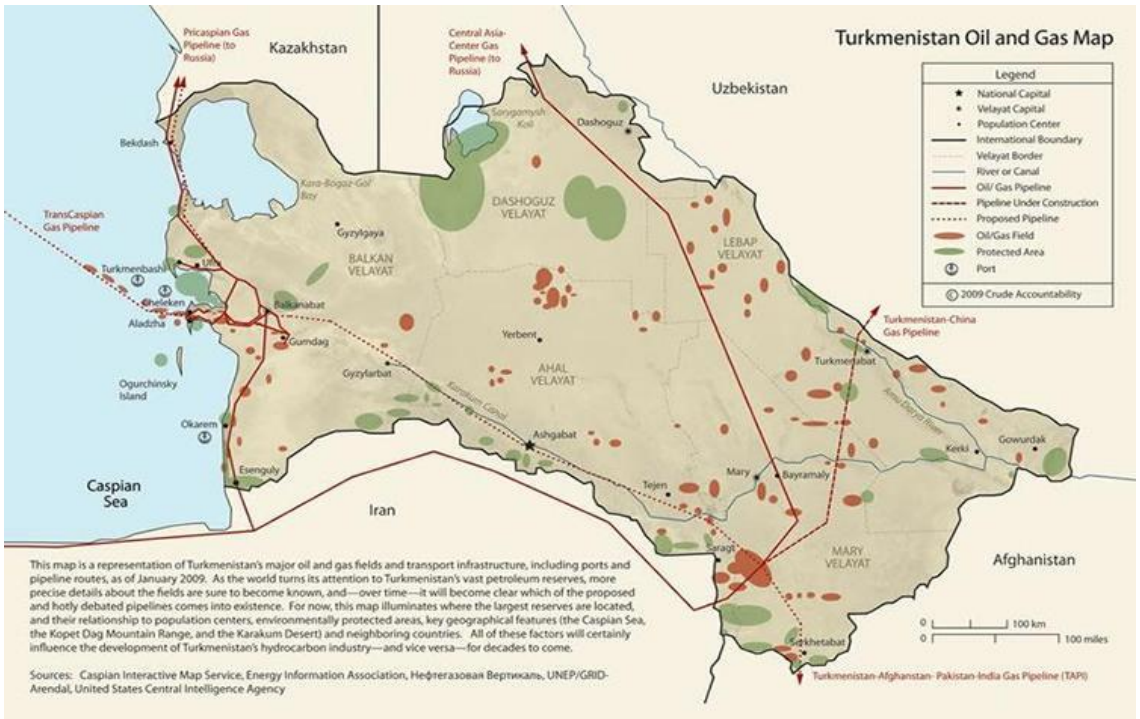
Currently, Turkmenistan is exporting natural gas to Russia, China and Iran. Despite the fluctuations in the amount of exported natural gas throughout the time, Turkmenistan managed to achieve stable increase (except for the year 2009) in the amount of exported natural gas since 1998. Since its independence, Turkmenistan's export capacity reached to the record level of 60.8 bcm in 2013.

2.2.2. Natural gas transportation routes

In this part, alternative energy transportation routes that originate from Turkmenistan is analyzed. This section is also devoted to whether diversification policy (diversification of exporting routes) of Turkmenistan has increased its bargaining power.

Map-1 shows alternative natural gas transportation routes of Turkmenistan. Additionally in Map-1, oil and natural gas reserves of Turkmenistan are presented.

Turkmenistan's major natural gas reserves are located at the center and at the east of the country. The first natural gas field was discovered in Derveze in 1956 which is located in the center of Turkmenistan. There is also considerable amount of natural gas in the western part of Turkmenistan. It is estimated that there is 1.3 trillion cubic meters of natural gas in the Turkmen side of the Caspian Sea. Eastern natural gas reserves are located in the Amu Darya basin. The largest natural gas field of Turkmenistan is Galkynysh field and it is the third largest natural gas field in the world.



Source: http://www.eurasiansecurity.com/energy-geopolitics/turkmenistan-pipeline-completing-east-west/ (February 23, 2015) Accessed 17/06/2015.

Map-1 Natural gas reserves and alternative energy transportation routes of Turkmenistan

This gas field is located in Mary province near Yoloten. In addition to that there is Bagtyyarlyk gas field that is located in the Lebap province of Turkmenistan. This gas field incorporates several gas fields which are located in the right bank of Amu Darya. By virtue of large scale investments, starting from 2020s producing capacity of this field expected to reach 100bcm/a (Natural Gas Europe, 2015).

Natural gas transportation routes of Turkmenistan and their technical features are presented in Table 3. There are three present and two potential routes. In Table 3 Trans Caspian pipeline is not included due to the lack of reliable data.

The present energy transportation routes are; Central Asia – Center gas pipeline, Turkmenistan – Iran gas pipeline system, Central Asia – China gas pipeline. The potential routes are; Turkmenistan – Afghanistan – Pakistan – India gas pipeline and lastly Trans – Caspian pipeline. These routes are evaluated in the following sections and their impacts on the Turkmen economy are interpreted.

Table 3 Natural gas transportation routes originating from Turkmenistan

	Starting Date	Completion Date	Diameter	Capacity	Length
Central Asia-Center (2)	1960	1967	1 200-1 400 mm	80 bcm/a	3 000 km
Korpedje-Kurt Kuy (3)	October, 1995	August, 1997	--	8 bcm/a	200 km
Dovletabad-Sarakh-Khangiran (3)	July, 2009	October, 2009	--	12 bcm/a	182 km
Central Asia-China (Line A) (1)	July, 2008	December, 2009	1 067 mm	15 bcm/a	1 830 km
Central Asia-China (Line B) (1)	July, 2008	October, 2010	1 067 mm	15 bcm/a	1 830 km
Central Asia-China (Line C) (1)	September, 2012	May, 2014	1 219 mm	25 bcm/a	1 830 km
Central Asia-China (Line D) (1)	September, 2013	In 2017	--	30 bcm/a	1 000 km
TAPI (4)	end of 2015	end of 2018	1 422 mm	33 bcm/a	1 820 km

Source: Based on data from (1) CNPC, (2015); (2) Gazprom, (2015a); (3) Atai & Azizi, (2012); (4) Foster, (2008). Accessed 07/02/2015

2.2.2.1. Present energy transporting routes

Present energy transporting routes include Central Asia – Center (CAC) gas pipeline and lastly Turkmenistan – Iran gas pipeline system, Central Asia – China gas pipeline. Central Asia – Center gas pipeline system connects Central Asian countries to Russian natural gas network system and Turkmenistan – Iran gas pipeline system includes two different natural gas pipelines which connect western and eastern parts of Turkmenistan to northern Iran. Central Asia – China gas pipeline connects Central Asian countries to China.

2.2.2.1.1. Central Asia – Center Gas Pipeline System

Central Asia – Center gas pipeline system (CAC) is made up of four lines. This pipeline system connects Turkmenistan, Uzbekistan and Kazakhstan with Russian natural gas network system. It aims to collect natural gas from the gas fields located at the center and

in Amu Darya basin of Turkmenistan and transport that gas to Russia as can be seen from Map-2.

The first phase of construction of CAC was completed in 1967 as given in Table 3. By 1985, CAC reached its maximum delivery capacity of 80 bcm of natural gas annually. The total length of this system is about 3,000 kilometers (Gazprom, 2015a).

Turkmenistan exported all its natural gas through CAC until 1997. The payment procedure for exported Turkmen natural gas was in two forms. The first one was in cash (US dollars) and the second one was in barter form. The barter system worked by exchanging industrial equipment such as KAMAZ trucks or any other agricultural equipment instead of paying for the exported natural gas by cash. The payment process was a mixture of these two forms, therefore, it is complicated to determine the exact impact of exports of natural gas to Russia on Turkmenistan's overall exports[6]. The two payment systems still prevail, however the share of barter has considerably decreased at present.

Source: Gazprom (2015). Accessed 22/05/2015

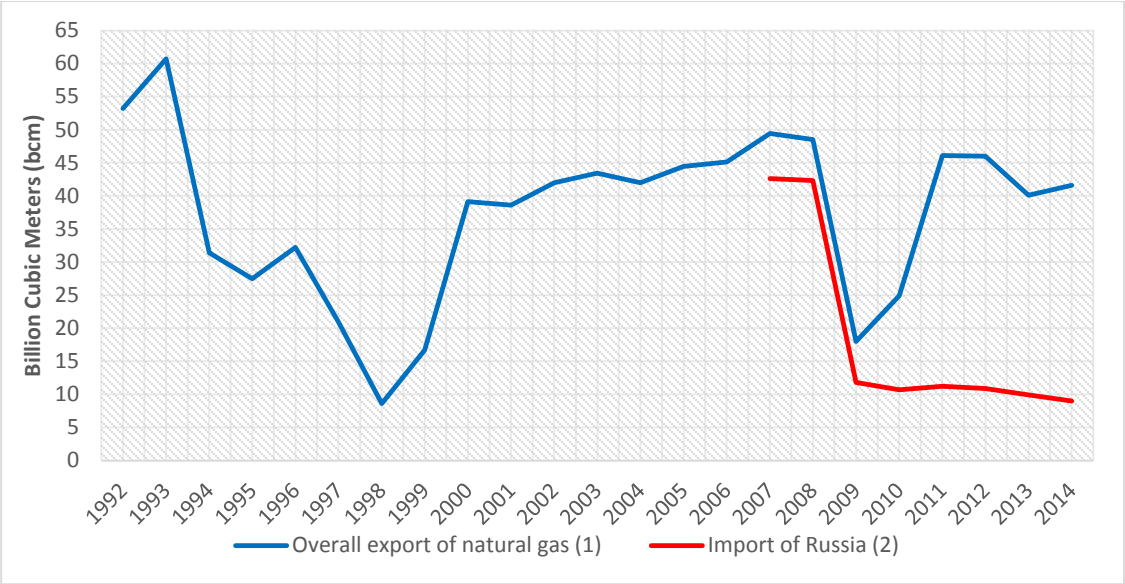
Map 2 Map of Central Asia – Center Gas Pipeline

[6] The drawbacks of depending only on one buyer are analyzed in section 5.2.2.

Russia has the largest natural gas reserves in the world (US EIA, 2014a). For Russia, the main driver of importing natural gas from Turkmenistan is to export that gas to energy thirsty Europe. Exportation of natural gas to Russia has shown oscillations since Turkmenistan's independence. Until 1998, the export of natural gas gradually decreased due to the delays in the payment as explained in section 2.2.1. Then, from that year on, exportation of natural gas started to increase modestly. According to the agreement signed between Turkmengaz State Concern and Gazprom in 2008, Russia undertook to import 40 bcm of natural gas annually from Turkmenistan.

However, due to the explosion in the CAC in 2009, there has been a decrease in the exportation of Turkmen natural gas to Russia as can be seen from Figure 5. At 1:32 a.m. on April 9, 2009 explosion occurred in the 302 mile segment of CAC pipeline system which is near the Turkmen-Uzbek border. Following that development Foreign Ministry of Turkmenistan issued several statements about this incident alleging that Gazprom unilaterally decided on short notice to reduce the amount of natural gas imports from Turkmenistan. Warning about the reduction of imported gas was given only one day in advance which was not sufficient time for Turkmen experts to reduce its flow into the pipeline network (Daly International Correspondent, 2009). Since the explosion, previous delivery capacity of CAC has not been reached. Recently, Russian energy company Gazprom, announced that by the end of 2015 Gazprom will have imported 4 billion cubic meters of natural gas from Turkmenistan (Trend News, 2015a) which is about a 90 percent decrease in the import of natural gas with respect to the period before 2009.

Until 2009, though Iran was also importing natural gas from Turkmenistan through Turkmenistan – Iran pipeline system, Russia was a major actor in the import of Turkmen natural gas. Due to the insufficient reliable information, the exact volume of natural gas that is imported by Russia from Turkmenistan cannot be given for all the years. However, it is common knowledge that Russia had been importing substantial amount (about 85-90 percent) of exported Turkmen gas until 2009, which can be observed from Figure 5. Since 2009, this stance has shifted to a decreasing trend and importance of Russia in the import of Turkmen gas seems to decrease even further mainly due to economic reasons.



Source: Own calculations based on (1) US EIA (2013) & BP (2013-2015)

(2) Gazprom (2015) & BP (2013-2015). Accessed 22/05/2015.

Figure 5 Import of natural gas by Russia

2.2.2.1.2. Turkmenistan – Iran Pipeline

There are two pipelines which connect Turkmenistan with Iran. The first one is Korpedje – Kurt Kuy pipeline which connects western Turkmenistan with northern Iran. The second one is Dovletabad – Sarakhs – Khangiran pipeline which connects Turkmenistan's Dovletabad gas field (eastern part of Turkmenistan) with northern Iran.

Iran is one of the first countries that recognized Turkmenistan's independence and energy is the major driver in the bilateral relations of these countries. Iran has more natural gas reserves than Turkmenistan. However, being one of the most energy intensive countries in the world, and having a poor network system, Iran is forced to import natural gas from Turkmenistan. Most energy reserves of Iran are located in the southern part of Iran, however, the main population of Iran resides in the northern part. Thus, importing natural gas from Turkmenistan is more economic for Iran than investing huge amounts of capital to connect its southern part with its northern part, at least for the present.

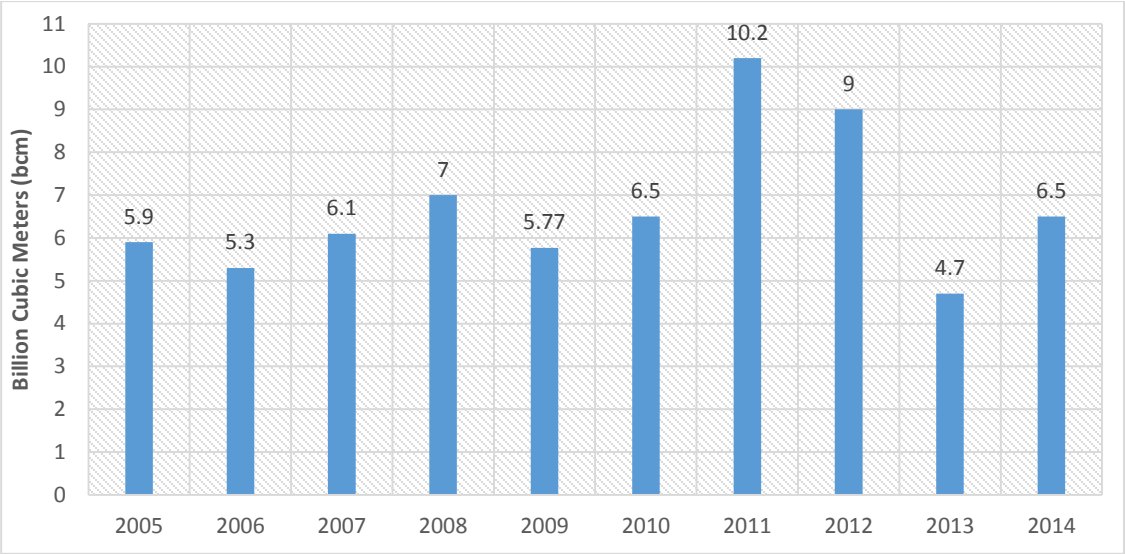
In October 1995, National Iranian Gas Company (NIGC) signed a 25 year Korpedje – Kurt Kuy agreement with Turkmenistan. According to this agreement, Turkmenistan is

to export 8 bcm (Table 3) of natural gas to Iran annually through Korpedje – Kurt Kuy pipeline for 25 years (until 2022). The pipeline is 200 km long and connects the western part of Turkmenistan to the populous northern part of Iran. The construction of pipeline had a cost of 190 million US dollars and came into operation in 1997. The initial capacity of pipeline was 4 bcm of natural gas annually and eventually reached to 8 bcm/a (Atai and Azizi, 2012). Korpedje – Kurt Kuy pipeline has a major importance for Turkmenistan as being the first pipeline that transported natural gas abroad other than CAC. This development was a breakthrough for Turkmenistan in pursuing its supply diversification policy.

The second pipeline that connects Turkmenistan with Iran is the Dovletabad – Sarakhs – Khangiran pipeline (Table 3). The decision about the construction of this pipeline was made at state level in July 2009 and construction of this pipeline was completed in October 2009. The first flow of natural gas was initiated on 6 January, 2010. The total length of the pipeline is 182 kilometers, 31 kilometers of which lay in the Turkmen part. The pipeline starts from Douletabad gas field and stretches to Sarakhs where it crosses Turkmenistan – Iran border. The initial capacity of this pipeline was 6 bcm annually and eventually it is planned to reach 12 bcm of natural gas annually.

With Korpedje – Kurt Kuy and Dovletabad – Sarakhs – Khangiran gas pipeline, overall delivery capacity of Turkmenistan – Iran gas pipeline system reached to 20 bcm annually (Hasanov, 2009). As can be seen from Figure 6, the maximum capacity of these two pipelines (20 bcm/a as shown in Table 3) has never been exploited. Both of the pipelines are used to meet the natural gas demand of the population which resides in the northern part of Iran.

There are problems in determining the exact economic impact of natural gas trade with Iran on the Turkmen economy due to the insufficient amount of reliable information. However, it can be said that, sometimes problems arise in receiving payments. The main impediment on receiving payments is the sanctions of Western countries on the Iranian banking sector's international transactions.



Source: BP (2005-2014). Accessed 17/06/2015

Figure 6 Turkmenistan's natural gas exports to Iran (2005-2014)

Since both countries are rich in natural gas reserves, the extent of natural gas trade is restricted. In 2013, Iran was the sixth largest trading partner of Turkmenistan with a share of 2.4 percent in overall trade of Turkmenistan (European Commission, 2015). When Iran manages to connect its southern part with its northern part, it will be more economic to meet its domestic natural gas demand by its internal natural gas production than importing natural gas from Turkmenistan.

2.2.2.1.3. Central Asia – China gas pipeline

Central Asia – China gas pipeline is made up of 4 pipelines. They are Line A, Line B, Line C and Line D. Lines A/B/C are parallel to each other and start from the city of Gedaim, which is located in the Turkmenistan – Uzbekistan border, and end in the city of Horgon which is located in China's Xinjiang Uygur Autonomous Region, passing through Uzbekistan and Kazakhstan. Line D is now under construction and is planned to be finished in 2017. It starts from Turkmenistan and ends in China passing through Uzbekistan, Tajikistan and Kyrgyzstan (CNPC, 2015).

2.2.2.1.3.1. Construction process

In April 2006, a general agreement was signed between China and Turkmenistan about the construction of Turkmenistan – China gas pipeline (Central Asia – China Gas Pipeline). Table 4 presents general information about all agreements on Central Asia – China gas pipeline which was signed between Turkmenistan and China on the issues of energy. About one year later, in July 2007, they signed a production sharing contract about the exploration and development of gas fields on the right bank of Amu Darya, as well as the gas sales and purchase agreement about the annual delivery of 30 billion cubic meters of Turkmen gas to China for 30 years. In June 2012, they signed a cooperation agreement about the increase of gas supply from Turkmenistan to China via Central Asia – China Gas Pipeline. According to this agreement, on September 2013, they signed an additional 25 bcm/a natural gas sales and purchase agreement with an EPC (engineering, procurement and construction) contract about gas production capacity building in the Galkynysh gas field (CNPC, 2015).

Table 4 Agreements between Turkmenistan and China

April, 2006	A general agreement between Turkmenistan and China about the construction of Turkmenistan – China gas pipeline was signed.
July, 2007	CNPC and Turkmengaz State Concern and Turkmen State Agency for Management and Use of Hydrocarbon Resources signed the production sharing contract about the exploration and developments of gas fields. Additionally, gas sale and purchase agreement about the annual delivery of 30 billion cubic meters of Turkmen gas to China for 30 years was signed.
June, 2012	A cooperation agreement was signed between Turkmengaz State Concern and CNPC about the increase of gas supplies from Turkmenistan to China.
September, 2013	According to above mentioned (June, 2012) agreement, Turkmengaz State Concern and CNPC signed an additional 25 bcm/a natural gas sale and purchase agreement. Additionally, agreement about the construction of Line D was signed.

Source: Based on data from CNPC (2015). Accessed 12/03/2015

Central Asia – China gas pipeline passes through central Uzbekistan, southern Kazakhstan and finally reaches Horgon in China's Xinjiang Uygur Autonomous Region. At present, the gas pipeline has three lines (Line A, Line B and Line C) parallel to each other. Each line's length is 1 830 kilometers and pipeline diameter of Line A and Line B is 1 067 mm as given in Table 3. Construction of Line A and Line B was started in July 2008. Line A became operational in December 2009 and in 4 December 2009 first flow of Turkmen gas to China was initiated. Line B became operational in October 2010. By the end of 2011, Line A and Line B's overall capacity reached to 30 bcm/a. Construction of Line C was started in September 2012. Line C has a designed capacity of 25 billion cubic meters per annum with pipeline diameter of 1 219 mm which is 152 mm wider than Line A and Line B. Welding works of Line C was completed on 31 May 2014, and by the end of 2014 gas flow of Turkmen gas through Line C started. Line A and Line B of Central Asia – China Gas Pipeline takes 13 bcm/a of natural gas from Amu Derya basin and 17 bcm/a of natural gas from Turkmengaz State Concern. Line C is supplied by natural gas of 10 bcm, 10 bcm and 5 bcm per year from Turkmenistan, Uzbekistan and Kazakhstan respectively. After the finishing of all supporting facilities of Line C by the end of 2015, the overall delivery capacity of the Central Asia – China gas pipeline will reach 55 bcm annually being equal to approximately 20 percent of China's annual natural gas consumption (CNPC, 2015).

In September 2013, China signed intergovernmental agreements with Turkmenistan, Uzbekistan, Tajikistan and Kyrgyzstan about the construction of Line D and in the same month, construction of the Tajikistan section of Line D started. Line D will receive all its gas supply (30 bcm) from Galkynysh gas field in Turkmenistan and will pass through Uzbekistan, Tajikistan and Kyrgyzstan which eventually reaches to China. Line D's total length is 1000 km and 840 km of that pipeline lays outside of China and has a delivery capacity of 30 billion cubic meters per year. After the completion of the construction of Line D which is expected to finish by 2017, the overall delivery capacity of Central Asia – China Gas Pipeline will reach to 85 bcm per year, becoming the largest gas transmission system in Central Asia (CNPC, 2015).

2.2.2.1.3.2. Economic dimension

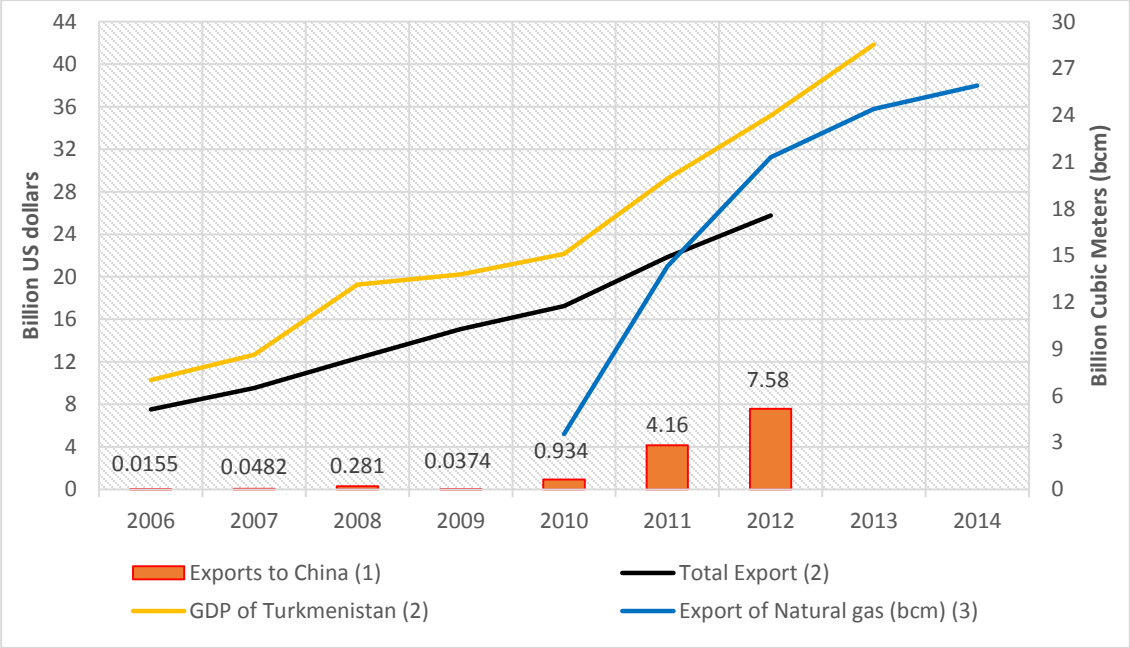
Turkmenistan pursues a policy which is based on selling its energy resources at its border, in other words Turkmenistan undertakes to bring energy resources to its border. Therefore, construction of only Turkmenistan's section of pipeline constitutes the cost of Central Asia – China gas pipeline system for the Turkmen economy. Due to insufficient information about the cost of pipeline construction, when analyzing the economic dimension of the pipeline, overall amount of natural gas that is exported to China and overall future exports of natural gas to China are taken into consideration.

The first gas flow from Turkmenistan to China was initiated on December 2009. As can be seen from Figure 7, since then, Turkmenistan's export of natural gas has been 3.55 bcm in 2010 (BP, 2011), 14.3 bcm in 2011 (BP, 2012), 21.3 bcm in 2012 (BP, 2013a), 24.4 bcm in 2013 (BP, 2014) and lastly in 2014, the export volume reached 25.5 bcm (BP, 2015a). During this period, total export of natural gas to China reached almost to 90 bcm.

Since 2009, the value of Turkmenistan's exports to China increased dramatically as shown in Figure 7, in which natural gas and to a small extent petroleum products constitute approximately 95 percent of total export of Turkmenistan to China (Observatory of Economic Complexity, 2015). With the beginning of flow of natural gas to China, growth rate of total exports of Turkmenistan has increased and eventually affected the gross domestic product of Turkmenistan. The slope of total export of goods and services of Turkmenistan has increased after natural gas exports to China started, as can be seen from Figure 7. To be brief, 2010 was a milestone for Turkmenistan in its energy and especially natural gas sector.

Another important factor that can be noticed from Figure 7 is that, in 2012 export of natural gas to China was about 21.3 bcm and value of overall exports of goods and services to China reached to 7.58 Billion US dollars, which constitutes 30 percent of the total exports of Turkmenistan. In 2013, China was the biggest trading partner of Turkmenistan with 42.7 percent share in overall trade and exports to China constituted 66.1 percent of Turkmenistan's overall exports (European Commission, 2015).

Although, current designated capacity of Central Asia – China gas pipeline enables Turkmenistan to export 40 bcm of natural gas annually, Turkmenistan was able to export only 25.5 bcm/a of natural gas to China in 2014. Sales and purchase agreements which were signed until now between Turkmenistan and China allow the exportation of 55 bcm/a. By the end of 2017 designated capacity of Central Asia – China gas pipeline for Turkmenistan is planned to reach 65 bcm/a. According to the Line D agreement of September 2013, CNPC pledged to increase annual import of natural gas from Turkmenistan to 65 billion cubic meters by 2020. An additional sales and purchase agreement between the parties is necessary enabling the exportation of 65 bcm/a of natural gas to China.



Source: Own calculations based on data from (1) Observatory of Economic Complexity (2015);
(2) World Bank, Turkmenistan (2015); (3) BP (2011-2015). Accessed 22/05/2015

Figure 7 GDP of Turkmenistan and indicators of trade relations with China

Based on the above stated agreements, it can be inferred that prospects of trade relation between Turkmenistan and China are promising. After reaching 65 bcm of export capacity in 2020, exports of natural gas would boost Turkmen economy even more.

2.2.2.2. Potential natural gas transporting routes

Potential energy transporting routes comprises Turkmenistan – Afghanistan – Pakistan – India pipeline (TAPI) and Trans Caspian Pipeline (TCP). TAPI connects Turkmenistan with three different countries which are Afghanistan, Pakistan and India. Starting point of this pipeline is Turkmenistan and ending point is India. According to planned route of Trans Caspian Pipeline, TCP is going to connect the city of Turkmenbashy, which is in the western part of Turkmenistan with the capital of Azerbaijan, Baku.

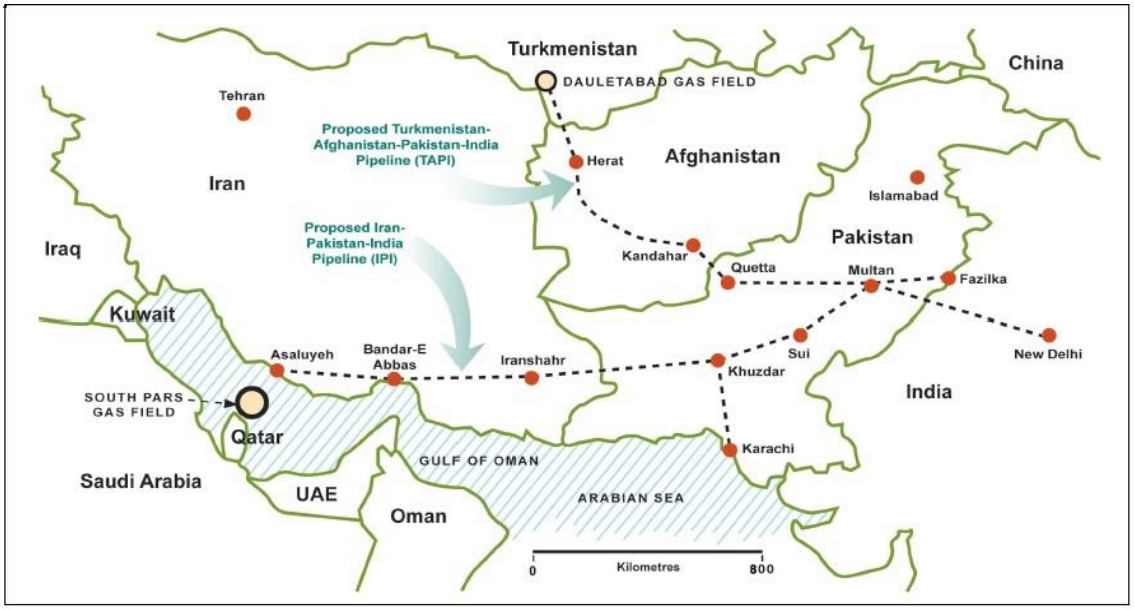
2.2.2.2.1. Turkmenistan–Afghanistan–Pakistan–India Pipeline

The history of Turkmenistan–Afghanistan–Pakistan–India Pipeline (TAPI) goes back to 2003. In that year, Asian Development Bank (ADB) financed technical feasibility study of the Turkmenistan–Afghanistan–Pakistan (TAP) pipeline. According to this study, planned pipeline would have 1 700 km length with a pipeline diameter of 56 inches and would start from Turkmenistan's Galkynysh gas field extending until Pakistan. In 2002, the estimated cost of pipeline was 7.6 billion US dollars.

In April 2008, India officially joined this gas pipeline project and the name if this pipeline evolved from TAP to TAPI. After the inclusion of India, the length of TAPI pipeline reached to 1 820 kilometers (Table 3). Map-3 shows the planned trajectory of TAPI natural gas pipeline. As different from the TAP pipeline, this pipeline is to start from Galkynysh gas field in Turkmenistan, pass from Herat and Kandahar cities in Afghanistan, from Quetta and Multan in Pakistan and eventually reach to Fazilka which is located in the Pakistani-Indian border. Envisaged initial delivery capacity of TAPI is 27 bcm/a at first, reaching up to 33 bcm/a as can be followed from Table 3. At its maximum capacity, Afghanistan would get 5 bcm/a of natural gas and both Pakistan and India could each get 14 bcm of natural gas annually. ADB is the sponsor of this project (Foster, 2008).

Recently, British company Prenspen signed a contract with ADB, again to conduct a feasibility research for TAPI gas pipeline in order to calculate the updated cost, because

more than 10 years have passed since the first feasibility study. According to the latest data, projected cost of TAPI reached to 10 billion US dollars (Hasanov, 2015a).



Source: Foster (2008) Accessed 23/05/2015

Map 3 TAPI pipeline

The main reason of prolongation of the TAPI project is the security concerns. Another impending factor in the construction of TAPI project is financial difficulties. Recently, positive developments on this project have taken place. The Turkmen Oil and Gas Industry and the Mineral Resources Ministry of Turkmenistan have recently announced that: *an international tender would be announced soon to select the leader*[7] *of TAPI gas pipeline project consortium*[8] (Trend News 2015a).

When it comes to the economic feasibility of TAPI project, as mentioned earlier, Turkmenistan guarantees to deliver natural gas until its Afghan border by constructing a pipeline from Galkynysh gas field to Turkmen – Afghan border (about 200 km in length). Exact cost of that section of TAPI project is not announced yet. The construction of TAPI

[7] A company which will construct the pipeline and operate the flow of natural gas through this pipeline.

[8] In 2014, gas companies of Turkmenistan, Afghanistan, Pakistan and India formed a consortium in order to build, own and operate the TAPI gas pipeline, where each has an equal share of 25 percent in this project. This consortium is now in negotiation with French energy company Total to award a contract of TAPI pipeline (Natural Gas Asia, 2015).

gas pipeline is planned to start in 2015 and is estimated to finish by 2018 (The Times of India, 2015). After the completion of TAPI project, the export capability of Turkmenistan will increase by 33 bcm annually. By TAPI pipeline, Turkmenistan is going to export its natural gas to three new countries (Afghanistan, Pakistan and India) among which India is one of the fastest growing economies in the world with the second largest population in the world. The increase in export destinations is in favor of Turkmenistan, which strengthens Turkmenistan's position in the negotiation process of natural gas trade, i.e. increases the bargaining power of Turkmenistan[9].

2.2.2.2.2. Trans Caspian Pipeline

Construction of Trans Caspian Pipeline (TCP) is under discussion since 1990s. Main impending factor on the construction of this pipeline is the uncertain legal status of the Caspian Sea. Prior to the collapse of the USSR, Caspian Sea was simply shared between Soviet Union and Iran. In 1991, four new independent littoral countries (Turkmenistan, Azerbaijan, Russia, and Kazakhstan) emerged and now there are 5 littoral countries (Turkmenistan, Azerbaijan, Russia, Kazakhstan and Iran). In recent years substantial progress was achieved on the determination of legal status of Caspian. It is expected that an agreement will be reached about the legal status of Caspian Sea in next Astana summit which will be held in Kazakhstan in 2016.

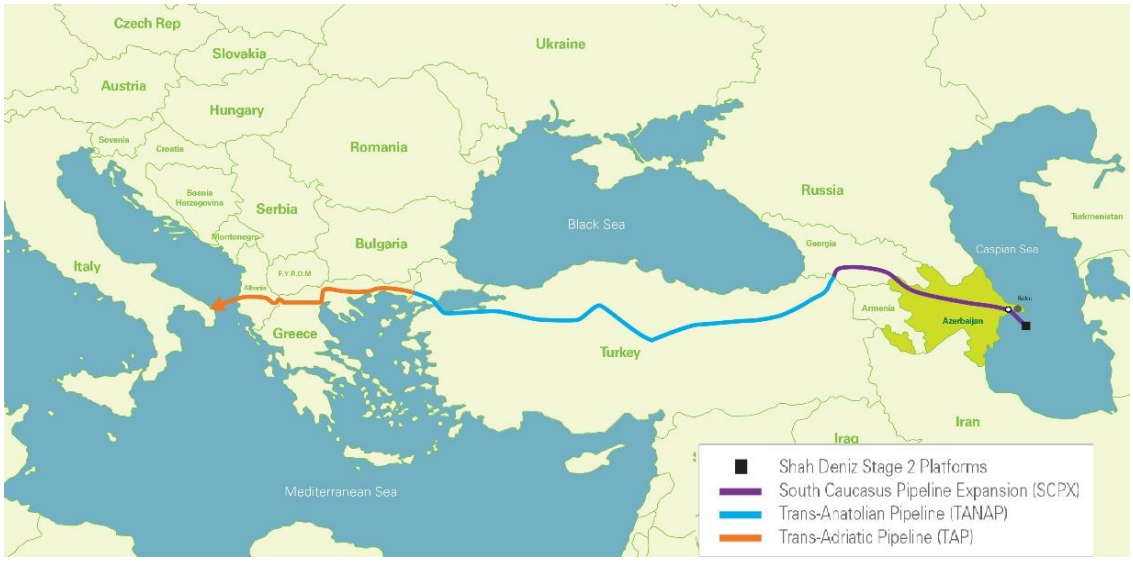
Trans Caspian Pipeline is the proposed natural gas transporting pipeline which will connect Turkmenistan's Turkmenbashy city with the capital of Azerbaijan, Baku, in order to export Turkmenistan's natural gas to Europe. According to proposed plan, approximately 300 km of pipeline will be laid on the seabed of Caspian Sea. Technical configurations of Trans Caspian Pipeline have not been announced yet.

Russia and Iran claim that TCP could only be realized by consent of all littoral countries. Turkmenistan and Azerbaijan claim that, in any case (according to any principle of sharing Caspian Sea) proposed TCP will pass from the waters which will be designated

[9] There is another proposed pipeline which is Iran – Pakistan – India pipeline. However, the probability of realization of this project is less likely than TAPI due to the western countries sanctions on Iran.

to Azerbaijan and Turkmenistan since these two countries are neighboring each other. As a consequence, construction of TCP concerns only Turkmenistan and Azerbaijan. Turkmenistan assures other littoral countries on the preservation of environmental security at a maximum level. Another interesting claim that was made by Russia is that, possible construction of TCP poses serious risks on the ecosystem of the Caspian Sea. Russia justifies this claim by alleging that, possible explosion of TCP will pose serious risks on ecosystem of the Caspian Sea. Irony with this claim is that, Blue Stream project of Russia entirely crosses the Black Sea. In addition to that, Nord Stream project of Russia is realized by crossing whole Baltic Sea by laying a 1 224 kilometer long pipeline on seabed of Baltic Sea. Another example is the Turkish Stream project of Russia which is now under discussion. According to planned route of Turkish Stream, 910 kilometers of pipeline is going to be laid on seabed of Black Sea (Gazprom, 2015a).

In order to make an inference about the delivery capacity of TCP, it is noteworthy to investigate the Southern Gas Corridor (Map 4) which is expected to extend TCP for connecting Azerbaijan to Europe, in other words, delivery capacity of TCP depends on the actions of other energy supplying and demanding countries such as Azerbaijan and Turkey which are located along the Southern Gas Corridor. As shown in Map 4, this gas corridor consists of three parts.



Source: BP, (2013b) Accessed (27/05/2015)

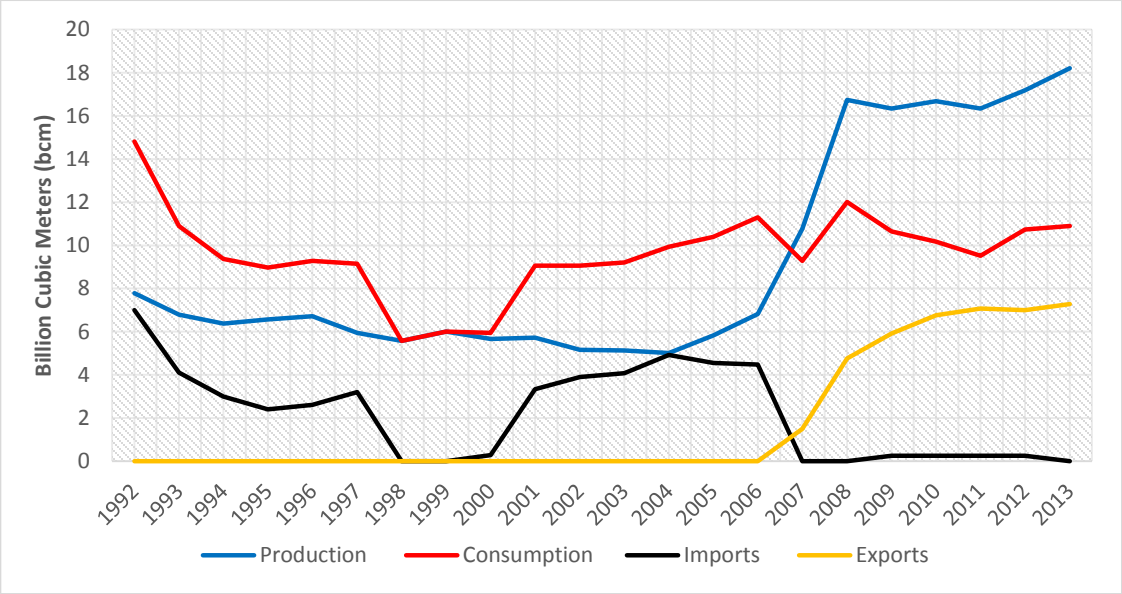
Map 4 Southern Gas Corridor

They are South Caucasus Pipeline Expansion (SCPX), Trans – Anatolian Pipeline (TANAP) and Trans – Adriatic Pipeline (TAP). The amount of natural gas that will pass through Trans Caspian Pipeline will be framed according to Turkey's and Europe's demand for Turkmen natural gas and at the same time Azerbaijan's supply of natural gas.

Turkmen authorities started to pay more attention to the European market recently. The president of Turkmenistan said that: "*Turkmenistan sells gas to Russia, Iran and China and works to diversify its gas exports. At present, we are holding the tripartite negotiations with Azerbaijan and Turkey. I hope that we will come to an agreement. This will be another step towards the implementation of the European vector*" (Trend News, 2015b).

2.2.2.2.2.1. Azerbaijan

Azerbaijan is the starting point of SCPX, which is planned to transport natural gas from Shah Deniz 2 Stage Platform. Azerbaijan is a former Soviet Union country which is among the countries that gained independence in 1991. The country holds 7 billion barrels of proven oil reserves and 0.9 trillion cubic meters of natural gas (BP, 2014). Figure 8, presents indicators of natural gas sector of Azerbaijan through time.



Source: Own calculations based on data from US EIA (2013). Accessed 25/05/2015

Figure 8 Indicators of natural gas sector of Azerbaijan

From 1992 to 2013, natural gas production of Azerbaijan increased from 7.8 bcm to 18.2 bcm which is about a 233 percent increase. During the same period, consumption of natural gas decreased from 14.8 bcm to 10.9 bcm which is about a 26 percent decrease. Since 2006, Azerbaijan started to export natural gas abroad. Main destinations of export is basically Turkey and Russia to a small extent.

By the completion of pipeline in 2018, Azerbaijan is planned to export 16 bcm of natural gas to Turkey annually. Turkey will consume 6 bcm of that natural gas and 10 bcm will go to Europe. From Azerbaijan to Turkey, natural gas is going to flow through SCPX and from there, natural gas is going to flow through TANAP. Azerbaijani authorities repeatedly reported that they are ready and glad to transport Turkmen natural gas to Europe via Azerbaijani soil.

2.2.2.2.2.2. Trans – Anatolian Pipeline

TANAP is the pipeline that is going to transport natural gas from Posof Ardahan, Georgia border of Turkey to Ipsala Edirne, Greece border of Turkey. Construction of TANAP started in March 2015 and it is planned to finish in 2018. Length of TANAP is about 1,850 kilometers with 56 inch diameter and is going to pass through 20 provinces of Turkey. Initial capacity of TANAP will be 16 bcm of natural gas annually and eventually it will reach to 31 bcm (TANAP, 2015). After reaching its maximum delivery capacity, Turkmenistan will be able to export 15 bcm of natural gas through TANAP to reach Europe.

Turkey's import dependence on natural gas is nearly 100 percent (US EIA, 2013). As a result of growing economy, Turkey's demand for natural gas has increased sharply in the last two decades and it seems to grow even further. Major part of Turkey's import come from Russia. Turkey can buy enough natural gas from Russia to meet its internal demand, but this situation increases its dependence on Russian gas, in other words increases its dependency to one supplier. Therefore, Turkey aims to increase its import destinations in order to decrease her vulnerability to one supplier. Another main goal of Turkey is to be an energy hub in the region by connecting energy rich east with energy thirst west on its territory. On 7 November 2014, Turkmenistan's Turkmengaz State Concern and

Turkish private energy company Atagaz signed a framework agreement on cooperation in the purchase and sale of natural gas (Trend News, 2015c), details of which have not been announced yet.

From Europe's point of view, importance of Turkmen natural gas has recently increased even more. Main reason is the soaring tension between Russia and Europe on Ukraine issue, and Europe's need to decrease its import dependence on Russia. Previous conflicts[10] between Russia and Ukraine revealed the grim reality of Europe's import dependence on Russia. Therefore, importing natural gas from Turkmenistan is Europe's main priority. On 1 May 2015, quadripartite meeting between Turkmenistan, Azerbaijan, Turkey and European Union was held in Ashgabat. Meeting has focused on the diversification of the routes for transportation of energy resources to the world markets, and especially to the European Union. In relation to that, creation of multiple pipelines were also discussed during the quadripartite meeting. As a result of this meeting, a declaration[11] was signed between the participants. Declaration reflects the issues discussed and confirms willingness of Turkmenistan, Azerbaijan, Turkey and the European Union to continue active cooperation within international organizations on the establishment of an effective mechanism to ensure energy security (Turkmenistan News, 2015). After that quadripartite meeting of 1 May 2015, Maroš Šefčovič, Vice president of the European Commission, in charge of energy union said that: *"For Turkmenistan it is very important to diversify its export options, while for the EU it is very important to diversify its imports. Europe expects supplies of Turkmen gas to begin by 2019*" (Trend News, 2015d).

2.2.2.3 Evolution of bargaining power of Turkmenistan

As mentioned above, since 2005 competition over Turkmenistan's transportation system of natural gas has intensified between Russia, China, EU and India. This intensification has increased Turkmenistan's bargaining power in the process of pursuing its policy on

[10] In 2006, there was a gas dispute between Russia and Ukraine which eventually led to Russia's halt of flow of natural gas to Europe for two weeks.

[11] See Appendix A for the Ashgabat declaration

diversification of transportation routes. Table 5 shows price and amount of natural gas that Turkmenistan exported abroad during the (2005-2015) period.

Table 5 Price and amount of natural gas that Turkmenistan exported abroad

Year	Gas price paid to Russia in European border (US dollar per 1000 m^3) (1)	Price of Turkmen natural gas paid by Russia (US dollar per 1000 m^3) (1)	Gas exports to Russia (bcm) (2)	Gas export to China (bcm) (2)	Gas exports to Iran (bcm) (2)
2005	213.7	44-60		--	5.9
2006	285.2	65	41	--	5.3
2007	294.1	100	43.2	--	6.1
2008	418.9	130-150	42.3	--	7
2009	307.8	340*	10.66	--	5.77
2010	--	--	9.68	3.55	6.5
2011	--	--	10.1	14.3	10.2
2012	--	--	9.9	21.3	9
2013	--	--	9.9	24.4	4.7
2014	--	--	9	25.5	6.5
2015	--	--	4**	--	--

Source: Based on data from (1) Pirani, (2012):78; (2) BP (2005-2014) Accessed 01/08/2015

**Trend News, (2015a), *price was valid only until first quarter of 2014

Throughout 2005, price of exported Turkmen natural gas to Russia on Turkmen border was between 44 and 60 US dollars per thousand cubic meters. In 2006, this price increased to 65 US dollars per thousand cubic meters. Russia sold the same gas to Europe for 285.2 US dollars per thousand cubic meters, an increase in the price of natural gas in European border by about 4.4 fold. In other words, Russia earned 220.2 US dollars for every thousand cubic meters of Turkmen natural gas from reselling this gas to Europe. Profit margin of this reselling process was 339 percent. Table 5 shows that the same pattern is valid for other years for which data is available.

From the beginning of 2006, China started to actively engage with Turkmenistan on purchase of Turkmen natural gas. In July, 2007 Turkmenistan signed sales and purchase agreement with China about the delivery of 30 bcm of natural gas annually for 30 years. This competition in turn strengthened Turkmenistan's bargaining position. This increase in bargaining power of Turkmenistan has manifested itself in Turkmenistan's relations with Russia. Turkmenistan demanded higher prices for its exported natural gas in 2007

and in November of that year Russia agreed to meet this demand, and increased price of thousand cubic meters of Turkmen gas from 100 US dollars to 130 US dollars in the first half of 2008 and to 150 US dollars in the second half of 2008, as can be seen from Table 5. Since then, as a result of increasing competition for Turkmen natural gas, Turkmenistan again started to demand higher prices for its natural gas. Russia became more responsive to Turkmenistan's consecutive demands for gas price increases in order not to lose the Turkmen market. Turkmenistan, together with Kazakhstan and Uzbekistan demanded the highest price increase ever, demanding the "European price" for their gas in March 2008 and Russia's Gazprom responded positively to this demand. 4 months later, in July of 2008 Turkmengaz and Gazprom reached an agreement. According to this agreement Gazprom undertook to more than double the price of Turkmen natural gas and determined the price of thousand cubic meters of Turkmen gas as 340 US dollars on Turkmen border (Pirani, 2012).

However, as a result of global financial crisis, economies of European countries contracted and European price of natural gas decreased due to the decline in the demand for natural gas in Europe. In other words, starting from January 2009 Gazprom started to pay 340 US dollars but price of natural gas in European border was 307.8 US dollars, thus Russia could not expect windfall profits anymore by buying Turkmen natural gas and reselling it to the European market. It is clear that, this operation was not advantageous for Russia. After all these developments, Turkmenistan's exports of natural gas to Russia has plummeted due to the "explosion" in Central Asia – Center gas pipeline. In 2008, Turkmenistan exported 42.3 bcm of natural gas to Russia but in 2009, this figure decreased to 10.66 bcm.

As can be followed from Table 5, starting by 2010 China started to buy Turkmen natural gas and in 2011 it replaced Russia as the major buyer of Turkmen natural gas. In 2012, export of natural gas to China was more than the total of natural gas which was exported to Russia and Iran. In 2014, China's leadership in buying Turkmen natural gas became even more evident surpassing the total of exports to Russia and Iran by 64.5 percent.

2.2.3. Positive impact of natural gas reserves on Turkmen economy

Considering that the Turkmen economy is heavily dependent on exports of natural gas, its overall exports and GDP follow the same trend as this variable. Table B1in Appendix B and Figure 9 shows the trends in these variables.

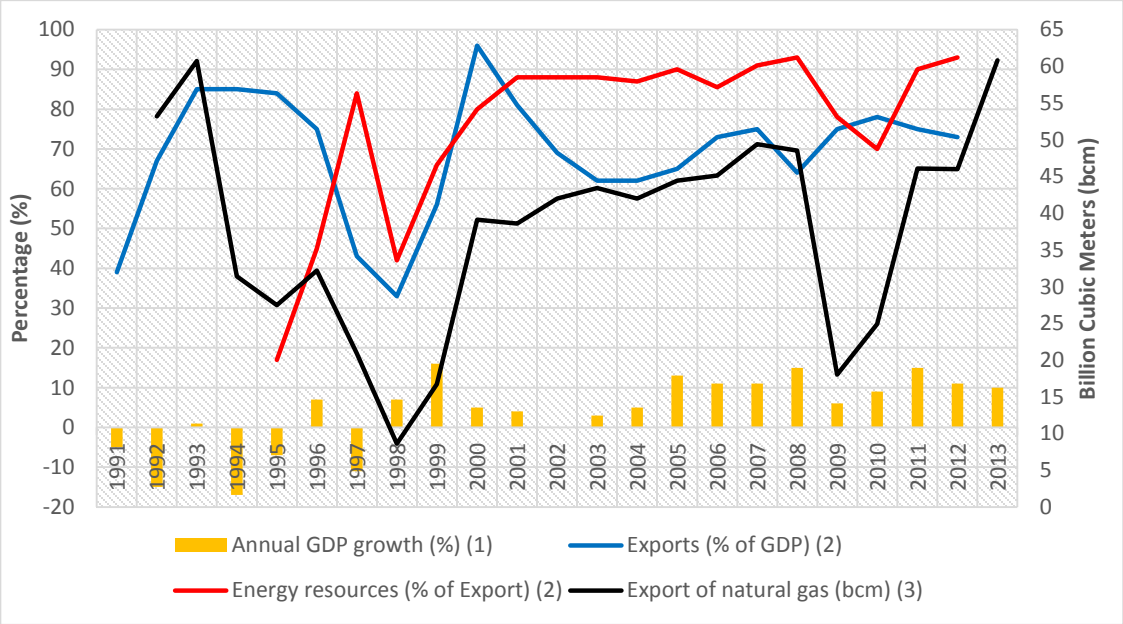
From Figure 9, it can be observed that the major macroeconomic indicators are highly correlated with the export of natural gas. From 1993 to 1995, export of natural gas has steadily decreased and during the same period Turkmen economy has also steadily contracted. As export of natural gas decreased between 1993 and 1998 (1996 is exception), share of energy resources in the exports of goods and services and share of exports of goods and services in overall GDP of Turkmenistan also decreased as can be followed from Figure 9. In 1998, value of export of goods and services of Turkmenistan has decreased by 31 percent with respect to 1991. This can be explained by sharp decrease in the exportation of natural gas during the same period. Export of natural gas decreased from 53.2 bcm/a to 8.6 bcm/a, a decrease by 83.8 percent. In 1991, GDP of Turkmenistan was 3.2 billion US dollars whereas, in 1998 it decreased to 2.6 billion US dollars, a decrease by 18.75 percent.

Starting from 1998, export of natural gas has shown stable increase and since then share of energy resources in overall export of Turkmenistan has shown consistent increase. This shows that GDP of Turkmenistan is highly dependent on exportation of natural gas. Since 1999, share of exports of goods and services in total GDP of Turkmenistan was always above 60 percent, even reaching 96 percent in 2000. Starting from the same year (1999), growth rate of Turkmen economy was always positive even during the global financial crisis, such that in 1999 Turkmenistan achieved a historic level of growth with 16 percent.

From 1991 to 2000s, main driver behind the economic growth of Turkmenistan was the amount of energy resources that were exported abroad. After that period, along with the increase in the amount of energy that was exported abroad, increase in the market price of energy resources and especially increase in the market price of natural gas was another driving factor in the economic growth of Turkmenistan. In 2009 export sharply decreased due to the accidental explosion in CAC pipeline. As can be noticed from Figure 9, growth

rate of GDP decreased in that year. Although in 2009 export of natural gas has decreased by 63 percent, Turkmen economy achieved a 6 percent growth. This can be partly explained by the increase in the market price of natural gas.

Throughout the period under study, share of energy resources in total exports of Turkmenistan was usually higher than 80 percent (on average 76 percent between the period 1995-2012), and in average share of export in GDP of the country was 69 percent as seen in Table B2 in Appendix B and Figure 9. From this fact it can be inferred that energy resources, and especially natural gas, is the main driving force of increase in export of goods and services of Turkmenistan and thus, is the main driving force in the increase of GDP of Turkmenistan. Since then, GDP of Turkmenistan has shown consistent increase whereas, export of natural gas has shown a stable increase until 2009.



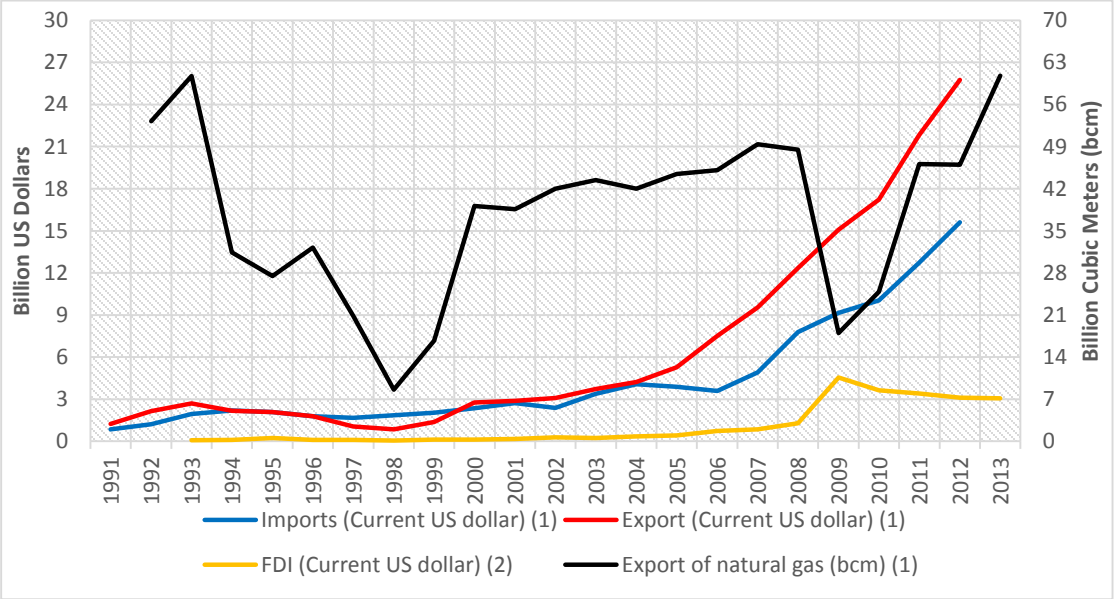
Source: Own calculations based on data from (1) World Bank, (2015b); (2) Table B1 in Appendix B; (3) Table-2. Accessed (08/06/2015)

Figure 9 Exports of natural gas and GDP growth

From 1991 to 2012, both export and import of goods and services of Turkmenistan has shown dramatic increase as shown in Figure 10. In 1991, export of goods and services of Turkmenistan was 1.2 billion US dollars and when it came to 2012, this value reached to 25.8 billion US dollar, increasing almost by 21 fold (1 980 percent increase). During the

same period, import of goods and services of Turkmenistan has increased from 857 million US dollars to 15.611 US dollars, increasing more than 17 fold (1 621 percent increase). To sum up, by virtue of revenue gained from the exportation of natural gas Turkmenistan managed to increase its foreign trade volume significantly throughout the time.

Inflow of FDI to Turkmenistan (Figure 10) was about 79 million US Dollars in 1991 (World Bank, 2015b). Until 2003, FDI has shown modest increase (up to 226 million US dollars) whereas after that year, increase of FDI has accelerated. Such that, in 2008 flow of FDI has shown sudden increase reaching up to 1.28 billion US Dollars. In the next year FDI reached to 4.55 billion US Dollars (3.5 fold increase in one year). Main driving factor behind this increase in 2009, was Chinese investments in Turkmenistan's natural gas sector.



Source: Own calculation based on data from (1) Table-2; (2) Table B1 in Appendix B. Accessed (08/06/2015)

Figure 10 Turkmenistan's export of natural gas trade and FDI inflow

In general, flow of FDI is directed to energy sector, especially natural gas sector, and derivatives of energy sector such as chemical sector of Turkmenistan. Recently, an agreement was signed with China which is expected to stimulate the inflow of large scales of FDI.

CHAPTER 3

POTENTIAL DEMAND FOR TURKMEN NATURAL GAS

First part of this chapter concentrates on potential demand for Turkmenistan's natural gas with specific emphasis on world energy outlook. Share of energy resources including renewable energy, which may be substitutes for natural gas in the composition of total energy production is also taken into consideration. Second part explores potential demand for Turkmen natural gas from specific countries, which are markets for Turkmenistan, namely Russia, China, Europe, India, Iran and Turkey. The trend in energy demand since the independence of Turkmenistan until 2040 is determined with emphasis on the amount of natural gas which is imported from Turkmenistan and its share in overall import and in overall internal consumption of each importing country.

3.1. Global Energy Outlook

This section is basically based on IEA (2014) data and projections regarding energy and especially natural gas until 2040 using 2012 as the base year. IEA (2014) data and projections are also supported by BP (2015b). BP (2015b) provides projections about world energy outlook till 2035, using 2013 as the base year. These two sources are most comprehensive and their data are rather close to each other.

IEA (2014) provides projections of long-term energy trends, by using three scenarios, which differ from each other on their assumptions about the evolution of government policies with respect to energy and environment. These scenarios are, *the New Policies Scenario, the Current Policy Scenario* and *the 450 Scenario*.

The *New Policies Scenario* is the central scenario of IEA (2014) and it takes into account the policies and implementing measures affecting energy markets that had been adopted as of mid-2014, as well as relevant policy proposals, even though specific measures

necessary to put them into effect are not yet fully developed. Regulations in the United States to cut greenhouse-gas emissions from power plants, the European Union's 2030 policy framework for climate and energy policies, and changes in energy subsidy schemes (for fossil fuels and renewables) in many countries are examples of such policies. The *Current Policies Scenario* by contrast, takes into consideration only those policies and implementing measures that had been formally adopted as of mid-2014. This is designed to offer a baseline picture of how global energy markets would evolve without any new policy intervention. The *450 Scenario* takes a different approach, adopting a specified outcome – the international goal to limit the rise in the long-term average global temperature to two degrees Celsius (2 °C) – and illustrating how that might be achieved (IEA, 2014: 36). Different from IEA (2014), BP (2015b) presents future world energy outlook using single scenario, which is similar to the *New Policies Scenario* of IEA (2014).

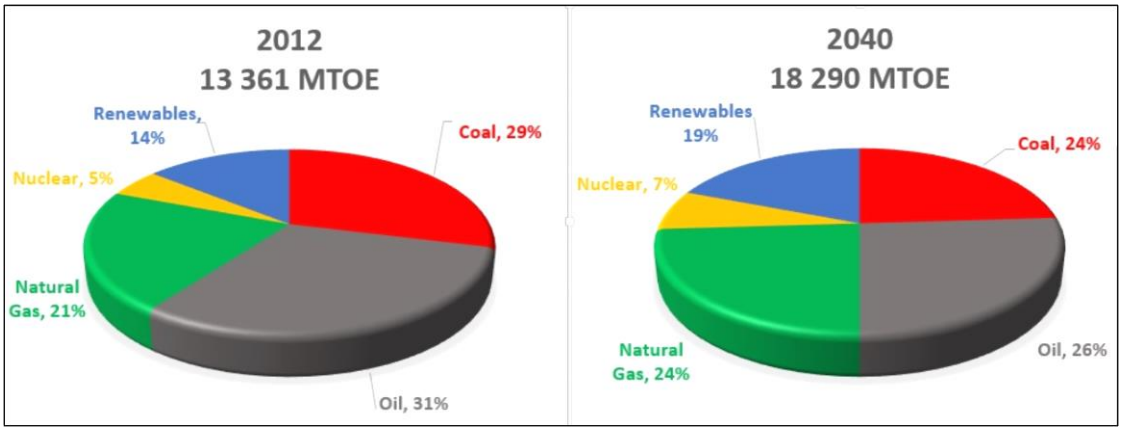
3.1.1. Global energy trends

There are two principal drivers of energy demand. The first is the rate of GDP growth and the second is the rate of population growth. In IEA (2014) average GDP growth of the world is expected to be 3.4 percent between the years 2012-2040 and world population is expected to expand from 7.0 billion in 2012 to 9.0 billion in 2040, increasing at an average rate of 0.9 percent. Whereas according to BP, by 2035 world population will reach 8.7 billion and world GDP is expected to grow more than twice with respect to its base year, in other words, globally GDP per person is expected to be 75 percent higher than GDP per person in 2014 (BP, 2015b). Table B2 in Appendix B presents the comparison of projections of IEA (2014) and BP (2015b) about future world primary energy demand.

In the New Policies Scenario, which takes into account existing and planned government policies, world primary energy demand increases by 37 percent between 2012 and 2040. Average annual growth rate of world primary energy demand between above mentioned period is 1.1 percent. The growth rate of natural gas demand is 1.6 percent, coal and oil demand growth rate is 0.5 percent, nuclear energy demand growth rate is 2.3 percent, and

growth rate of demand for renewables excluding hydro is 6.9 percent. From the BP's perspective between the years 2013 and 2035, demand for world primary energy increases by 37 percent which corresponds to average 1.4 percent growth annually. Growth rate of demand is 0.8 percent for coal, 1.9 percent for natural gas, 0.8 percent for oil, 6.3 percent for renewables, 1.8 percent for nuclear and lastly 1.8 percent for hydro-electric power (BP, 2015b).

The growth of energy demand was higher in previous decades with respect to the period between 2012 and 2040. The slowdown in the growth of energy demand is mainly due to energy efficiency gains and structural changes in the global economy in favor of less energy-intensive activities (IEA, 2014). According to BP this decrease in the growth of energy demand originates from the decrease in non-OECD Asia's demand, where growth was 7 percent in average since 2000 and is estimated to slow down to 2.5 percent annually between 2013 and 2035 (BP, 2015b). Throughout the period of 2012-2040, the share of fossil fuels (coal, oil and natural gas) in the primary energy mix falls as shown in Figure 11. In 2040, oil, natural gas and coal, each account for roughly 25 percent of demand and low-carbon fuels mainly renewable energy and nuclear power account for another 25 percent of total demand.



* Renewables include fuelwood and charcoal

Source: Based on data from IEA (2014). Accessed 04/05/2015

Figure 11 Shares of total primary energy consumption in 2012 and 2040

Based on data from BP (2015b), in 2035 shares of all fossil fuels are clustered around 26-28 percent without single dominant fuel. In aggregate, fossil fuels' share in total

primary energy demand decrease from 86 percent in 2013 to 81 percent in 2035, which still remains as the dominant form of energy. During the same period, share of renewables (including biofuels) are expected to increase from 3 percent to 8 percent (BP, 2015b). Thus the projections of both sources are quite close to each other.

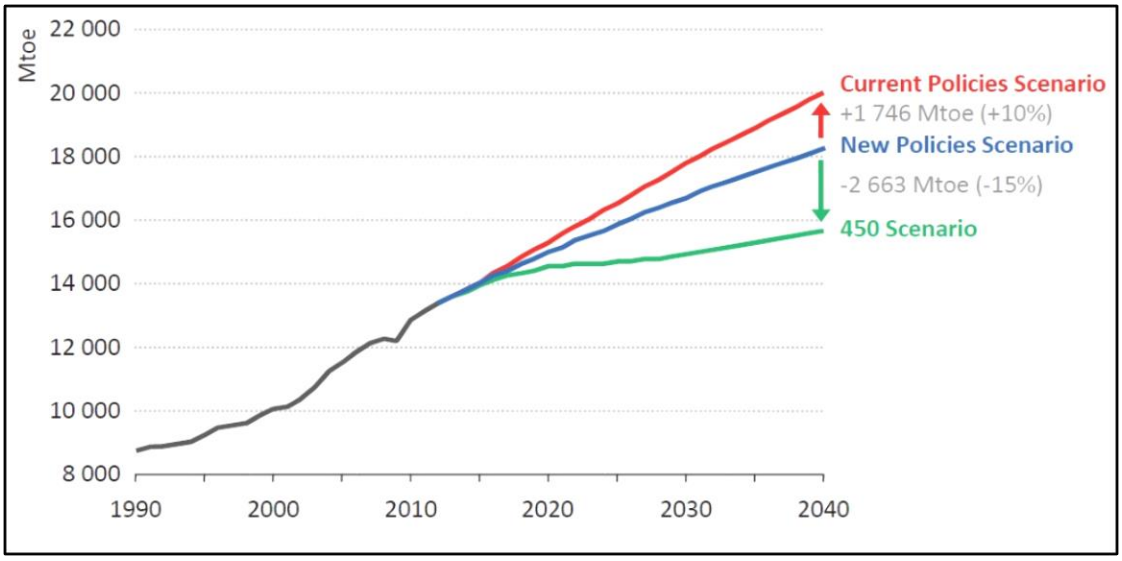
During the outlook period (2012-2040), oil remains the single largest energy source, but the growth of renewable energy use is the fastest. Almost all of the growth in energy demand comes from non-OECD countries, being 97 percent in IEA (2014) and 96 percent in BP (2015b). Energy consumption in non-OECD countries increases by 2.2 percent and in OECD countries increases by 0.1 percent annually until 2035 (BP, 2015b). Developing Asian countries accounts for 65 percent of that growth in energy demand, shifting the center of gravity of energy markets decisively away from the Americas and Europe. Since Turkmenistan is located in Asia, shift in the center of gravity of energy markets to Asia automatically leads Turkmenistan to become a dominant actor in the region as an energy supplier.

China is the dominant force behind global demand growth for the next decade, accounting for more than one-third of the increase. However, after 2025, India takes over as Chinese growth slows down noticeably (IEA, 2014). According to BP, from 2013 to 2035 China and India are estimated to grow by 5.5 percent annually on average, and by 2035, India will be 3rd largest and China will be 1st largest economy in the world (BP, 2015b). Currently China is indeed importing natural gas from Turkmenistan and India will most likely import natural gas from Turkmenistan in the foreseeable future, making Turkmenistan an essential actor in the satisfaction of Asian energy demand.

Per capita energy use in non-OECD countries grows sharply between 2012 and 2014, but in 2040, it is yet quite below the level that was reached in OECD countries in the early 1970s. Increasing energy prices along with changes in economic structure is likely to increase average spending on final energy use in non-OECD countries by close to 50 percent (IEA, 2014) however, recent developments in energy sector shows that in the short term, price of energy is going to stay at low levels. The re-ordering of trade flows of energy towards Asian markets gains acceleration. The rising crude oil-import needs of China and India from the Middle East and other regions increase their vulnerability to a

disruption to oil supply (IEA, 2014). Therefore this situation leads both China and India to turn to Central Asia as a main supplier in order to decrease their vulnerability.

Figure 12 shows the growth of total primary energy demand of world by scenarios of EIA (2014). According to New Policies Scenario, (existing and planned policies included), world primary energy demand is projected to increase on average by 1.1 percent per year between 2012 and 2040. Until 2040, world primary energy demand rises about 4900 million ton of oil equivalent (Mtoe) and reaches almost to 18 300 Mtoe equivalent with an increase of about 37 percent with respect to 2012. Demand expands much more rapidly in the Current Policies Scenario (no new government policies), with a rise at an annual average rate of 1.5 percent per year until 2040, being 47 percent higher than in 2012. In the 450 Scenario, (policies to keep average global temperature increase to 2 °C), world primary energy demand grows on average by only 0.6 percent per year. In 2040, the demand is 17 percent bigger than that of 2012. The gap in 2040 between demands in the different scenarios is substantial: taking the New Policies Scenario as the base, demand is 10 percent higher in the Current Policies Scenario and 15 percent lower in the 450 Scenario (IEA, 2014: 55).



Source: IEA (2014) Accessed 04/05/2015

Figure 12 World total primary energy demand by scenario

The share of fossil fuels in the overall primary fuel mix has remained broadly constant in the last 30 years, but during the outlook period this share falls. Nevertheless, in 2040, the share of fossil fuels is again dominant. In the Current Policies Scenario, the share falls from 82 percent in 2012 to 80 percent in 2040. In the New Policies Scenario, it falls to 74 percent in 2040, and in the 450 Scenario it falls to 60 percent in 2040. For coal and non-hydro renewable energy (excluding traditional use of solid biomass), outcomes differentiate substantially according to scenarios because these energy sources are affected mostly by the evolution of environmental, energy security and climate policies worldwide. Demand for coal rises by more than 50 percent between 2012 and 2040 in the Current Policies Scenario, but in the 450 Scenario demand of coal falls by 30 percent. The trend in the use of modern renewable energy follows the opposite direction, such that the use of modern renewable energy is highest in the 450 Scenario and lowest in the Current Policies Scenario. Among all the sources of energy, hydropower shows the smallest variations across scenarios. Future demand pattern of electricity is the most constant, in which demand grows steadily in each scenario (IEA, 2014). Between the period 2012 and 2040, according to the New Policies Scenario, demand for coal increases about 14.7 percent and in absolute term increases about 569 Million tons of oil equivalent (Mtoe) as shown in Table 6. Demand for oil increases about 13.5 percent (+567 Mtoe), natural gas increases about 55.3 percent (+1,574 Mtoe), nuclear energy increases about 88.5 percent (+568 Mtoe), hydro increases about 69.3 percent (+219 Mtoe), bioenergy, which includes traditional and modern uses of biomass, increases about 48.9 percent (+658 Mtoe) and lastly other renewables grow with dramatic increase of 646.5 percent (+776 Mtoe). In absolute terms, the demand for natural gas expands most with an increase of 1,574 Mtoe, in which increases prospects for natural gas exporting countries and especially for Turkmenistan.

According to BP (2015b), between 2013 and 2035, about one third of growth in energy demand is supplied by natural gas. Coal and oil constitute another one third, and fossil-fuels make another one third of growth in energy demand. In absolute terms natural gas is the most rapidly increasing energy source throughout the projection period (BP, 2015b).

Table 6 World primary energy demand by fuel in the New Policies Scenario (Mtoe)

	1990	2012	2020	2025	2030	2035	2040	CAAGR* 2012-2040
Coal	2 231	3 879	4 211	4 293	4 342	4 392	4 448	0.5%
Oil	3 232	4 194	4 487	4 612	4 689	4 730	4 761	0.5%
Gas	1 668	2 844	3 182	3 487	3 797	4 112	4 418	1.6%
Nuclear	526	642	845	937	1 047	1 137	1 210	2.3%
Hydro	184	316	392	430	469	503	535	1.9%
Bioenergy**	905	1 344	1 554	1 675	1 796	1 911	2 002	1.4%
Other renewables	36	142	308	435	581	744	918	6.9%
Total	**8 782**	**13 361**	**14 978**	**15 871**	**16 720**	**17 529**	**18 293**	**1.1%**

*Compound average annual growth rate. ** Includes traditional and modern uses of biomass.

Source: IEA (2014) Accessed 09/05/2015

Since demand for natural gas increases the most in absolute terms with respect to other energy sources in both IEA (2014) and BP (2015b), it can be said that the future use of natural gas will become more widespread in the world. This has direct implications on Turkmenistan which holds 10 percent of worlds proven natural gas reserves.

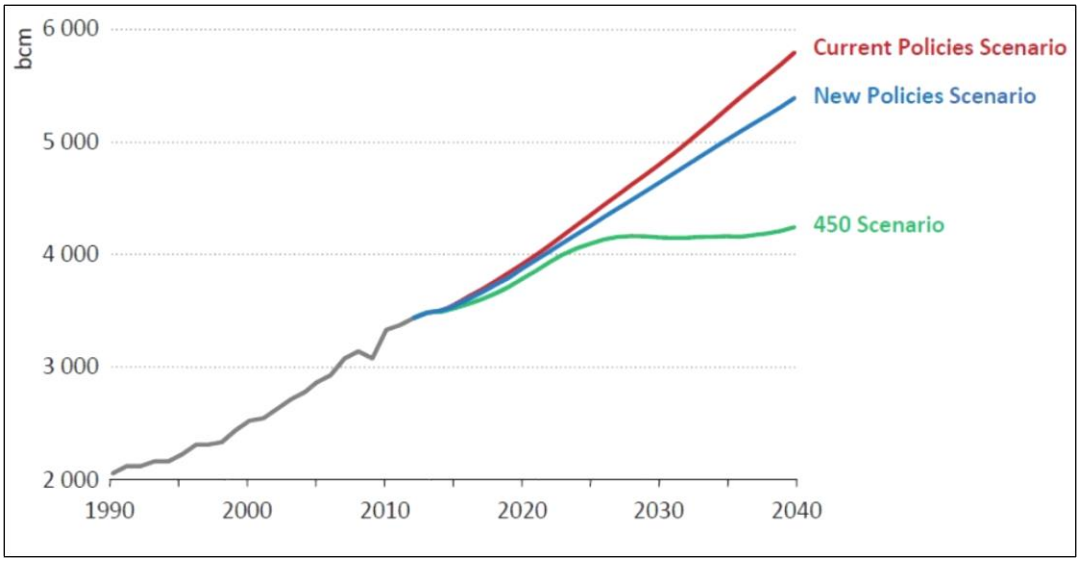
In OECD countries the most salient factor is that, the use of low-carbon fuels such as renewables and nuclear are in increasing trend. Over the next 25 years, many of the leading countries are expected to show significant changes in their energy mix, most of which result from major policy initiatives over the past few years. Over the outlook period (2012-2040), total primary energy demand grows barely in many OECD countries, where low-carbon fuels increasingly replace fossil fuels particularly in the power sector of OECD countries, however in OECD countries consumption of fossil fuels increase with respect to other energy sources (IEA, 2014: 59).

The growth of renewable energy sources (excluding fuelwood and charcoal which are a form of solid biomass) through the projection period is very high, which is driven by subsidies, technological advances which are expected to reduce costs and projected high fossil fuel prices. The share of renewable energy sources in world primary energy demand was 8 percent in 2012 and is going to reach 15 percent in 2040. Most of this increase is expected to originate from power sector in which the share of renewables in total generation increases from 21 percent in 2012 to 33 percent in 2040.

3.1.2. Global natural gas market outlook

According to all three scenarios of IEA (2014), natural gas demand is expected to continue its expansion throughout the projection period as mentioned in the previous section. Natural gas is the fastest growing fossil fuel although the pace of expansion differs markedly between the 450 Scenario and the New and Current Policies as can be seen in Figure 13. Global demand for natural gas is projected to increase faster than oil or coal, and in absolute terms increases more than any other fuel between 2012 and 2040. In the New Policies Scenario, demand for natural gas increases from 3.4 trillion cubic meters (tcm) in 2012 to 5.4 tcm in 2040 an overall increase of 57 percent or 1.6 percent increase per year (IEA, 2014) and according to BP, between the years 2013 and 2035, global natural gas demand is expected to grow by 1.9 percent annually (Table B2 in Appendix B) reaching around 5.3 tcm by 2035 (BP, 2015b). In the New Policies scenario, the share of natural gas in the global energy mix increases from 21 percent in 2012 to 24 percent in 2040, reaching the same level with coal. Non-OECD demand is again major driver in the growth of global natural gas demand which grows by 2.5 percent annually and demand of OECD countries increase by 1.1 percent annually (BP, 2015b). China, which becomes the third-largest global gas consumer after the United States and Russia in 2013, is expected to account alone for about 35 percent of the increase in non-OECD gas demand by 2040, and non-OECD countries account for around 80 percent of the increase in global natural gas demand. In 2035, China overtakes the European Union in terms of gas demand.

According to Current Policies Scenario, demand rises more quickly with 1.9 percent growth per year, because of lack of new government policies aimed at curbing energy consumption. In this scenario, demand for natural gas increases from 3.4 tcm in 2012 to 5.8 tcm in 2040 as shown in Figure 13. The growth of natural gas demand in the 450 Scenario is slow as a result of reduced electricity demand and the introduction of additional policies to reach the goal of limiting the long-term global temperature increase to 2°C. In this scenario, natural gas demand increases to 4.3 tcm of natural gas in 2040. In each scenario, non-OECD countries are set to account for the largest part of growth in natural gas consumption (IEA, 2014).



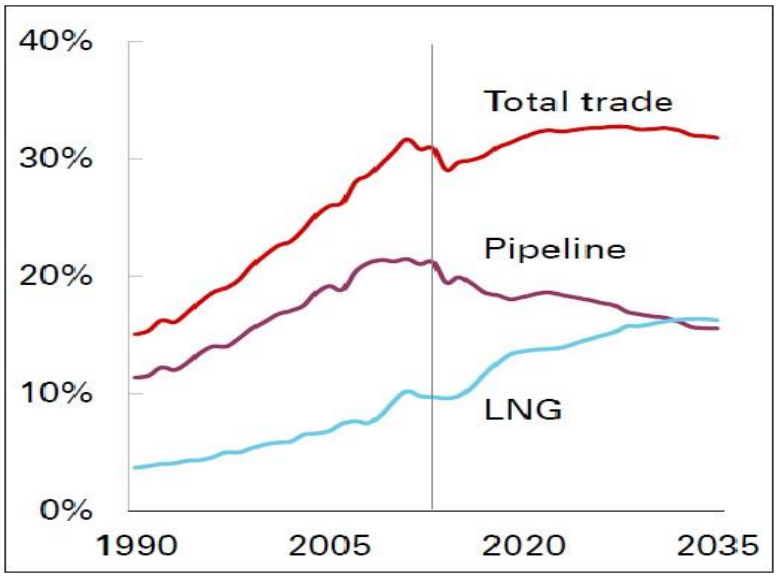
Source: IEA (2014) Accessed 04/05/2015

Figure 13 World natural gas demand by scenario

In overall, as can be seen from Figure 13, slope of natural gas demand line is increasing even more beginning from 2020s. Therefore, global consumption of natural gas would reach to very high levels, which has direct implications on natural gas exporting countries, like Turkmenistan.

3.1.3. Global LNG market Outlook

From 2013 to 2035, 87 percent of increase in the amount of traded gas across regions will come from the trade of LNG. Supply of natural gas through pipeline grows much more slowly than LNG transportation. New pipelines will be launched mostly by Russia and Central Asia. Largest destination for LNG is Asia and this region's share in global LNG demand will stay above 70 percent. By 2035, China will become second largest LNG importer following Japan. From 2013 to 2035, Europe's share in global LNG imports increases from 16 percent to 19 percent (BP, 2015b).



Source: BP (2015b) Accessed 06/06/2015

Figure 14 Share of total trade in global consumption of natural gas

During the same period, global trade of natural gas increases by 2 percent annually. In total, share of natural gas, which is transported via pipeline decreases. Supply of natural gas via LNG will grow by 4.3 percent annually, which is more than two times faster than the growth of natural gas trade. Figure 14 shows share of traded natural gas, share of pipeline and share of LNG in total consumption of natural gas (BP, 2015b).

3.2. Present and potential markets for Turkmen natural gas

This part is allocated for presenting information about energy demanding countries. Some countries are indeed importing natural gas from Turkmenistan and the rest are likely to import natural gas from Turkmenistan in the near future. In evaluating each country, firstly, historical indicators of natural gas sector are presented. After that, based on the energy outlook projections, each country's projected statistics about natural gas sector are given. For convenience, in analyzing demand of each country, data about the indicators of energy sector start from 1992.

3.2.1. China

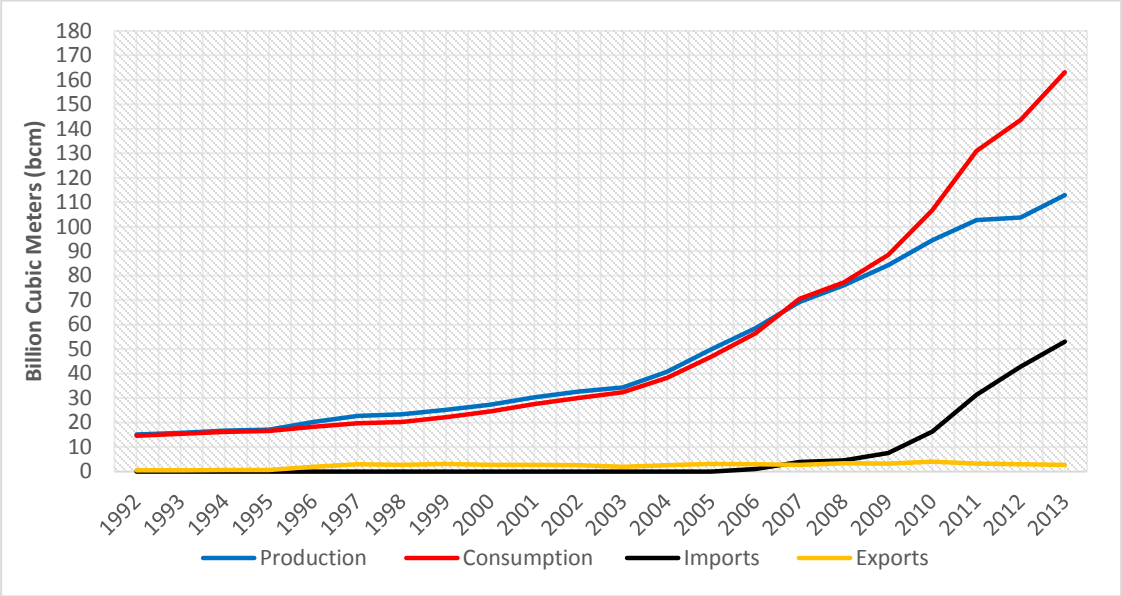
Fast-growing economy has led China to be the largest energy consumer and producer. China has quickly risen to the top ranks in global energy demand over the past few years. It is the world's second-largest oil consumer behind the United States and has become the largest global energy consumer in 2010 (US EIA, 2014c). China's proven natural gas reserves are about 3.3 trillion cubic meters (BP, 2014) and with its population of 1 357 billion it ranks among the high energy intense countries' group with 24 708 Btu in 2011 (World Bank, 2015a). Table B3 in Appendix B presents basic indicators of natural gas sector of China along with energy intensity and growth rate of Chinese economy.

Natural gas production and use has been rapidly growing in China, however in 2011, natural gas comprised only 4 percent of the China's total primary energy consumption. Heavy investments in the development of upstream projects[12] with greater import opportunities such as the establishment of Central Asia – China gas pipeline are likely to be a driver of significant growth in China's natural gas demand (US EIA, 2014c).

Furthermore, dynamically growing economy of China coupled with very high population, led to the sudden increase in domestic consumption needs of natural gas and as a result, consumption outstripped the internal production of natural gas, thus leading to the sudden increase in import dependency. Figure 15 shows that in 2007 China became a net importer of natural gas. From 1992 to 2013 domestic natural gas production of China expanded by more than seven-fold (by 648 percent), increasing from 15 bcm to 113 bcm. However, during the same period domestic consumption of natural gas expanded by more than eleven fold (by 1,014 percent), increasing from 14.6 bcm to 163.1 bcm. China's export of natural is very low with respect to the production and consumption levels of natural gas throughout the analyzed period. Largest portion of total natural gas consumption comes from industrial sector (Lin, B., Liu and Lin, L., 2015). China started to import natural gas in 2006, and import of natural gas has increased dramatically in seven years from 0.9 bcm in 2006 to 53 bcm in 2013. Main driver of increase in import of natural gas was the initiation of Central Asia – China gas pipeline

[12] A step of producing/extracting natural gas.

that transports natural gas from Turkmenistan to China. In other words, Turkmen gas holds substantial amount of share in China's total import of natural gas.



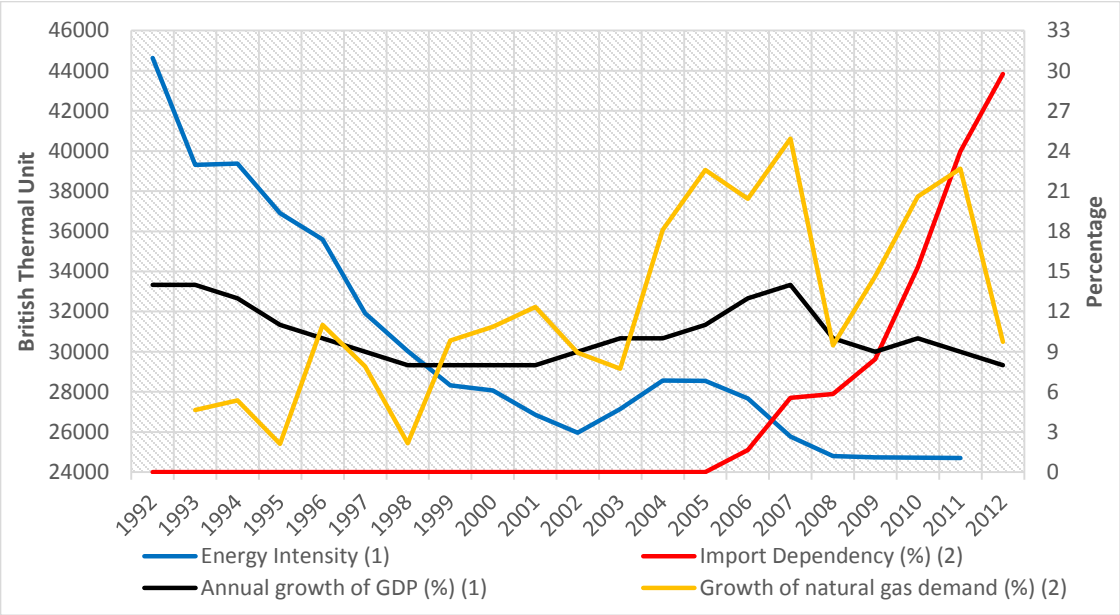
Source: Own calculations based on data from Table B3 in Appendix B. Accessed 11/05/2015

*Data are converted from cubic feet to cubic meter by author's own calculations

Figure 15 Indicators of natural gas sector of China

A major factor that affects import dependency is energy intensity and this indicator of Chinese economy gradually decreased over time only except for the period between 2002 and 2005, as shown in Figure 16. However, despite this fact, import dependency has an increasing trend after 2006. Another striking factor is that, since 1999, the growth rate of natural gas demand was higher than the growth rate of the Chinese economy. In 2006, import dependency of China on natural gas was only 1.65 percent (Figure 16) and since then, import dependency on natural gas has shown a sudden increase, reaching 24 percent in 2012 and this dependence is expected to rise from just under 30 percent in 2013 to over 40 percent by 2035 (BP, 2015b). This indicates that in the future more and more portion of internal consumption of natural gas is going to be met from the importation of natural gas from abroad and most likely from Turkmenistan via Central Asia – China gas pipeline.

From 2013 to 2035, overall energy import dependency of China is expected to rise from 15 to 23 percent (BP, 2015b). Import dependency for oil rises from 60 percent (6 Mb/d) in 2013 to 75 percent (13 Mb/d) in 2035 with an absolute increase in demand by 67 percent and over the same period, demand for natural gas expands by 270 percent and demand for coal expands by 21 percent. Demand for renewables increase by 580 percent, nuclear by 910 percent and hydro by 50 percent during the same period (BP, 2015b).



Source: Based on data from (1) Appendix B3; (2) US EIA (2013), Accessed 11/05/2015

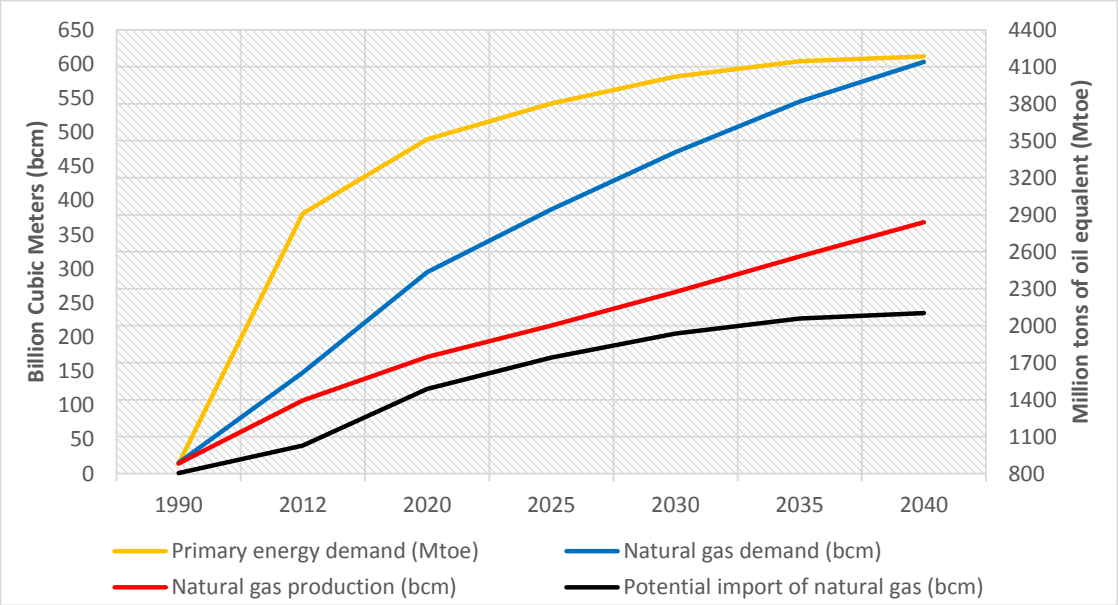
Figure 16 Energy intensity, annual GDP growth and import dependency on natural gas of Chinese economy

According to US EIA (2014c), Chinese government plans to increase the share of natural gas in total energy consumption to around 8 percent by the end of 2015 in order to alleviate high pollution, which emanates from the country's heavy coal use. Despite that, according to BP projections the share of natural gas in total energy consumption is expected to be 10 percent by 2020 and by 12 percent in 2035 (BP, 2015c). In accordance with this purpose, by 2020, it is estimated that Chinese natural gas demand will be 295 bcm annually and by 2040, it will reach 603 bcm annually, growing by an annual average rate of 5.2 percent (US EIA, 2014c). Until 2025, China remains the dominant driving force behind the rise in global demand, accounting for more than one-third of total

increase in energy demand. In 2010, China overtook the United States and became world's biggest energy consumer and will continue its position as a global leader in medium term. By 2025, China will make up 24 percent of global energy demand, while this share was 22 percent in 2012 and just 12 percent in 2002. According to IEA (2014), the trend changes over the period 2025-2040. As economic growth in China slows down and population growth starts to decline slowly after 2030, this will change the position of China over the period 2025-2040. India will take over China as a major driver of global demand growth by around the late 2020s, as the Indian population exceeds China's population. By around the same time, India's GDP per capita reaches China's present level and continues to grow rapidly thereafter (IEA, 2014). According to BP, when China's productivity level catches up with the OECD countries, growth rate of Chinese economy is projected to slow from 7 percent annually (which is projected to be prevalent between 2015-2025) to 4 percent annually (which is projected to be prevalent between 2025-2035). Different from Chinese case, India's growth moderation is more modest slowing from 6 percent annually (from 2015 to 2025) to 5 percent annually (from 2025 to 2035) (BP, 2015b).

According to IEA (2014), between the years 2012 and 2040 China's average annual growth rate of demand on natural gas is expected to be 5.2 percent, and as shown in Figure 17 import demand for natural increases in net absolute terms by 455 bcm through the outlook period. But at the same time over the outlook period, production of natural gas increases by 261 bcm with average annual growth rate of 4.5 percent until 2040, in which in 2040, 235 bcm of gas would be imported in order to meet the domestic natural gas demand. According to projections of BP (2015c), over the period 2013-2035, total energy production rises by 47 percent whereas consumption grows by 60 percent. China's energy mix follows the trend in which coal's dominance declines from 68 percent in 2013 to 51 percent in 2035, and natural gas reaches the share of 12 percent in 2035. Share of oil nearly does not change which stays around 18 percent. Output of natural gas increases about 200 percent and coal increases 19 percent offsetting the decline of oil by 3 percent (BP, 2015c). Striking factor about Figure 17 is that the slope of natural gas demand line is higher than the slope of primary energy demand line. In other words, during the projection period, share of natural gas within the total primary

energy consumption increases. By 2050, primary energy consumption will rise continuously, reaching its peak around 2040s. Decrease in energy demand is expected to be 26 billion tons of coal equivalent from 2005 to 2050. Future potential decrease in energy demand is greatest in the industry sector in the earlier years and in the buildings sector in the long run (Zhou, Fridley, Khanna, Ke, McNeil, and Levine, 2013).



Source: Own calculations based on data from IEA, (2014). Accessed 12/05/2015

Figure 17 Natural gas demand projections for China

China's economy expands by 220 percent between 2013-2035 and at the same time energy intensity decreases by 50 percent similar to the decline seen between 1990 and 2010. By mid-2020s China overtakes Russia as the world's second largest gas consumer behind the US (BP, 2015c) and around 2030s, China overtakes the United States as a world's largest oil consumer. In other words, with geographical proximity to Turkmenistan and already built infrastructure for the transportation of natural gas, Turkmen natural gas is the most feasible source in order to meet the expanding natural gas demand of China. Turkmenistan and China have interrelated interests in developing their mutual relations since their economies are complementary with each other. China has ability to export consumer goods such as, technological products and Turkmenistan has ability to export hydrocarbons (Laruelle and Peyrouse, 2013).

3.2.2. Russia

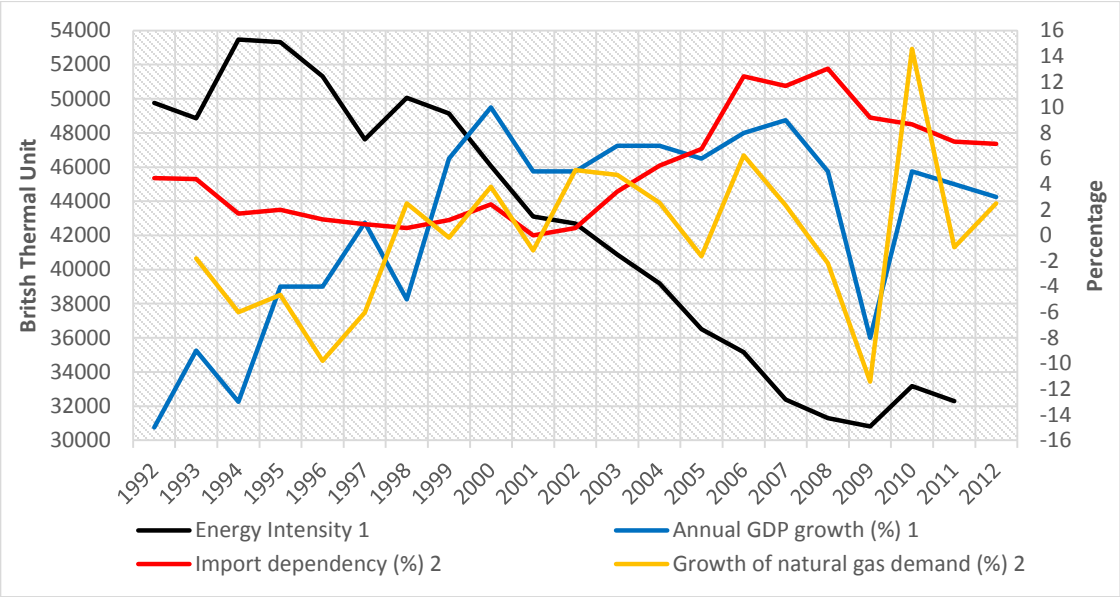
Until 1991, Turkmenistan and Russia are ruled under single authority which made Turkmenistan and Russia very interrelated with each other. For example, natural gas transportation network of Turkmenistan was connected only to Russia until 1997, and in addition to that, Turkmen economy was highly dependent on Russian economy in terms of final product, since Turkmenistan served as the supplier of only raw materials.

Table 4 in Appendix B presents basic indicators of natural gas sector of Russian Federation along with energy intensity and growth rate of Russian economy. Russia as an exporter of natural gas will be examined in section 4.1. This section concentrates on energy intensity, import dependency of Russia and on the future projections of Russia's overall energy demand, i.e. Russia as an importer of Turkmen natural gas.

Russia holds the world's largest natural gas reserves which are more than enough in meeting domestic consumption (US EIA, 2014a). For this reason, Russia's imported natural gas is not consumed domestically, but rather re-exported to Europe with relatively high price. Main factor which makes this re-exportation possible, is the formerly built network of natural gas across the whole former Soviet Union countries. In the first years after the dissolution of Soviet Union, successor energy rich countries did not have any exporting route except for formerly built routes which connect only to Russia.

As can be seen from Figure 18, between 2001 and 2006 Russia's natural gas imports increased. However, since 2008, it has shifted to a decreasing trend due to the turbulences in energy markets which led to the decrease in importation of natural gas.

Another important factor that can be inferred from Figure 18 is that, although Russia managed to decrease its energy intensity by 35 percent between the period 1992 and 2012, Russia ranked in the fourth place among the most energy intense countries in the world in 2013 (Enerdata, 2014). Being an energy intense country relatively decreases Russia's capability to export natural gas abroad. Another important point that needs consideration is that the growth of natural gas demand follows rather a similar path with the growth of GDP of Russia, which can be observed from Figure 18.

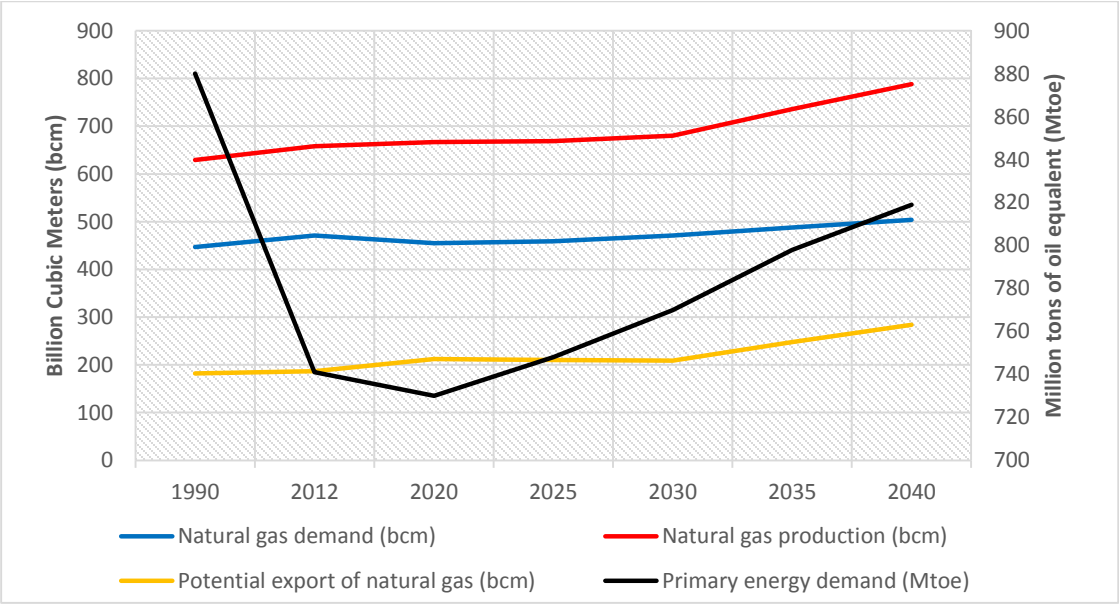


Source: Based on data from 1: Table B4 in Appendix B; 2: US EIA (2013), Accessed 12/05/2015

Figure 18 Energy intensity, annual GDP growth and import dependency of Russian economy

In 2012 natural gas consumption of Russia was about 470 bcm, which consists of more than 50 percent of the primary energy mix (IEA, 2014). Russia has the highest proportion of natural gas in primary energy mix among the world's major economies. This situation limits the scope for further growth of natural gas exports. Between 2013 and 2035 Russia's primary energy production is anticipated to rise by 14 percent, and at the same time, country's share of global energy production is expected to decline slightly from 10 percent in 2013 to 9 percent in 2035. During the same period, Russia's total energy consumption is expected to increase by 14 percent, which is lowest among BRICS countries, whereas total energy consumption is expected to increase by 128 percent in India, by 72 percent in Brazil and by 60 percent in China. By 2035, Russia's energy intensity will have decreased by 34 percent, yet it still remains twice that of OECD countries. Russia remains the world's largest energy exporter, meeting 4 percent of global energy demand by 2035. It will be the second largest oil and gas producer, with production of 1 236 Mtoe and exports of 712 Mtoe of oil and gas (BP, 2015d).

Based on the projections made by IEA (2014), gas consumption in Russia is expected to decrease slightly through the current decade and then increase at a relatively slow pace reaching 500 bcm in 2040 as shown in Figure 19. Between the years 2012 and 2040, Russia's natural gas demand is expected to increase by 33 bcm, with average annual growth rate of 0.2 percent. The average annual growth rate of natural gas production will be 0.6 percent, increasing the amount of natural gas production from 658 bcm in 2012 to 788 bcm in 2040. By 2040, there will be 284 bcm of natural gas that will be available for exportation (IEA, 2014). Due to the very low growth in demand of natural gas in Russia coupled with its huge reserves of natural gas, Russia cannot be considered as a major importer of natural gas from Turkmenistan in the future.



Source: Based on data from IEA (2014). Accessed 12/05/2015

Figure 19 Natural gas demand projections for Russia

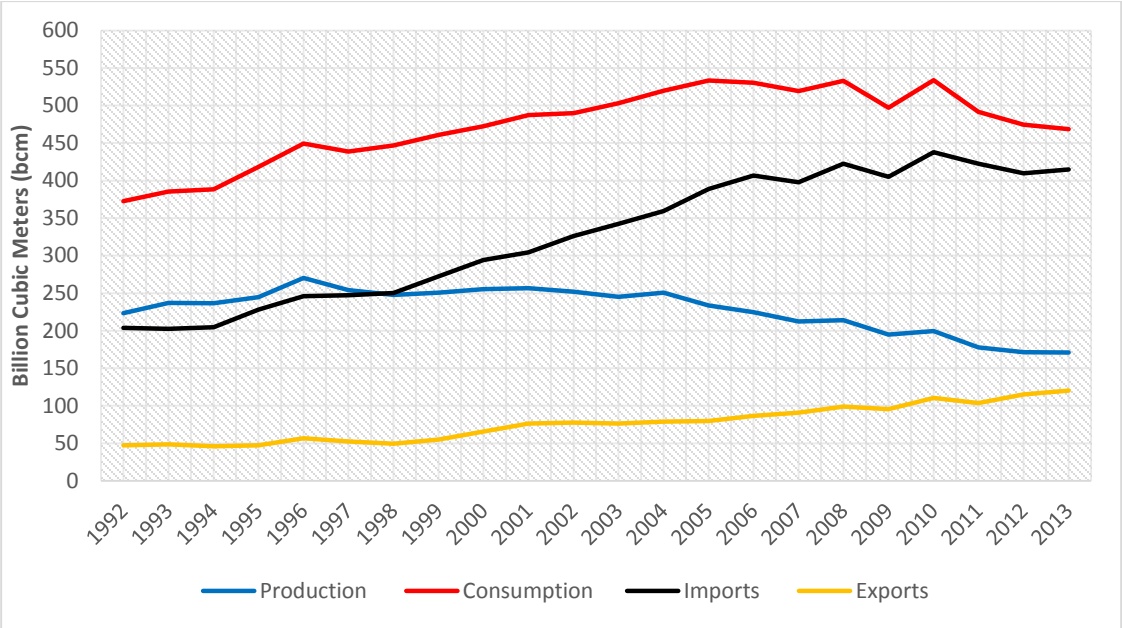
In conclusion it can be said that, future prospects of natural gas trade between Turkmenistan and Russia does not show a stable trend, since Russia can meet its domestic demand for natural gas by internal production of natural gas, and in the future, Russia would only import natural gas from Turkmenistan in order to re-export that gas to another market if it would earn a profit margin from this re-exportation.

3.2.3 European Union

Bilateral relations between Turkmenistan and EU are administered by an Interim Trade Agreement, which was signed in 1998. Other than that, in 2008, Turkmenistan and European Union signed a Memorandum of Understanding on Cooperation in the field of energy (European Union External Action, 2015).

Table B5 in Appendix B presents basic indicators of natural gas sector of European Union along with energy intensity and growth rate of European Union's economy. Figure 20 is the graphical illustration of this Table, and it shows that between the years from 1992 and 2013, European Union's consumption of natural gas increased from 373 bcm to 469 bcm with an increase of about 25.7 percent. At the same time production of natural gas decreased from 223 bcm in 1992, to 171 bcm in 2013 with a decrease of about 23.3 percent. Increase in consumption coupled with decrease in production resulted in an increase in import dependency of European Union on natural gas. In 1992, import of natural gas was 204 bcm and in 20 years this figure reached 409 bcm with an increase of about 200 percent. In other words, net import dependency on natural gas was 42 percent in 1992 whereas, in 2013, net import dependency for natural gas was 62.8 percent. During the above mentioned period, export of natural gas increased from 47 bcm to 114 bcm (US EIA, 2013).

During the same period (1992-2013), energy intensity of European Union decreased from 6 733 Btu to 5 143 Btu (Table B5 Appendix B) with a decrease of about 24 percent and, by 2027, it is estimated that EU will have become the most energy efficient economic region in the world. In that year, EU will catch up with Africa and will become the least energy intensive region in the world and, will maintain the leading position as the region with the highest share of renewables in the primary energy mix with 18 percent (BP, 2015e).



Source: Based on data from Table B5 in Appendix B, Accessed 13/05/2015

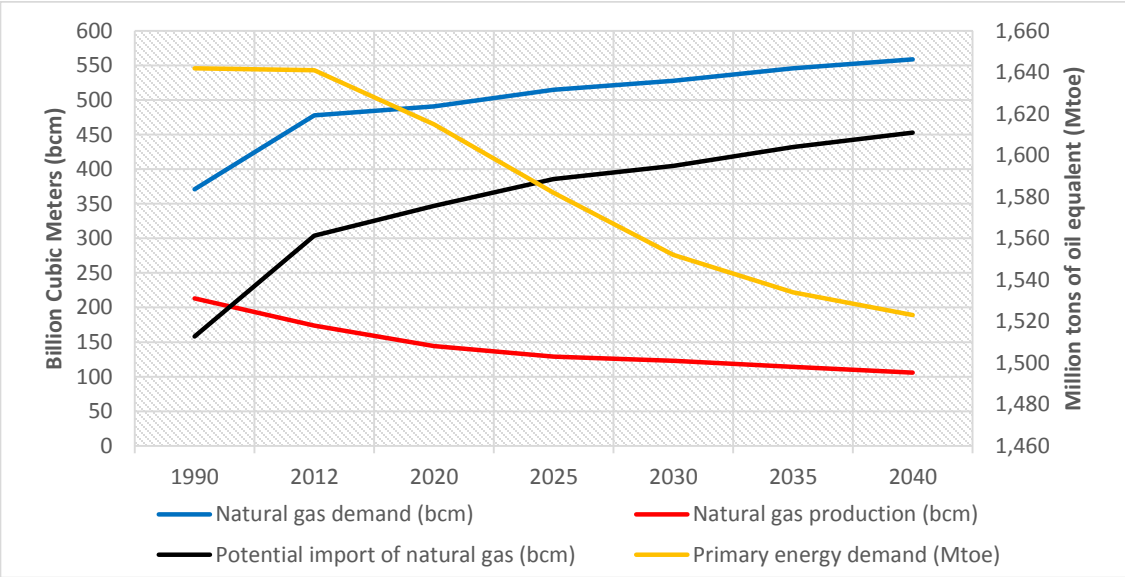
Figure 20 Indicators of natural gas sector of European Union

Decreasing energy intensity is a major goal of European Union, for both achieving the aim of decrease in greenhouse gas emissions and mitigating its import dependency. However, due to the decreasing trend in domestic production of natural gas, import dependency of European Union on natural gas is expected to increase over time. Till mid-2030, the extent of European energy supply security seems to be rather uncertain, however beyond 2030 prospects are more optimistic as a result of expanding renewable energy sources (Umbach, 2010).

By 2035, primary energy consumption is expected to have declined by 6 percent reaching its lowest level since 1984. Between 2013 and 2035, renewables are the fastest growing source of energy with 136 percent, decline in the coal is by 54 percent and decline in oil is by 23 percent. Between the same period, European Union's production of primary energy falls by 5 percent (-38 Mtoe) and net imports of primary energy fall by 6 percent. The main driver of this fall is the decline in oil imports, which accounts for 57 percent in total primary energy import of European Union in 2013. This share is expected to decline to 48 percent in 2035. During the same period net import of natural gas is anticipated to increase by 45 percent. Until 2035, the decline in production is expected to be 55 percent

in coal and 45 percent in natural gas. These are the main drivers in the increase in natural gas imports. Likewise, production of oil will have decreased by 43 percent. Natural gas imports of EU will diversify increasingly. Until 2035, net import of LNG is expected to almost triple increasing the share in the consumption from 9 percent in 2013 to 30 percent in 2035. Import from Russia via pipeline is likely to remain an important source of supply which would grow by 15 percent, maintaining its 31 percent share in total imports of European Union (BP, 2015d). Due to this fact European Union is in search of increasing its origin of imports and in which, Turkmenistan is the main candidate with its low energy intensity and fourth largest proven natural gas reserves (17.5 tcm) in the world.

As shown in Figure 21, from 2012 to 2040, Europe's demand for natural gas increases from 478 bcm to 559 bcm with average annual growth rate of 0.6 percent, according to IEA (2014) projections. During the same period, EU's production of natural gas decreases from 174 bcm to 106 bcm with average annual decrease rate of 1.7 percent (IEA, 2014). An important point that is needs to be emphasized in Figure 21 is that, between given period, demand for total primary energy decreases whereas demand for natural gas increases leading to the increase in the share of natural gas in the composition of total primary energy demand which is in line with EU Commission's future energy targets.



Source: Based on data from IEA (2014). Accessed 13/05/2015

Figure 21 Natural gas demand projections for European Union

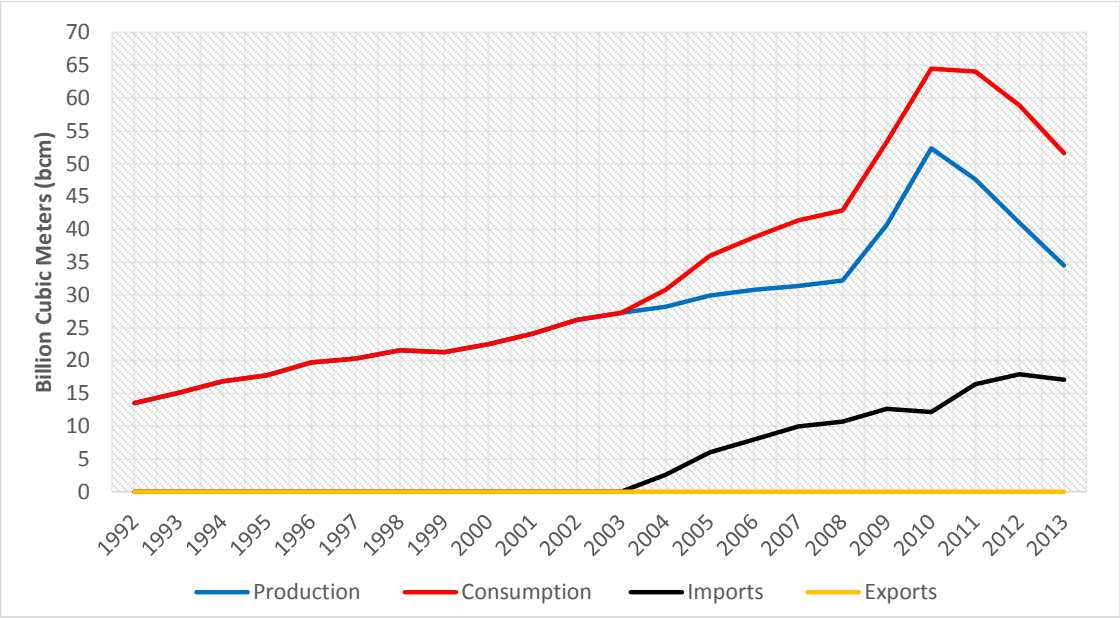
In overall, recently EU's relation with Turkmenistan about cooperation on energy field has intensified. This intensification can be interpreted as the EU's strong will on the import of Turkmen natural gas.

3.2.4. India

Beginning from the early 1990s, Indian government started to implement economic liberalization measures, including industrial deregulation, privatization of state-owned enterprises, and reduced controls on foreign trade and investment which eventually served to accelerate the country's growth, which averaged under 7 percent per year from 1997 to 2011. Due to the decline in investment, caused by high interest rates, rising inflation, and investment pessimism about the government's commitments to further economic reforms and adverse developments in global economy led to the decline in India's economic growth since 2011 (CIA, 2015a).

Table B6 in Appendix B presents basic indicators of natural gas sector of India along with energy intensity and growth rate of India's economy. With respect to international standards, India's share of natural gas in energy mix was low with 6 percent in 2012. At the end of the 2013, India's proven natural gas reserves were announced as 1.4 tcm (BP, 2014) which is not promising enough with respect to its population (1.252 billion) (World Bank, 2015d). India does not have sufficient natural gas infrastructure and does not have adequate internal natural gas production to meet its domestic demand. Therefore, India relies on the import of natural gas and especially on liquefied natural gas. In 2004, India started to import natural gas in the form of LNG from Qatar and in nine years India became fourth largest LNG importer in the world following Japan, South Korea and China, bringing India's share in global LNG trade to almost 6 percent (US EIA, 2014d).

As can be seen from Figure 22, between the years 1992 and 2013, production of natural gas increased by 2.5 fold (by 155 percent) and consumption of natural gas increased by nearly four times (by 283 percent) and thus no natural gas were exported. In 2012, LNG imports comprised 29 percent of total demand of natural gas.



Source: Based on data from Table B6 in Appendix B, Accessed 11/05/2015

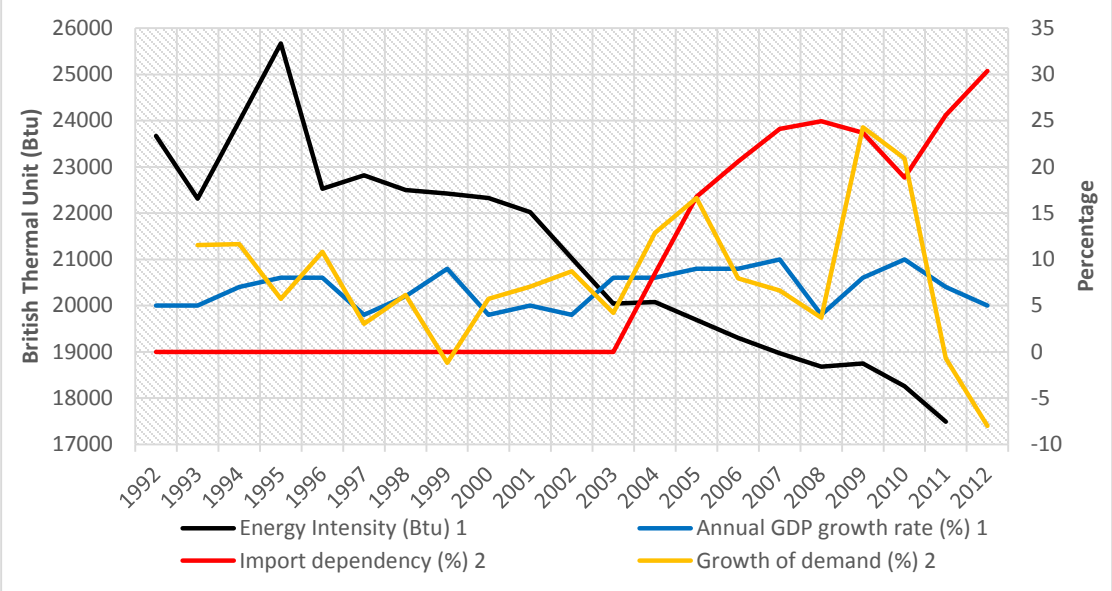
Figure 22 Indicators of natural gas sector of India

Between the years 1992-2011, energy intensity of Indian economy decreased by 26 percent which mitigated its demand for natural gas as shown in Figure 23. Despite the decreasing trend in energy intensity, from 2004 onward, import dependency of India on natural gas had increased until 2008 and then shifted to a decreasing trend until 2010 shifting again to the increasing trend. In 2012, import dependency was about 30 percent. Major driver behind the increase of import dependency is the high population (1.252 billion) and sustained high annual economic growth rates.

From 2013 to 2035, total energy production of India is going to increase by 117 percent whereas, energy consumption will grow by 128 percent. Demand for all fossil fuels is going to increase, with demand for oil rising by 117 percent and demand for coal increasing by 112 percent.

From 2013 to 2035, demand for renewables is expected to increase by 564 percent, nuclear energy by 363 percent and hydro-electricity by 98 percent. During the same period, India's energy mix evolves very slowly. In 2013, share of fossil fuels in total

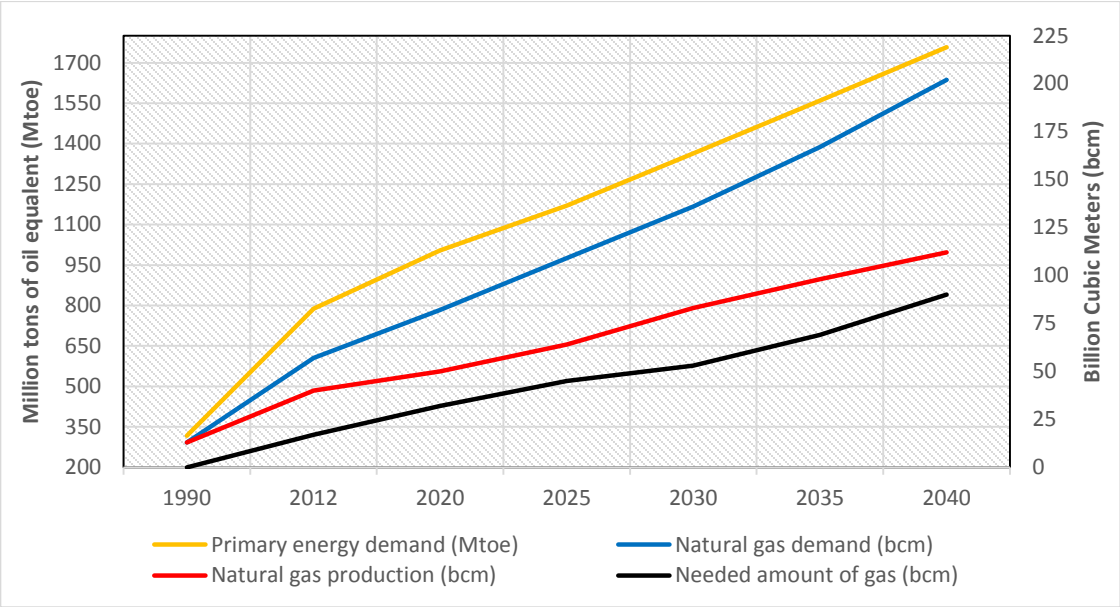
energy demand was 92 percent and in 2035 it is expected to be 87 percent, compared to the global average of 81 percent.



Source: Based on data from (1) Table B6 in Appendix B, (2) US EIA (2013) Accessed 13/05/2015

Figure 23 Energy intensity, annual GDP growth and import dependency of Indian economy

In 2035, India's share in global energy demand is anticipated to be 8 percent, while the shares of China and Russia would be 26 percent and 5 percent respectively (BP, 2015f). From 2012 to 2040, India's demand for natural gas is expected to increase by 145 bcm with average annual growth rate of 4.6 percent as shown in Figure 24. During the same period, India's production of natural gas is anticipated to increase by 72 bcm with average annual growth rate of 3.8 percent. In overall, in 2040, India is expected to need extra 90 bcm of natural gas in order to meet its domestic consumption (IEA, 2014). During the projection period, share of natural gas in the composition of total energy demand slightly increases. Whereas, the use of coal is going to maintain its large share because of its abundance and relatively low cost. Although renewable energy is the promising energy source, it is not enough to support India's rapidly growing economy. Only secure and affordable energy sources, especially coal can be a driver of continued economic progress and poverty alleviation (Ghose, 2012)



Source: Based on data from IEA (2014). Accessed 13/05/2015

Figure 24 Natural gas demand projections for India

In conclusion it can be said that, India with its large population and sustained growing economy is a promising market for Turkmenistan in order to export Turkmen natural gas. In addition to that, geographical proximity of India to Turkmenistan increases the feasibility of importing Turkmen natural gas even more.

In 2012, India imported 57 percent of its natural gas imports from Qatar in LNG form. Natural gas imports from Saudi Arabia and United Arab Emirates each accounted for about 10 percent of India's natural gas imports, and imports from Kuwait accounted for 7 percent of India's natural gas imports. Nigeria, Egypt and Algeria in total account for 10 percent of India's natural gas imports. In overall, it can be said that Qatar dominates India's natural gas market, however import origins of India are quite diversified and rather far away from India. Transformation of natural gas in liquefied form via LNG vessels makes this multidimensional trade possible. Turkmenistan's geographical proximity to India provides competitive advantage for Turkmenistan over those countries which export natural gas to India. Therefore, Turkmenistan needs to wisely use that advantage by quickly constructing TAPI pipeline as soon as possible. Once TAPI pipeline constructed

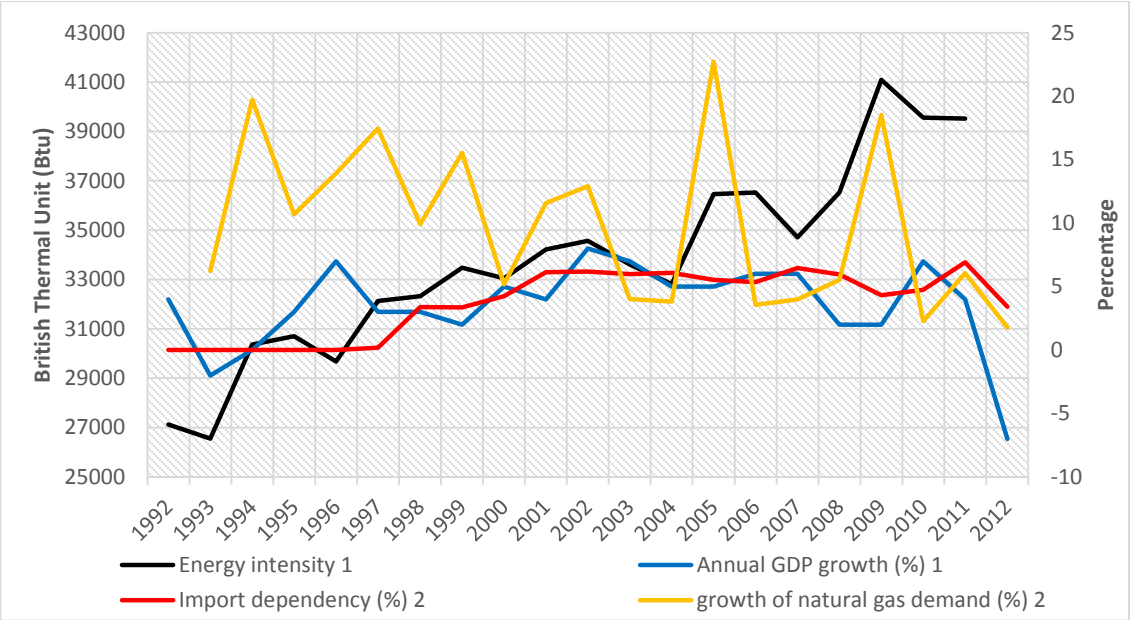
cost of Turkmen natural gas for India will be much lower with respect to cost of natural gas which is imported via LNG vessels.

3.2.5. Iran

As stated in previous chapter, Iran imports natural gas from Turkmenistan. Reason of importing natural gas despite holding the second largest natural gas reserves in the world (US EIA, 2014b) is due to the insufficient network system of the country. Iran's energy rich southern part is not connected to population dense northern part sufficiently and because of that Iran imports natural gas from Turkmenistan in order to satisfy its northern part's demand for natural gas. As Iran manages to connect fully its southern region with its northern region sufficiently, Iran would be able to gradually decrease its imports from Turkmenistan. It can be said that the future trade of natural gas between Turkmenistan and Iran is going to be conducted taking into consideration the fact that both of those countries hold huge amounts of natural gas.

Table 7 in Appendix B presents basic indicators of natural gas sector of Iran along with energy intensity and growth rate of Iran's economy and Figure 25 is the graphical illustration of this table. As in case of Russia, Iran as an exporter of natural gas will be examined in section 4.1. This section concentrates on energy intensity, import dependency of Iran and on the future projections of Iran's overall energy demand, i.e. Iran as an importer of Turkmen natural gas.

As can be noticed form Figure 25, from 1992 to 2011, energy intensity of Iran increased from 27 120 Btu to 39 525 Btu with an increase of about 46 percent in which internal production of natural gas barely meets the domestic demand for natural gas. If the current trend in energy consumption continues, Iran will have to cut its exports of both oil and natural gas to satisfy its domestic demand. Increase in energy consumption is partly due to the growing economy. Another driver is the energy intensity of Iran which is one of the highest in the world leading to the high level of inefficiency in the use of energy (Moshiri, 2012).



Source: Based on data from (1) Table B7 in Appendix B; (2) US EIA (2013) Accessed 14/05/2015

Figure 25 Energy intensity, annual GDP growth and import dependency of Iranian economy

In the future, after upgrading its network system, Iran may import natural gas from Turkmenistan only to re-export that gas. Iran's geopolitical location enables it to be a transit country for far away countries such as Japan, if Persian Gulf is provided by suitable infrastructure. As is extensively explained in section 5.3.1., possible transportation of Turkmen natural gas in LNG form to far remote countries like Japan would then be possible. Iran can also be a transit country for Turkmenistan's natural gas to Europe through Turkey and to India through Pakistan.

In conclusion it can be said that, in the long run Iran cannot be considered as a major natural gas importer from Turkmenistan but there is prospect of cooperation in the trade of energy, such as exchange of natural gas[13]. Recent developments on nuclear talks between Iran and P5+1[14] countries may change the course of natural gas trade, if agreements that are reached during the nuclear talks are implemented in practice.

[13] See section 5.3.1.

[14] P5+1 are five permanent members of UN Security Council plus Germany. Thus, P5+1 countries are China, France, Russia, the United Kingdom, United States plus Germany

3.2.6. Turkey

Impressive growth performance of Turkey since 2000s, is especially based on domestic demand which eventually led to the widening in the current account deficit. Sharp decrease in private savings and increase in energy imports are major drivers of current account deterioration (OECD, 2014). Additionally, Turkey's geopolitical location enables her to be the transit country between the energy rich East, North, South[15] and the energy thirst West. In Turkey important developments were achieved on the way toward being an energy hub such as launch of the construction of Trans Anatolian Pipeline (TANAP) in Kars (starting from Azerbaijan passing through Georgia and continuing through Turkey) on 17 March 2015. Another example is organized trilateral meetings between Turkmenistan, Azerbaijan and Turkey main agenda of which is energy issue.

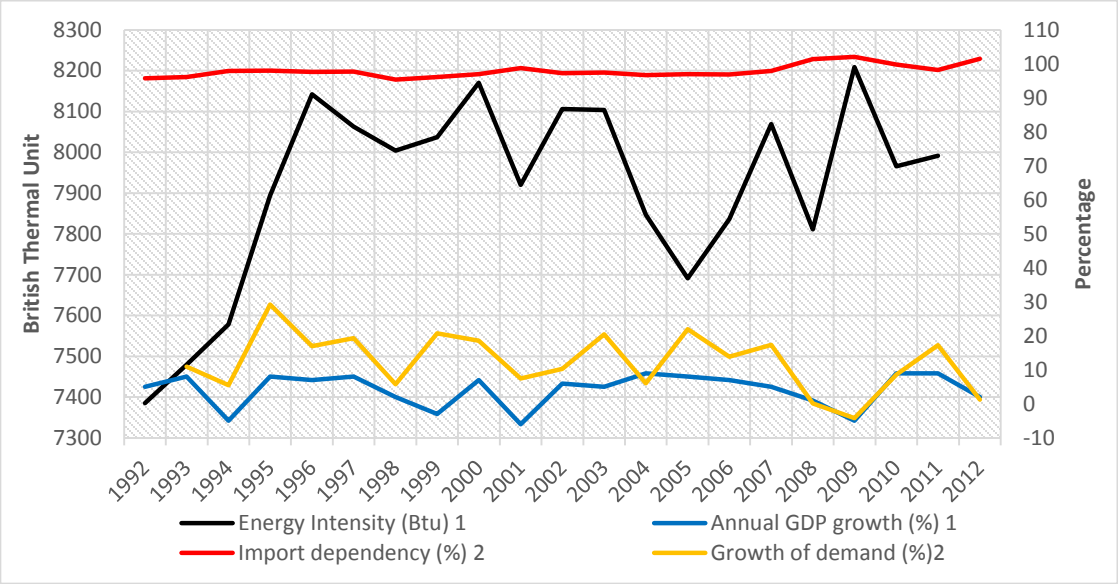
In 2011, Turkey ranked in the twenty first place in the world in terms of the consumption of primary oil; twenty first place in consumption of natural gas, twentieth place in consumption of electricity and it is the seventeenth among the countries with respect to its coal reserves and thirteenth among the countries with respect to its coal consumption (Akbalık & Kavcıoğlu, 2014)

Table B8 in Appendix B presents basic indicators of natural gas sector of Turkey along with energy intensity and growth rate of Turkey's economy. Between the years 1992 and 2012, Turkey's natural gas consumption increased from 4.6 bcm to 45.6 bcm. In other words, in 20 years demand for natural gas increased nearly tenfold (by 882 percent), (US EIA, 2013) and during the same period gross domestic product increased nearly threefold (by 171 percent) (World Bank, 2015e). Turkey meets almost overall internal demand by imports, making the import dependence of Turkey very high, as shown in Figure 26. During the above given period energy intensity, despite fluctuations, increased by 8 percent which further deteriorated the import dependency of Turkey.

It can be observed from Figure 26 that demand for natural gas has grown more than the growth of GDP between 1992 and 2012. Another striking factor is that, Turkey's import dependency on natural gas has been close to 100 percent throughout the period. In other

[15] Around 70 percent of world's energy reserves are located in the east, north and south of Turkey.

words, Turkey is dependent to Russia and Iran and especially vulnerable to changes in the price of natural gas in the energy market.



Source: Based on data from (1) Table B8 in Appendix B; (2) World Bank (2015e) Accessed 14/05/2015

Figure 26 Energy intensity, annual GDP growth and import dependency of Turkish economy

Turkish economy's import dependency on overall energy is high (nearly 100 percent) and a major driver in the increase of import dependency is natural gas. Therefore, the government aims to increase its import origins through launching a multi pipeline system in order to decrease its vulnerability to particular suppliers (Russia and Iran) in the energy market. For example, during the official visit of Turkey's president to Turkmenistan on November 2014, new natural gas purchase agreement has been signed between Turkey and Turkmenistan (however details of this agreement has not been announced yet). In conclusion, it can be said that Turkey can be seen as a promising importer of natural gas such that energy trade between Turkmenistan and Turkey has a win-win structure, since trade of natural gas both increases import origins of Turkey and increases export destinations of Turkmenistan.

CHAPTER 4

MAJOR PRODUCERS OF NATURAL GAS IN THE NEIGHBORHOOD

In this chapter major producers of natural gas in the neighborhood of Turkmenistan, namely Russia, Iran, Qatar, Kazakhstan and lastly Uzbekistan are examined exclusively. After discussing the main economic indicators with specific emphasis on the export of natural gas, their future projects in the natural gas sector (pipeline and LNG projects) is assessed. Moreover, comparative statistics of those natural gas producing countries is also discussed.

4.1. Russia

Russia has the largest natural gas reserves in the world and is in constant effort for extending its natural gas transportation routes. This section is devoted to the overview of Russia's natural gas sector and to the examination of future natural gas transportation routes.

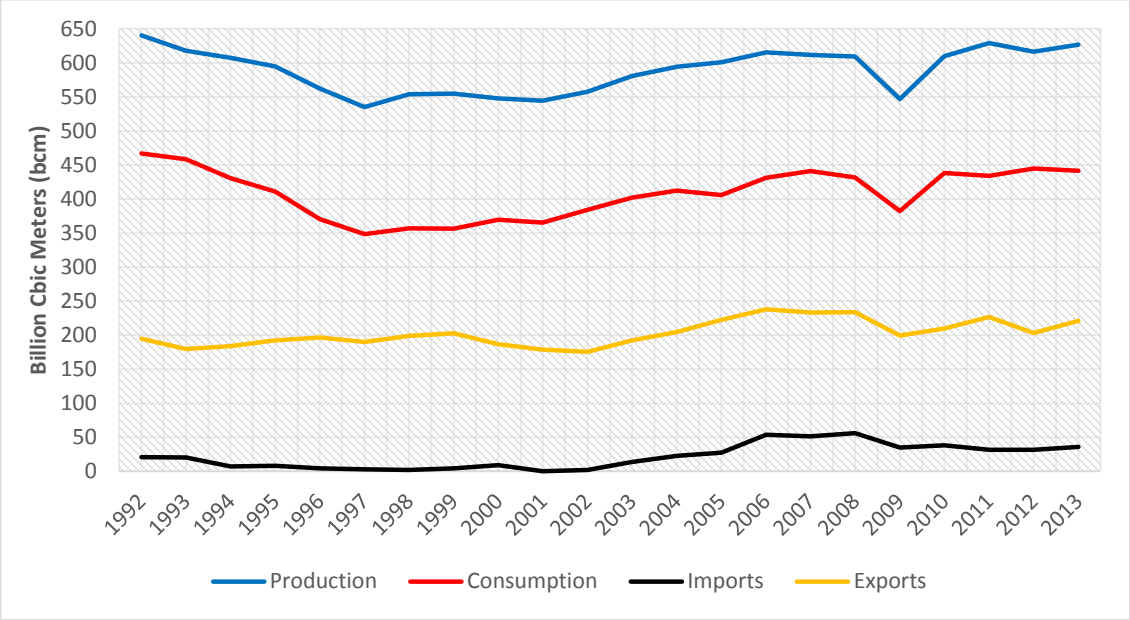
4.1.1. Overview of natural gas sector

The Rothschild family and the Nobel brothers played a prominent role in the exploration and development of natural gas in Russia. At the end 1800s natural gas was largely used to lighten major cities of Russia and was generally produced and consumed domestically (Bahgat, 2010). Russian Federation has the first place in the world in natural gas reserves, and has the second place in the world in dry natural gas production. Russia is the third-largest liquid fuel producer in the world. It produces a modest amount of coal despite its

significant amount of coal reserves and its economy is highly dependent on its hydrocarbons.

Data for 2013 shows that Russia is still the third-major producer of total liquids in the world, with average production at 10.5 million barrels per day (bbl/d) (US EIA, 2014a). Russian Federation holds 32.6 trillion cubic meters of proven natural gas reserves which corresponds to the 17.4 percent of global natural gas reserves (BP, 2015a). Russia produced 604.4 bcm of natural gas in 2013 with an increase of approximately 2.4 percent with respect to 2012. In 2013, Russia's share in global natural gas production was about 17.9 percent (BP, 2014).

When natural gas sector of Russia is analyzed and it is observed that the indicators such as production, consumption, import and export levels did not fluctuate much during the 1992-2013 period except in 2009 as can be seen from Figure 27.



Source: Own calculations based on data from Table B4 in Appendix B. Accessed 15/03/2015

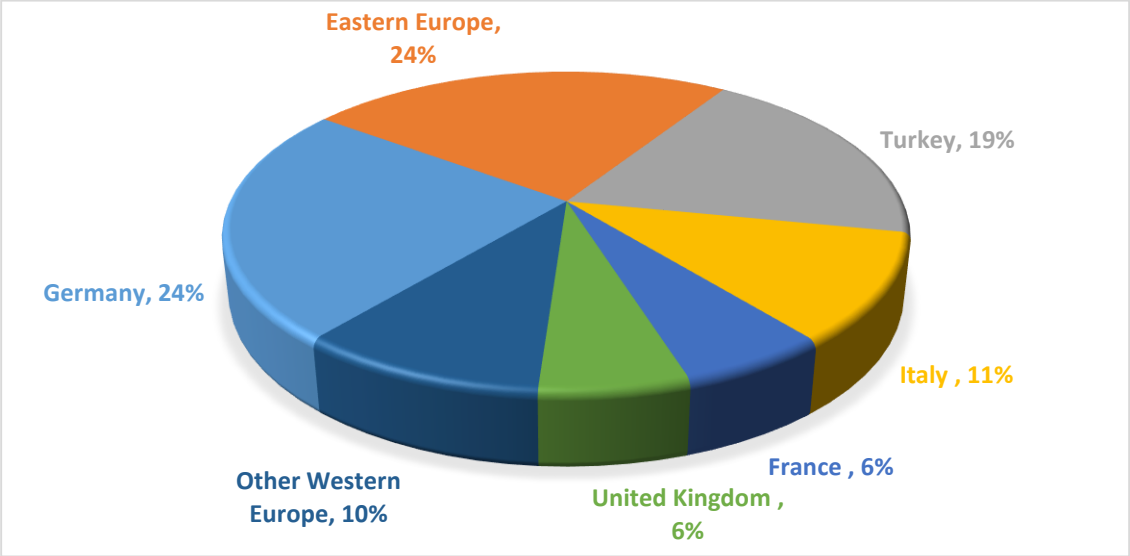
Figure 27 Indicators of natural gas sector of Russia

Due to the global financial crisis, Europe which is the main importer of Russian natural gas has decreased its demand for natural gas that consequently led to the decrease in natural gas exportation of Russia. Production and consumption levels of natural gas have decreased until 1997 and after that year, they started to increase. Import capacity of Russia

has switched to a decreasing trend after 2008. Russia's major import origin of natural gas was Turkmenistan. The explosion in the Central Asia-Center gas pipeline in 2009, has decreased the volume of natural gas that was being imported from Turkmenistan.

Russia's proven natural gas reserves can support high volume of production in the log-run. Russia is located next to two large and growing consuming markets namely, Europe and Asia. The two regions are already dependent on Russian supplies of natural gas and their dependence is likely to deepen further (Bahgat, 2010).

Figure 28 illustrates Russia's natural gas exports by countries. Germany is the major importer of natural gas absorbing nearly a quarter of Russia's overall exportation. EU-28 countries' import dependence on Russian gas was 39 percent in 2013 (Eurostat, 2013). Turkey, being another major gas importing country from Russia, imports nearly one fifth of Russia's natural gas exports and her import dependence on Russia's natural gas is about 56 percent (US EIA, 2014e).



Source: Based on data from US EIA (2014a), Accessed 20/03/2015

Figure 28 Russia's natural gas exports by destination

Oil and natural gas revenues correspond to more than 50 percent of federal budget revenues. By virtue of its high oil and gas production and, at the same time, with the elevated prices for those commodities, Russia's economic growth continues to be driven

by energy exports. . Increase in the price of oil and gas significantly increased state budget revenues of Russia and it has managed to create a mechanism that enables the absorption of surplus export revenues by the state budget through a mechanism that is called the sovereign wealth fund (Tabata, 2009).

4.1.2. Projected natural gas pipelines of Russia

This section examines Russia's future gas pipeline projects, which are Power of Siberia, Power of Siberia 2, Turkish Stream and Yamal-Europe-2 pipeline projects. Table 7 presents technical characteristics of those projected natural gas pipelines of Russia. Power of Siberia and Power of Siberia 2 pipelines are directed towards China. With Power of Siberia and Power of Siberia-2 projects Russia is expected to export 68 bcm of natural gas to China annually in the near future. Aim of Turkish Stream project is to export natural gas to Turkey and to European countries. Yamal-Europe-2 project is planned to export gas to Slovakia through Belarus and Poland.

Table 7 Projected natural gas pipelines of Russia

	Starting Date	Completion Date	Diameter	Capacity	Length
Power of Siberia	May, 2014	December, 2017	1 420 mm	38 bcm/a	4 000 km
Power of Siberia 2	--	December, 2015	1 420 mm	30 bcm/a	2 600 km
Turkish Stream	May, 2015	December, 2016	--	63 bcm/a	1 090 km
Yamal-Europe-2	2013	--	--	15 bcm/a	--

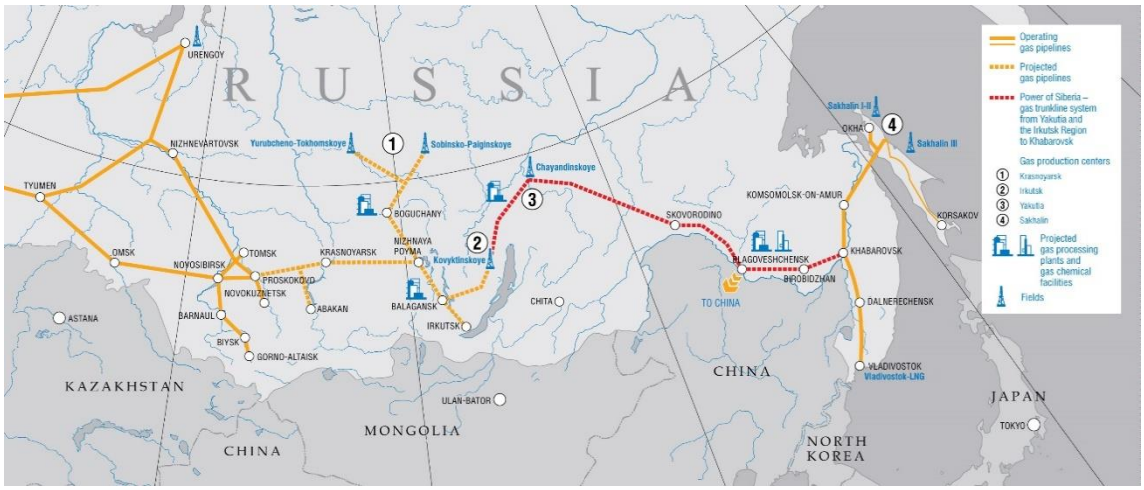
Source: Gazprom (2015) http://www.gazprom.com/about/production/projects/pipelines/ Accessed 23/07/2015

4.1.1. Power of Siberia

This pipeline project is going to extract natural gas from Chayandinskoye gas field which is located in Yakutia and from Kovyktinskoye gas field which is located in Irkutsk region. Chayandinskoye gas field has 1.2 tcm and Kovyktinskoye gas field has 1.5 tcm of natural gas reserves. Length of this pipeline is about 4 000 kilometers and pipeline diameter is 1 420 mm which will be able to transport 38 bcm of natural gas annually (Gazprom, 2015b). Constructions of Power of Siberia pipeline enables to export natural gas to China and this

project is classified as “eastern route”. Map-5 shows the planned route of Power of Siberia pipeline.

In May, 2014 national gas company of Russia, Gazprom signed a contract with China National Petroleum Corporation. According to that contract, Russia is to export 38 bcm of natural gas annually to China for 30 years and in total more than 1 tcm of natural gas is to be exported to China. In this contract price of natural gas is linked to oil prices and the “take-or-pay” clause. Around 55 billion US dollar is going to be invested in the construction of production and transmission facilities in Russia. Project deadline is the late 2017 (Gazprom, 2015c).



Source: Gazprom (2015b), Accessed 19/07/2015

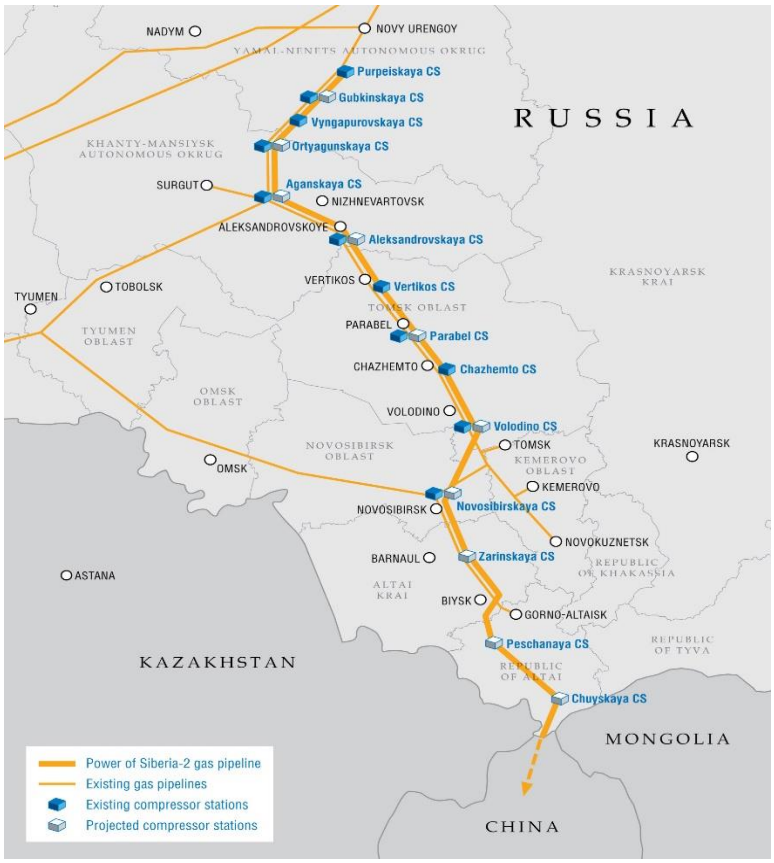
Map-5 Power of Siberia

4.1.2. Power of Siberia 2

On September 27, 2010 Gazprom and CNPC signed the Extended Major Terms and Conditions of Natural Gas Supplies from Russia to China. This contract sets fundamental commercial parameters of anticipated natural gas delivery to the Chinese market via the “western route”. Construction of pipeline starts from the Western Siberia to Novosibirsk with follow-up extension to the Russian Chinese border. Map 6 shows the map of Power of Siberia-2 project (Gazprom, 2015d).

First supplies of natural gas through Power of Siberia-2 project is planned for late 2015. Under the agreements reached in the above mentioned contract 30 bcm of natural gas is

going to be exported to China for 30 years. Length of the pipeline is 2 600 kilometers with a diameter of 1 420 mm.



Source: Gazprom (2015) http://www.gazprom.com/f/posts/59/990512/sila-sibiri-2-en.jpg Accessed 19/07/2015

Map-6 Power of Siberia-2

4.1.3. Turkish Stream

On December 1, 2014 Gazprom and Turkish company Botas Petroleum Pipeline Corporation signed the Memorandum of Understanding on constructing the Turkish Stream gas pipeline. In February 2015 the fundamental reference points of the planned route and technical properties of the gas pipeline in were approved and on May 8, 2015 Gazprom started the construction of Turkish streams offshore section (Gazprom, 2015e).

This pipeline will run across the Black Sea from the Russkaya CR to European part of Turkey as shown in Map-7. The length of offshore section of pipeline is 910 km and length

of onshore section of pipeline is 180 km, totaling 1 090 km. Turkish Stream is going to have 4 pipelines parallel to each other. Each line's annual transport capacity is planned as 15.75 bcm of natural gas. Overall annual capacity of Turkish Stream will be 63 bcm of natural gas. One line of Turkish Stream is designated to meet the increasing demand of Turkey and the other 3 pipelines are planned to transport natural gas to Europe. Construction of first line of Turkish Stream is planned to be completed by December of 2016 (Gazprom, 2015e).

Source: Gazprom (2015) http://www.gazprom.com/f/posts/55/359415/map-turkish-stream-en.jpg Accessed 20/07/2015

Map-7 Turkish Stream

4.1.4. Yamal – Europe – 2

Yamal – Europe – 2 gas pipeline is planned to transport natural gas to Poland, Slovakia and Hungary. Generally it aims to reduce the transmission costs and to increase the volume of Russian gas exports to the countries of Central Europe. In April, 2013 Gazprom was charged to conduct feasibility study of the project Yamal – Europe – 2 envisaging the construction of natural gas pipeline from the Russian – Belarussian border through Poland to Slovakia. In the same month, Gazprom and EuRoPol GAZ[16] signed a Memorandum of

[16] EuRoPol GAZ is a Gazprom – PGNiG joint venture operating the Polish section of the Yamal – Europe gas pipeline

Understanding as part of the project. Planned annual delivery capacity of this pipeline is 15 bcm and planned deadline of the construction of this pipeline is not announced yet (Gazprom, 2015f).

4.1.3. Implications for Turkmenistan

Between the years 2012-2020, export level of Russia increases from 187 bcm/a to 212 bcm/a, in other words, according to IEA (2014), until 2020 Russia's export level is to increase by 25 bcm/a, as can be followed from Figure 19 in Chapter 3. However according to the future projects of national energy company of Russia, Gazprom, export level of natural gas is likely to increase by 131 bcm[17] and in case of realization of Yamal – Europe – 2 pipeline this estimation will reach to 146 bcm until 2020. To sum up, there are contradictions between the data of Gazprom and IEA (2014) on Russia's natural gas exportation capacity. According to projections of Gazprom, by 2020 Russia is going to export at least 105 bcm of more natural gas abroad than the projections of IEA (2014).

Currently Russia exports natural gas to European Countries, Turkey, Japan, South Korea and China. In 2012, Russia's natural gas exports to China was very low level comprising about 0.26 percent of Russia's total natural gas exports abroad (Observatory of Economic Complexity, 2015). In coming years share of China among export destinations of Russian natural gas is expected to increase considerably since mega projects on transportation of natural gas to China (like Power of Siberia, Power of Siberia 2) are under construction (Gazprom, 2015a-f).

Turkmenistan is in search of diversifying of its export destinations, and currently exports natural gas to China, Russia and Iran. Turkmenistan will have to compete with Russia while diversifying its export destinations, because one of promising markets of Turkmen natural gas is Europe and currently Europe's major part of natural gas imports come from Russia. Turkmenistan should offer appealing options for European countries about Turkmen natural gas in order to compete with Russian natural gas in Europe. Same is needed for Chinese market also, since Russia and Turkmenistan is expected to be the main

[17] This value is obtained by adding up the transportation capacities of pipelines which are currently under construction.

suppliers of natural gas to China in the future. One advantage of Russia in competing with Turkmenistan on Chinese market is that Russia neighbors with China i.e. Russia has transportation advantage over Turkmenistan. Therefore, again Turkmenistan should offer more appealing options to China about Turkmen natural gas in order to gain a competitive advantage over Russia.

4.2. Iran

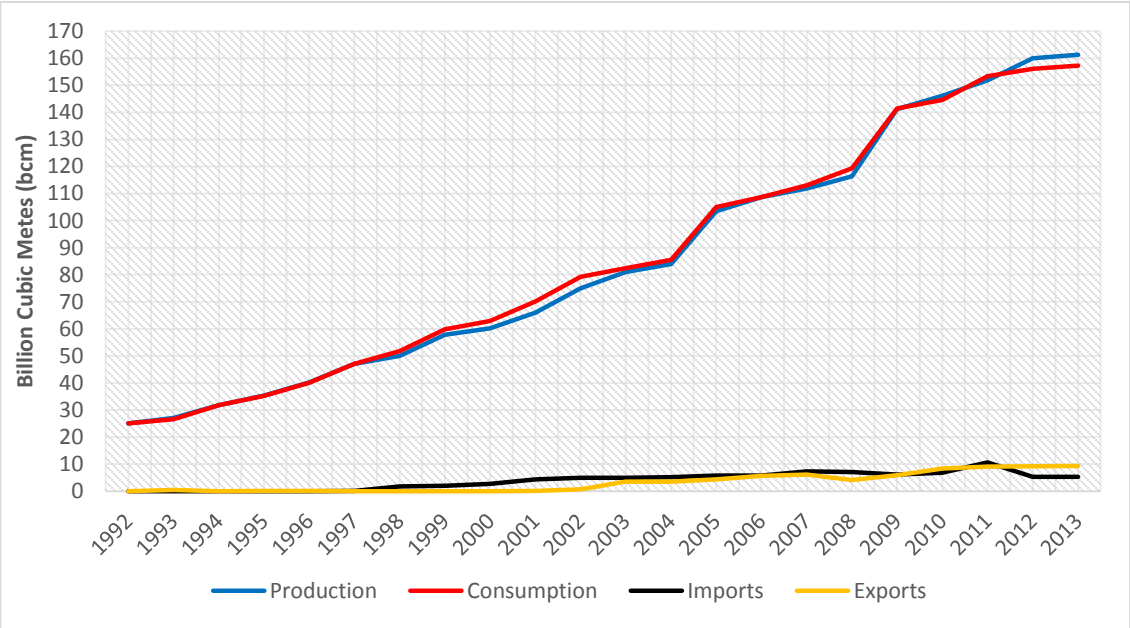
Iran has the world's fourth-largest proven crude oil reserves and the world's second-largest natural gas reserves. Since the beginning of 1990s Iran managed to achieve considerable progress in increasing per capita income and living standards. This development was especially based on investments, increase in employment and productivity since the early 1990s. Another major driving factor in this progress is the high terms of trade since the beginning of 2000. Main advantage of Iran is its vast hydrocarbon wealth and relatively more diversified resource-intensive economy. By virtue of these advantages, Iran’s social indicators show a decrease in poverty and income inequality.

However, this course of progress has stalled during the past several years. Main reason for this is the large shocks in the form of embargo that was put by western countries (IMF, 2014a). Despite the country's abundant reserves, Iran's oil production has substantially declined over the past few years, and natural gas production growth has slowed. International sanctions have profoundly affected Iran's energy sector. Cancellation or delays of upstream projects which resulted in declining oil production capacity were prompted by sanctions (US EIA, 2014b). Following the expansion of international sanctions in 2012, decrease in oil exports significantly reduced Iran’s oil revenue, which eventually forced government to cut public sector spending and caused a sharp currency depreciation. So, Iran’s economy contracted by 7 percent in 2012 and contracted by 2 percent in 2013 due to the increased international sanctions and the economy expanded slightly (1 percent) in 2014 (World Bank, 2015f).

Iran holds 33.8 trillion cubic meters of natural gas which accounts for 18.2 percent of the world's proven natural gas reserves (BP, 2014) and more than one-third of OPEC's

reserves. The largest natural gas field of Iran is South Pars which is estimated to hold roughly 40 percent of Iran's gas reserves. However, the vast majority of Iran's gas reserves are undeveloped. Other major gas fields in Iran include Kish, North Pars, Tabnak, Forouz, and Kangan. These fields and others also hold large amounts of hydrocarbon reserves (US EIA, 2014b).

As for the natural gas production, Iran ranks the world's third largest dry natural gas producer after the United States and Russia which accounted for nearly 5 percent of the world's dry natural gas production in 2012. Almost 40 percent of Iran's gross natural gas production came from the South Pars field in 2012 (US EIA, 2014b). In 2013, Iran consumed 157 bcm of natural gas, in other words it consumed 97.5 percent of its overall natural gas production. It can be observed from Figure 29 that the production of natural gas is indeed correlated with consumption of natural gas. From 1992 to 2013, production capacity of Iran increased about 545 percent, and increase in consumption capacity was nearly the same with 529 percent.



Source: Own calculations based on data from Table B7 in Appendix B. Accessed 20/03/2015.

Figure 29 Indicators of natural gas sector of Iran

Iran accounted for less than 1 percent of global natural gas trade in 2012 and it trades very small amounts of natural gas regionally via pipelines. In 2012, more than 90 per cent of

Iran's imports came from Turkmenistan, and roughly 90 percent of Iran's exports went to Turkey. Iran does not have the required infrastructure to export or import liquefied natural gas (LNG) (US EIA, 2014b).

In 2013, import of natural gas was 5.32 bcm and export of natural gas was 9.32 bcm. The main impending factor on the natural gas trade of Iran has been international sanction, which in practice had two negative impacts on Iranian economy. The first one is that Iran itself cannot exploit its reserves sufficiently due to insufficient investment. The second one is that there have been impediments in the international money transactions.

An agreement on nuclear deal between Iran and P5+1 countries which was reached recently, might change the course of energy trade in that region. According to that agreement, which was signed between P5+1 and Iran in 24 November 2013 in Geneva, major international sanctions on Iran will be removed after Iran fulfills all its obligations mentioned on the agreement.

According to EIA (2014), from 2012 to 2020, natural gas production of Iran is going to decrease from 156 bcm/a to 153 bcm/a. However, as a result of the recent agreement between Iran and P5+1 countries, sanctions that were put by western countries on Iran are going to be lifted. As a result, Iran will have an opportunity to export more natural gas abroad when compared with the case of being under economic sanctions. To sum up, based on the current developments, until 2020 Iran's natural gas production is not going to decrease to 153 bcm/a, but will increase significantly.

In 2012, Iran imported natural gas from Turkmenistan and exported natural gas to Turkey, South Korea, Indonesia and China (Observatory of Economic Complexity, 2015). Geopolitical location of Iran enables it to export natural gas to those countries. Turkmenistan's landlocked geography provides geopolitical advantage to Iran over Turkmenistan. Therefore, in order to increase its competitiveness Turkmenistan should develop new ways and means of transportation of natural gas, such as Trans Caspian Pipeline.

4.3. Qatar

Qatar is a sovereign Arab country located in Southwest Asia, occupying the small Qatar Peninsula on the northeastern coast of the Arabian Peninsula. It has land border only with Saudi Arabia in its south and the rest of Qatar's territory is surrounded by Persian Gulf. In 2013, Qatar's total population was 1.8 million with 278 000 of that population being Qatari citizens and 1.5 million being expatriates (BP, 2013c). Qatar is the world's richest country in terms of per capita income and has the highest human development index in the Arab World and Qatar is recognized as a high income economy by the World Bank (UNDP, 2013). According to World Bank, in 2013, gross domestic product of Qatar was about 203.2 billion US dollars (World Bank, 2015g).

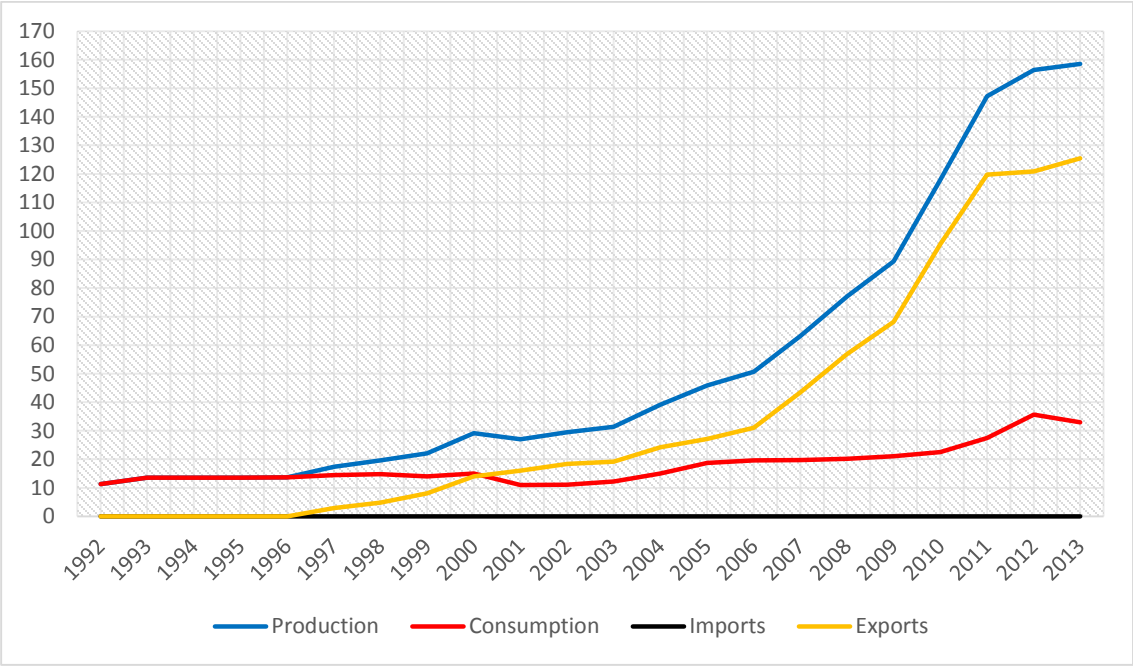
A significant part of Qatar's budget revenues are earned by the export of crude oil, LNG and petroleum products. As for the natural gas reserves, Qatar ranks third place in the world holding 24.7 trillion cubic meters of natural gas corresponding to 13.3 percent of global natural gas reserves (BP, 2014).

Like many of its neighbors, Qatar relies on its energy sector to support its economy. In 2012, Qatar was the world's fourth largest dry natural gas producer (behind the United States, Russia, and Iran). In addition to that, Qatar has the largest gas-to-liquid GTL facility in the world and is the leader of GTL production, and as a consequence it has been the world's leading liquefied natural gas (LNG) exporter since 2006.

Figure 30 provides information about production, consumption, import and export capacity of natural gas sector of Qatar between the years 1992-2013. As Qatar's economy has grown its overall energy demand and consumption of natural gas has also increased. Between the years stated above, natural gas consumption of Qatar has nearly tripled, increasing from 11.35 billion cubic meters (bcm) in 1992 to 32.93 bcm in 2013. As can be seen from Figure 30, Qatar meets all of its internal natural gas demand from domestic sources. The water desalinization and electric sectors account for most of the natural gas consumption in Qatar. Natural gas production of Qatar has increased from 11.35 bcm in 1992 to 158.52 bcm in 2013. In twenty years, the level of production capacity has increased about 1,296 percent (nearly 14 fold) whereas, internal consumption has increased about 190 percent (nearly 3 fold). Until 1997, Qatar had not exported natural

gas abroad. After that milestone, Qatar's natural gas exportation has increased dramatically. In 2013, Qatar exported nearly 125.5 bcm of natural gas which accounts for 79 percent of overall production. At present, the country exports 85 percent of natural gas in the form of LNG.

Qatar's small domestic population enables it to export the main portion of its natural gas production. As stated above, Qatar is a leading country in the exportation of LNG with its 10 LNG vessels, which make Qatar the pioneer in LNG exports.



Source: Based on data from US EIA (2013) and own calculation. Accessed 20/03/2015.

Figure 30 Indicators of natural gas sector of Qatar

Each vessel's transport capacity is 135 000 cubic meters of natural gas and these vessels are known as Q-Fleet ships. In addition to this, there are five more rented ships that are used in the exportation of LNG to Spain.

For the time being, Qatargas is in the process of developing two new classes of LNG tankers, referred to as Q-Flex and Q-Max. They were designed by a team of engineers who have made a considerable improvements in the capacities of LNG carriers. They have a cargo capacity between 210 000 and 266 000 cubic meters and are 80 percent larger than

the Q-Fleet ships (Qatargas, 2015). Currently there are 19 Q-Flex and 13 Q-Max LNG vessels under construction, and in total 32 new vessels will be added to Qatargas inventory. Based on these developments, it can be inferred that in the foreseeable future Qatar's LNG exporting capacity is to boost further.

According to IEA (2014), from 2012 to 2020 natural gas production of Qatar is expected to increase from 159 bcm/a to 164 bcm/a, in other words in eight years production level of Qatar is likely to increase only by 5 bcm. However as already mentioned above recently, there are 15 LNG vessels in Qatar Gas' inventory and 32 new LNG vessels are going to be added to inventory, with the new vessels' capacity being 80 percent bigger on average than previous LNG vessels. In other words, increasing LNG exportation capacity permits Qatar to double (or even triple) its production capacity, however due to technical constraints, it is uncertain whether Qatar can double or triple its production capacity in the near future. Therefore it can be said that by 2020, Qatar is going to export at least 60 bcm more natural gas abroad than the projections of IEA (2014).

Qatar is developing relations with Russia in order to cooperate in energy sector. In December 2010, Russian gas company Gazprom opened its representative office in Qatar in order to conduct long-term economic cooperation with Qatar and generally with Middle East (Kasayev, 2013).

In 2012, 33 percent of Qatar's natural gas exports were directed to Japan. 20 percent were directed to South Korea, 15 percent were directed to India, 10 percent of exports were directed to China, and 16 percent of Qatar's total natural gas exports were directed to European countries (Observatory of Economic Complexity, 2015). As can be noticed, none of those countries have land connection with Qatar, in other words, Qatar manages to reach to those markets by pioneering in LNG trade. Qatar has access to international waters and these feature of Qatar provides competitive advantage over Turkmenistan. All major competitors of Turkmenistan (Russia, Iran and Qatar) have access to international waters which gives considerable competitive advantage over Turkmenistan, and as a consequence Turkmenistan needs to gain a competitive advantage in one way or another by developing new ways and means of transportation of natural gas and offering appealing options for Turkmen natural gas.

4.4. Kazakhstan

Geographically Kazakhstan is the largest among the former Soviet republics, except Russia, and possesses substantial amount of fossil fuel reserves and other minerals and metals, such as uranium, copper and zinc. In the early 1990s, substantial oil and gas reserves were discovered in Kazakhstan. In addition to that, extensive mineral resources were also discovered. As Kazakhstan transforms itself from planned economy to market based economy, significant structural and institutional reforms have been made (Amin and Ainekova, 2012). It also has a large agricultural sector featuring livestock and grain. In 2015, Kazakhstan became the first country among Central Asian countries to join the World Trade Organization. Extractive industries have been the engine of Kazakhstan's growth and will continue to be so, although the country is seriously pursuing diversification program of economy. Being landlocked with restricted access to the high seas, Kazakhstan depends on its neighbors, especially on Russia in exporting its products. In 2010, Kazakhstan joined the Belarus-Kazakhstan-Russia Customs Union in order to increase foreign investment and as a result, improved trade relationships. In January 2015, the Customs Union evolved into the Eurasian Economic Union. Kazak economy has performed very well during the past decade, growing at an average rate of 9 percent annually. Moreover, over this period there has been substantial increase in production in all the sectors of the economy (Amin and Ainekova, 2012).

During 2014, Kazakhstan's economy was restrained by Russia's slowing economy, the weakening ruble, falling oil prices, and problems at its Kashagan oil field. Kazakhstan devalued its currency, the Tenge, by 19 per cent in February, 2014 and in November the government announced a stimulus package to cope with the economic challenges (CIA, 2015b).

Kazakhstan is an oil producer since 1911. In addition to this, Kazakhstan has the second largest oil reserves as well as the second largest oil production among the former Soviet republics after Russia. Kazakhstan holds proven crude oil reserves of 30 billion barrels (BP, 2015a), which is the second largest reserve in Eurasia after Russia, and the 12th largest in the world, just behind the United States (US EIA, 2015a). Kazakhstan's oil sector has experienced exponential growth which doubled the production of oil between

2000 and 2008 (Laruelle, and Peyrouse, 2013). Kazakhstan's current oil production is dominated by two giant onshore fields in the northwest of the country. They are Tengiz and Karachaganak, which produce about half of Kazakhstan's total petroleum liquid output. The offshore Kashagan field, located in the Kazakh part of Caspian Sea, will also play a major role in Kazakhstan's liquid production in the future (US EIA, 2014g).

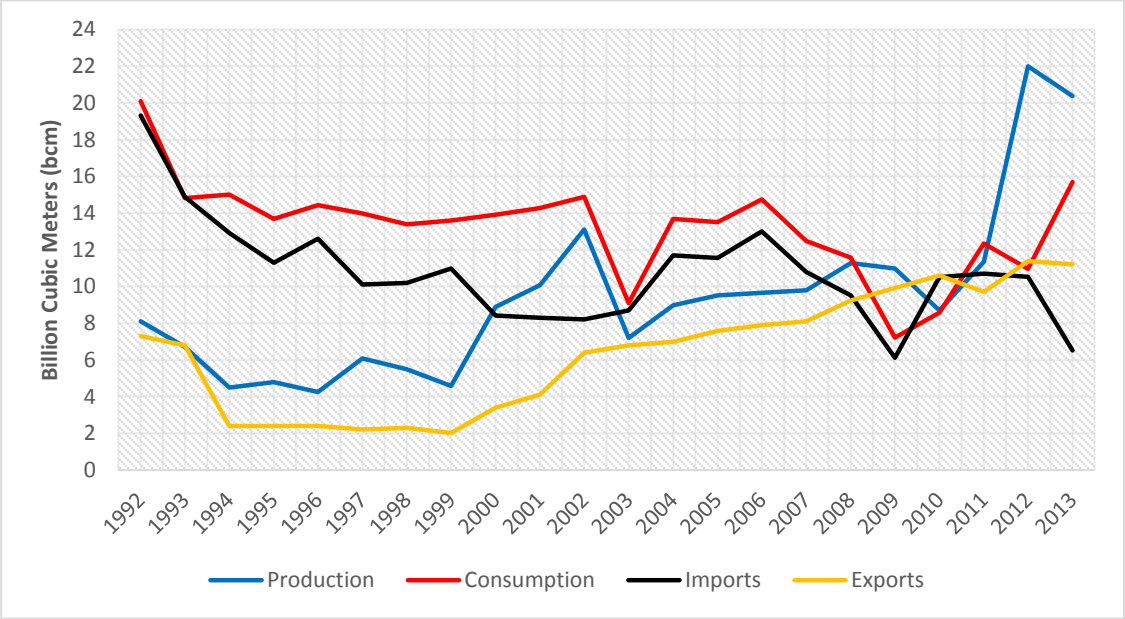
Compared with petroleum reserves, Kazakhstan's natural gas reserves are much smaller. Kazakhstan's largest petroleum liquid fields also contain substantial volumes of natural gas, most of which are re-injected into oil wells to improve oil recovery rates. As of end 2013, Kazakhstan's proven natural gas reserves were 1.5 tcm which corresponds to the 0.8 percent share of global natural gas reserves (BP, 2014). The majority of Kazakhstan's gas reserves are in crude or condense rich fields. Karachaganak and Tengiz oil fields are at the same time the two largest natural gas fields. Over the past decade, annual gross natural gas production has almost tripled, from 0.6 Tcf[18] in 2003 to 1.6 Tcf in 2012. Re-injected natural gas has accounted for most of the increase in gross production, while dry natural gas production has remained relatively stable. In 2012, re-injected natural gas production was more than twice the dry natural gas production. In 2012, Kazakhstan's total energy consumption amounted to 2.8 quadrillion Btu. Coal has the largest share in overall energy consumption with 63 percent. Natural gas has 18 percent and oil has 16 percent share in energy consumption (US EIA, 2014g).

There are two major natural gas exporting pipelines which pass through Kazakhstan's territories. One of them is Central Asia - Center (CAC) gas pipeline system and the second one is Turkmenistan-China pipeline. A third major pipeline is the Bukhara-Tashkent-Bishkek-Almaty pipeline which serves local demand in southern Kazakhstan with imported gas from Turkmenistan and Uzbekistan. Two of Kazakhstan's three underground gas storage facilities are located along this pipeline.

The domestic pipeline system in Kazakhstan is underdeveloped. Natural gas production in the country is concentrated in the northwest and is not connected to population centers in the south, north, center, and eastern part of Kazakhstan. A government objective is to develop a domestic natural gas system that would connect the country's producing and

[18] Trillion Cubic Feet

consuming areas (US EIA, 2014g). With respect to the first years of independency, Kazakhstan's consumption level decreased, and at the same time production level of natural gas increased. Even though Kazakhstan has large population, its internal natural gas consumption is low because coal has a big share in the satisfaction of energy demand. When Figure 31 is analyzed, it is observed that from 1992 to 2013 production capacity of Kazakhstan increased from 8 bcm to 20.3 bcm annually, an increase of about 154 percent.



Source: Based on data from US EIA (2013) and own calculations. Accessed 20/03/2015

Figure 31 Indicators of natural gas sector of Kazakhstan

During the same period consumption capacity of Kazakhstan decreased from 20.1 bcm/a to 15.7 bcm/a, a decrease of 21.9 percent. Import level of country has decreased significantly during the same period, from 19.3 bcm/a to 6.5 bcm/a. Kazakhstan exports more natural gas than it imports from abroad. From 1992 to 2013, Kazakhstan's export of natural gas increased from 7.3 bcm/a to 11.3 bcm/a, an increase by 54.8 percent.

4.5. Uzbekistan

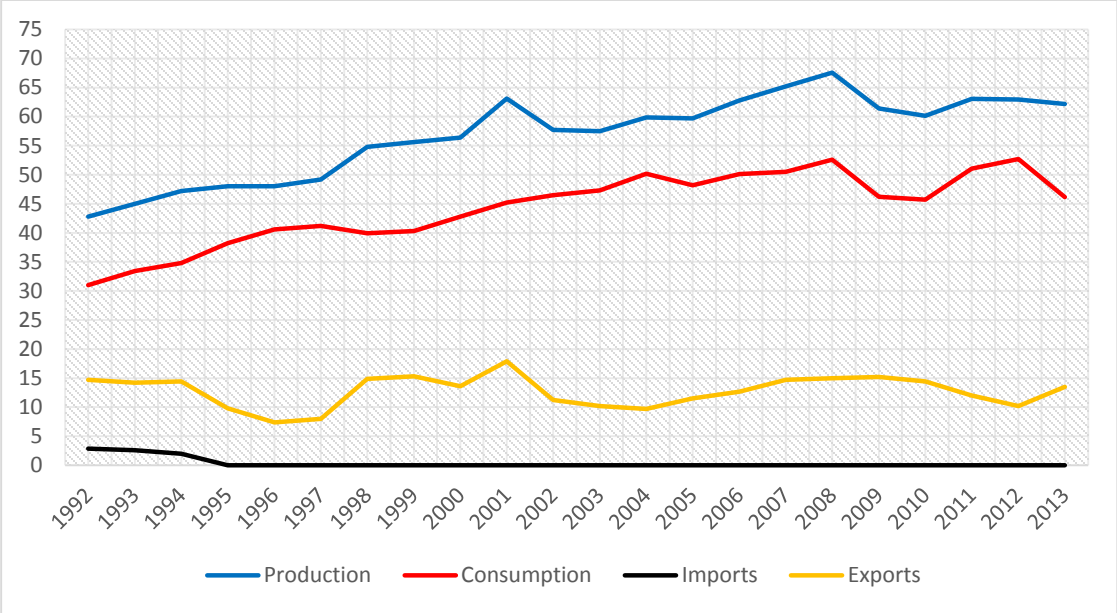
Uzbekistan, being a resource rich country, has managed to achieve robust economic growth with an average of 8 percent growth between 2008 and 2013 (World Bank, 2015h),

despite uncertainties in the global environment. Uzbekistan is rich in terms of gold, copper, uranium and natural gas. Moreover, Uzbekistan ranks in the sixth place among world's cotton producers. Additionally, Uzbekistan is among the five countries of the world in terms of the proven gold reserves, and among the ten leading countries in production gold (UZINFOINVEST, 2015). Uzbekistan has an automobile industry, legacy of Soviet Union. Therefore its car industry is one of few sectors which are not related to extractive industries, which have actually been successfully developed since independence (Laruelle, and Peyrouse, 2013). With 30.24 billion population (World Bank, 2015h) Uzbekistan comprises 40 percent of Central Asia's population. Poverty in the country declined from 26 percent in 2004 to 18 percent in 2010. However, per capita income remains low especially with respect to other resource rich countries in the region. Authorities of Uzbekistan are working on a strategy aiming to achieve upper-middle-income country status by 2030 (IMF, 2014b). Developing private sector needed new institutional structures and new laws, therefore the government recently started to focus on less state intervention, more administrative and financial decentralization, price liberalization and privatization of state owned enterprises (Aminova and Jegers, 2011).

In 2012, Uzbekistan was the third largest natural gas producer in Eurasia, behind Russia and Turkmenistan. Uzbekistan holds 1.1 trillion cubic meters of natural gas which corresponds to the 0.6 percent of world's overall natural gas reserves (BP, 2014). Total primary energy consumption in Uzbekistan was about 1.9 quadrillion Btu in 2013. Natural gas constituted approximately 85 percent, while consumption of petroleum products and coal were about 7 percent and 3 percent, respectively. Hydroelectricity represented the remaining 5 percent of the share (US EIA, 2014h).

Uzbekistan is well endowed with energy resources, but its energy system presents severe problems in terms of sustainability, security and affordability (Gómez, Dopazo and Fueyo, 2015). Uzbekistan's natural gas transmission and distribution system allows trade with Russia, Kazakhstan, and Kyrgyzstan. Uzbekistan also serves as a transit country for natural gas flow from Turkmenistan to Russia and China. Additionally, two new natural gas pipelines, Gazli-Kagan and Gazli-Nukus, were built to connect the Ustyurt and Bukhara-Khiva regions with country's existing system.

When Figure 32 is analyzed, it is observed that since 1994 Uzbekistan has been meeting its domestic natural gas demand through internal production of natural gas. Considering its big population (30.24 million), insufficient pipelines and aging energy infrastructure have slowed the production, distribution, and exports of hydrocarbons in recent years.



Source: Based on data from US EIA (2013) and own calculations. Accessed 20/03/2015

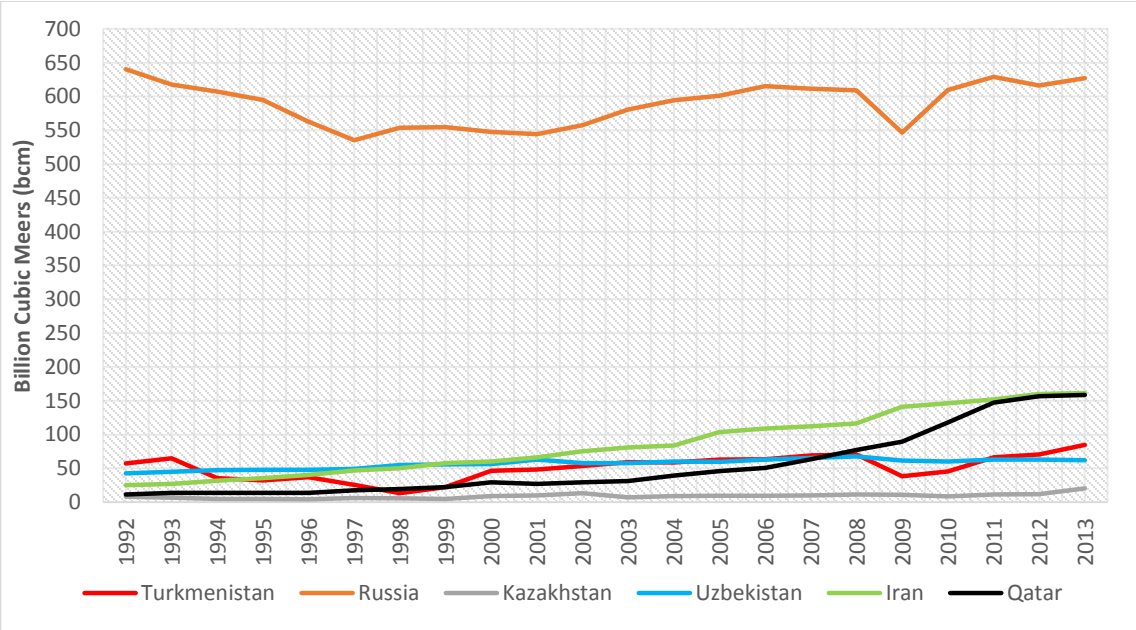
Figure 32 Indicators of natural gas sector of Uzbekistan

As a result, exportation of natural gas decreased from 14.7 bcm in 1992 to 13.5 bcm in 2013. In that year, Uzbekistan exported 21.7 percent of its produced natural gas, and the rest of natural gas (78.3 percent of domestic natural gas production) is used in domestic consumption. When compared to 1992, natural gas consumption increased about 48.8 percent in 2013, and this development is due to the increase in energy intensity of Uzbek economy, whereas production capacity of natural gas has increased about 45.3 percent thus leading to the decrease in the export capacity of natural gas.

4.6. Comparative statistics of energy supplying countries

In this section, production, consumption and export capacities of natural gas of Turkmenistan, Russia, Kazakhstan, Qatar, Iran and Uzbekistan are compared and contrasted. In addition, energy intensities of those countries are also analyzed.

When comparing production capacities of countries in Figure 33, it is salient that Russia's export capacity is much bigger than that of the total of other five countries. In 2013, according to production level, Russia ranked in first place with 627 bcm. Iran ranked in second place with 161 bcm, Qatar ranked in third place with 158.5 bcm, Turkmenistan ranked in fourth place with 84.8 bcm and Uzbekistan ranked in fifth place with 62 bcm and Kazakhstan ranked in last place with 20 bcm.

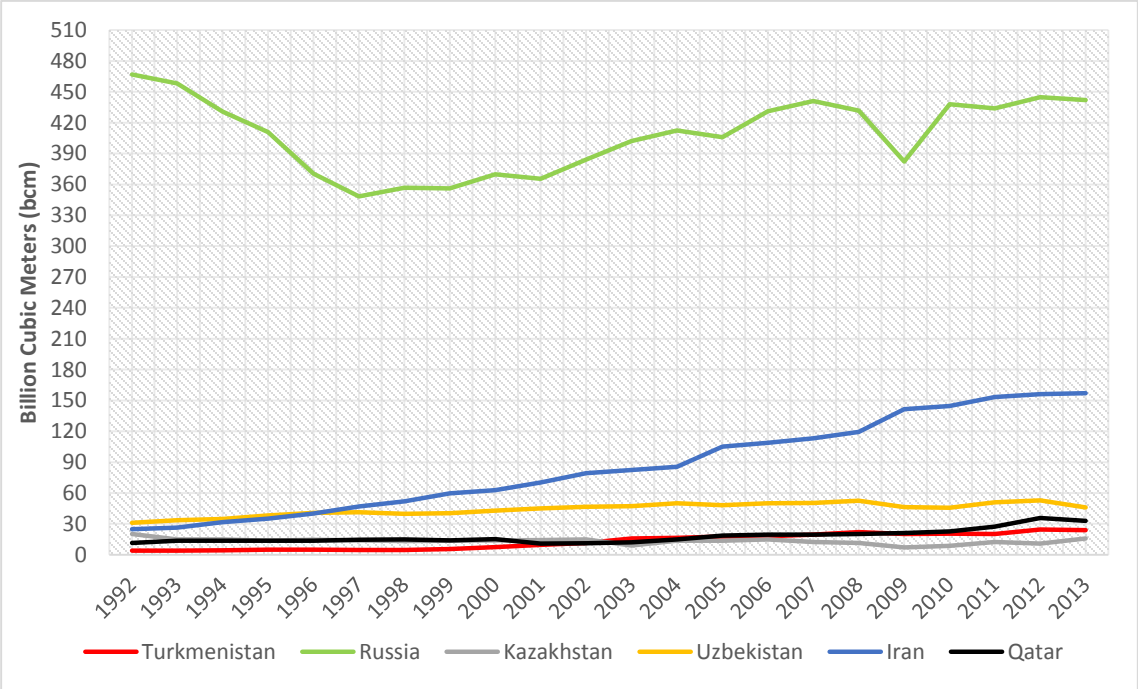


Source: Based on data from US EIA (2013), Accessed 20/03/2015.

Figure 33 Comparison of production levels of Turkmenistan's competitors

When analyzing the consumption level of these six countries in Figure 34, again Russia ranks in the first place such that Russia's consumption is bigger than the total consumption of the other five countries.

In 2013, Russia consumed 70 percent (442 bcm), Iran consumed 98.1 percent (157 bcm), Uzbekistan consumed 74 percent (46 bcm), Qatar consumed 21 percent (33 bcm), Turkmenistan consumed 28 percent (24.5 bcm) and lastly Kazakhstan consumed 77 percent (15.7 bcm) of its internal natural gas production.

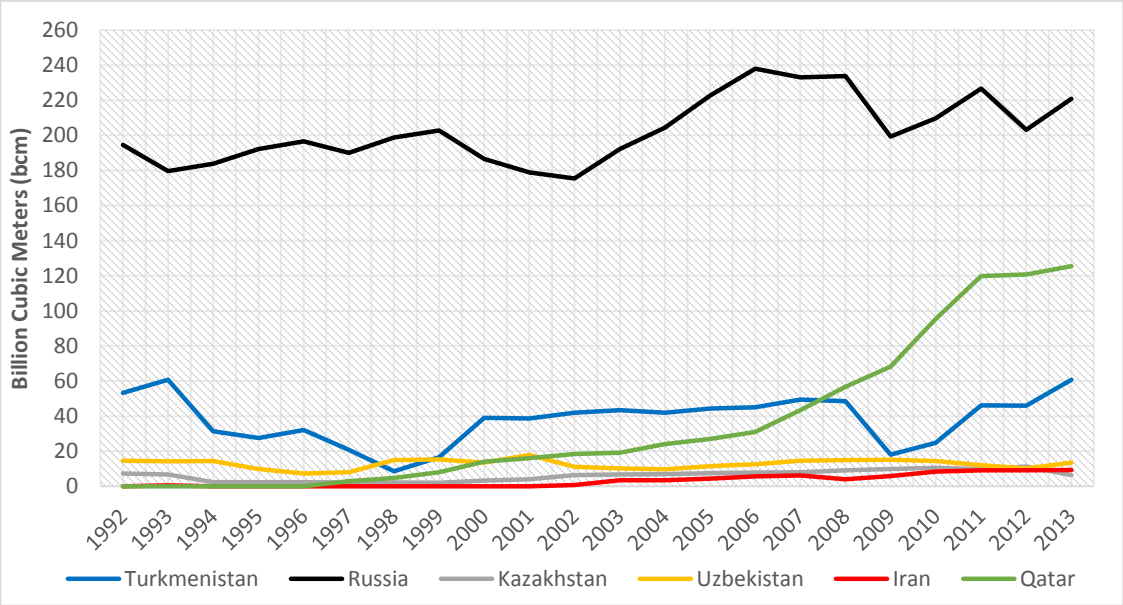


Source: Based on data from US EIA, (2013). Accessed 20/03/2015.

Figure 34 Comparison of consumption levels of Turkmenistan's competitors

When assessing the export capacity of these six countries in Figure 35, again Russia is the leading country. In 2013, Russia exported 220.9 bcm which is 35 percent of its total production of natural gas and is nearly equal to the rest of five countries' export. Qatar is in second place with 125.5 bcm of exports which corresponds to 79 percent of its total production, and Turkmenistan is in the third place with 60.8 bcm of exports corresponding to 72 percent of its total production. The rest of the countries that are Kazakhstan, Iran and Uzbekistan have exported nearly the same amount of natural gas and they are 6.5 bcm, 9.3 bcm and 13.5 bcm respectively. Share of exports of natural gas in their total production of natural gas are 31.9 percent, 5.7 percent and 21.7 percent respectively.

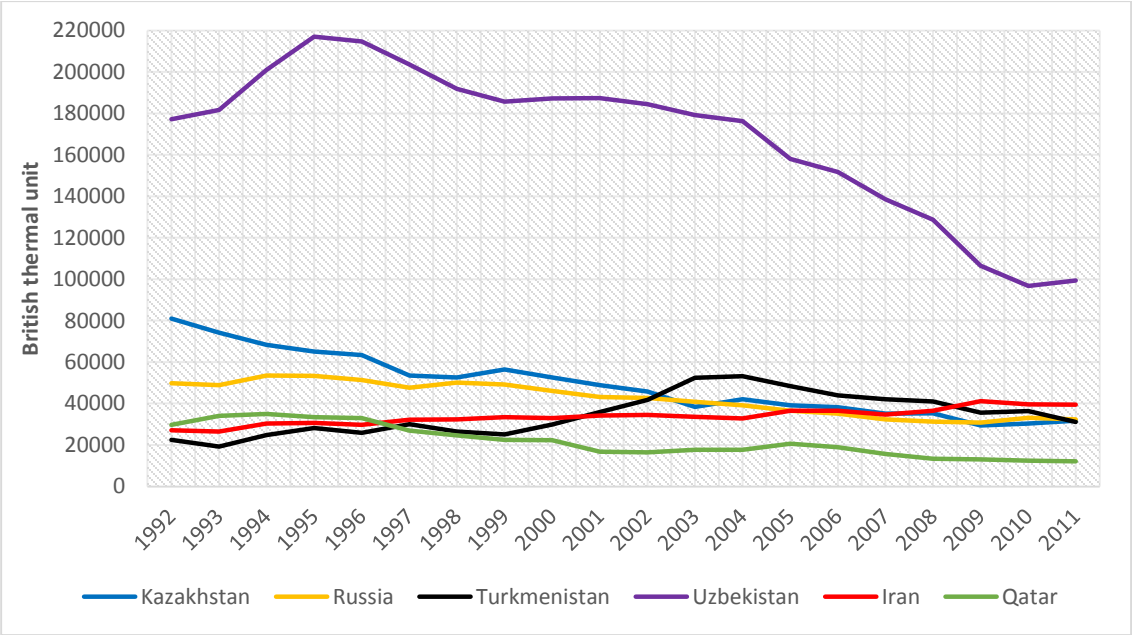
In Figure 36, energy intensity of above mentioned six countries are compared. Uzbekistan has the largest energy intensity among those countries and in the world (US EIA, 2013). In 2011, Uzbekistan's energy intensity was 99 346 Btu, and the second largest energy intense country was Iran with 39 525 Btu.



Source: Based on data from US EIA, (2013). Accessed 20/03/2015.

Figure 35 Comparison of export levels of Turkmenistan's competitors

The third largest energy intense country was Russia with 32 294 Btu, the fourth largest energy intense country was Kazakhstan with 31 744 Btu. Turkmenistan was the fifth largest energy intense country with 31 061 Btu, and the least energy intense country was Qatar with 12 166 Btu. In conclusion, it can be said that Turkmenistan is the second least energy intense country among these six countries. Consuming only 28 percent of total internal production of natural gas and being the second least energy intense country enhances Turkmenistan opportunities in the exportation of natural gas.



Source: Based on data from US EIA, (2013). Accessed 20/03/2015.

Figure 36 Energy intensities of Turkmenistan's competitors

As can be seen from Figure 36, although Russia decreased its energy intensity considerably it is yet the highest energy intense country among above mentioned six countries. This high energy intensity decreases export potential of Russia. Least energy intense country is Qatar and it increases export potential.

CHAPTER 5

TURKMENISTAN'S EXPORT POTENTIAL AND AVOIDING THE NEGATIVE IMPACTS OF DEPENDENCE ON SINGLE ENERGY RESOURCE

This chapter is devoted to investigation of Turkmenistan's export potential by presenting demand and supply projections of the countries in the neighborhood in a combined form until 2040 in the first section. In this section two different approaches have been adopted, which are base case scenario and alternative case scenarios, in which source of projections differ in each approach. In the second section, possible negative impacts of being dependent on single resource ownership, namely being dependent on export of natural gas and its implications on Turkmen economy is evaluated. In the last section of this chapter, policy recommendations are explored and presented for avoidance of the negative impacts of single resource dependence on Turkmen economy.

5.1. Demand and supply projections of natural gas

In this section, potential demand from Turkmenistan's possible markets is investigated by using IEA projections for 2012-2040. Supply of natural gas by Turkmenistan's competitors is also investigated using two different approaches. First approach is the projections of IEA (2014) for 2012-2040. Second approach depends on our own predictions based on exporting competitor countries' intended policies announced by their authorities, which are explained in Chapter 4, section 4.1 and 4.3.

5.1.1. Base case scenario

In this part, IEA (2014) projections are used in order to provide the Base-case scenario of demand for Turkmen natural gas. Future trade movements of natural gas in the neighborhood of Turkmenistan until 2040 is presented with a vision of formulating a general framework about future demand for Turkmen natural gas. This is done in order to determine whether Turkmenistan will have sustained demand for its natural gas until 2040. In doing so, 7 regions are considered depending on whether they create a market for Turkmenistan's natural gas or are competitors of Turkmen natural gas or are either potential markets as well as competitors of Turkmen natural gas. The American continent is excluded from this group due to its geographical remoteness. Turkmenistan is also excluded in order to observe whether there will be a demand surplus for natural gas which can be met by Turkmenistan. The first region is Asia Oceania region including large countries like Japan and Australia. Second is Middle East region which is comprised of important supplier countries like Iran, Qatar, Saudi Arabia, Iraq and important demanding countries like Turkey. Third region is Africa, in which Nigeria and Algeria are major exporters of natural gas to Europe. Fourth region is European Union which is an important demanding region. The fifth region is Russia, which has a unique place in Turkmenistan's natural gas trade as being an exporter and importer. Last two are China and India, which are very important for the demand of Turkmenistan's natural gas both in terms of their high population and future growth perspectives.

As can be seen from Table 8, Russia, Middle East and Africa are net exporters of natural gas. Asia Oceania, China, India and European Union are net importers of natural gas. Kazakhstan and Uzbekistan are excluded from this group due to their small level of export potential, and Africa region is included due to its natural gas trade with European Union which is the potential markets for Turkmen natural gas.

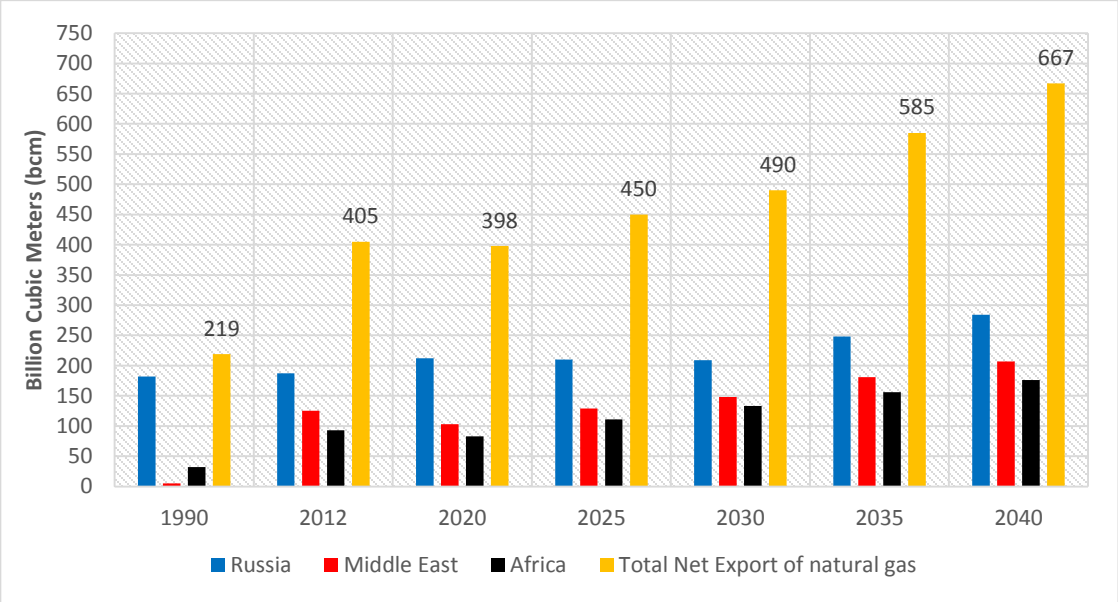
Table 8 Potential natural gas trade (imports of markets, exports of competitors) (1990-2040)

	Export of natural gas (bcm)				Import of natural gas (bcm)				
Years	Russia	Middle East	Africa	Total Net Exports	Asia Oceania	China	India	European Union	Total Net Imports
1990	182	5	32	219	55	1	0	158	214
2012	187*	125	93	405	154	41	17	304	516
2020	212	103	83	398	65	124	32	347	568
2025	210	129	111	450	46	170	45	386	647
2030	209	148	133	490	47	205	53	405	710
2035	248	181	156	585	54	227	69	432	782
2040	284	207	176	667	40	235	90	453	818

Source: Own calculations based on data from IEA (2014). Accessed 08/08/2015

* Excluding the American continent

In Figure 37-A, countries and regions which are expected to be net exporters of natural gas in the future, i.e. Turkmenistan's competitors are collected in the same group and overall amount of natural gas which they can export abroad in the foreseeable future is given. There are six reference years in order to analyze the future period. They are; 2012 and starting from 2020 years ending with 5 and 0 until 2040.



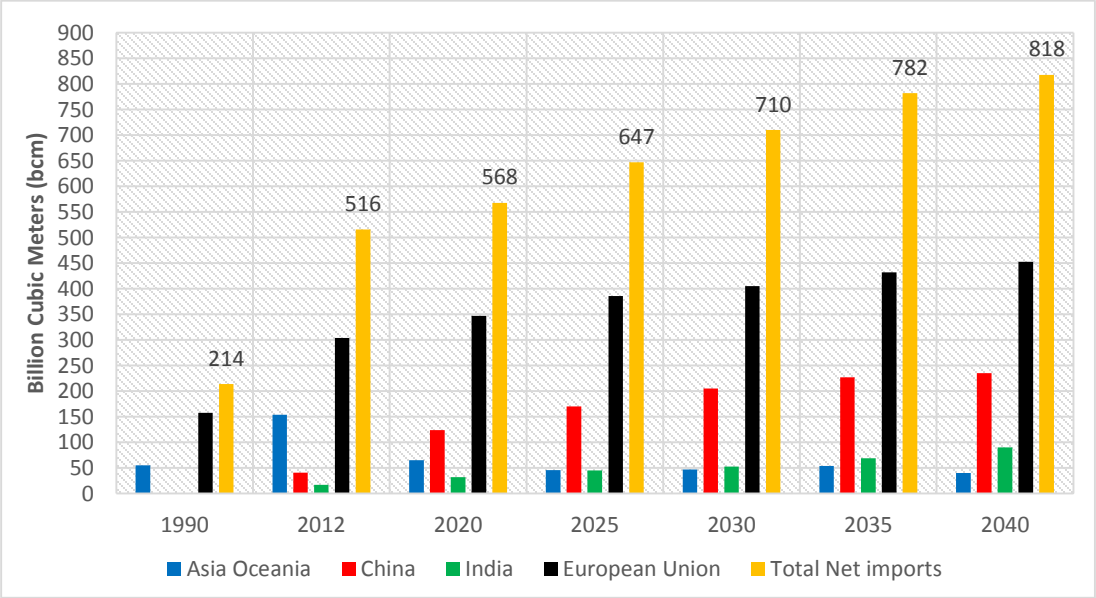
Source: Based on data from IEA (2014). Accessed 15/06/2015

* Excluding the American continent

Figure 37-A Future net exporters of natural gas (Turkmenistan's competitors)

An important fact about Figure 37-A is that the total net exports of natural gas decreases during the shift from 2012 to 2020, and thereafter shows stable increase until 2040. Among the net exporters, Russia has the largest share in the total net exports of natural gas throughout the projection period.

In Figure 37-B, the same is done but in terms of importing countries and regions, i.e. Turkmenistan's potential markets. Countries and regions which are projected to be net importers of natural gas in the future, are gathered in the same group and overall amount of natural gas that is likely to be imported by those countries and regions is given. When Figure 37-B is analyzed it is observed that, in the neighborhood of Turkmenistan, highest demand for natural gas comes from the European Union, followed by China. Throughout the projection period (2012-2040) total net import of natural gas is likely to increase by 302 bcm.



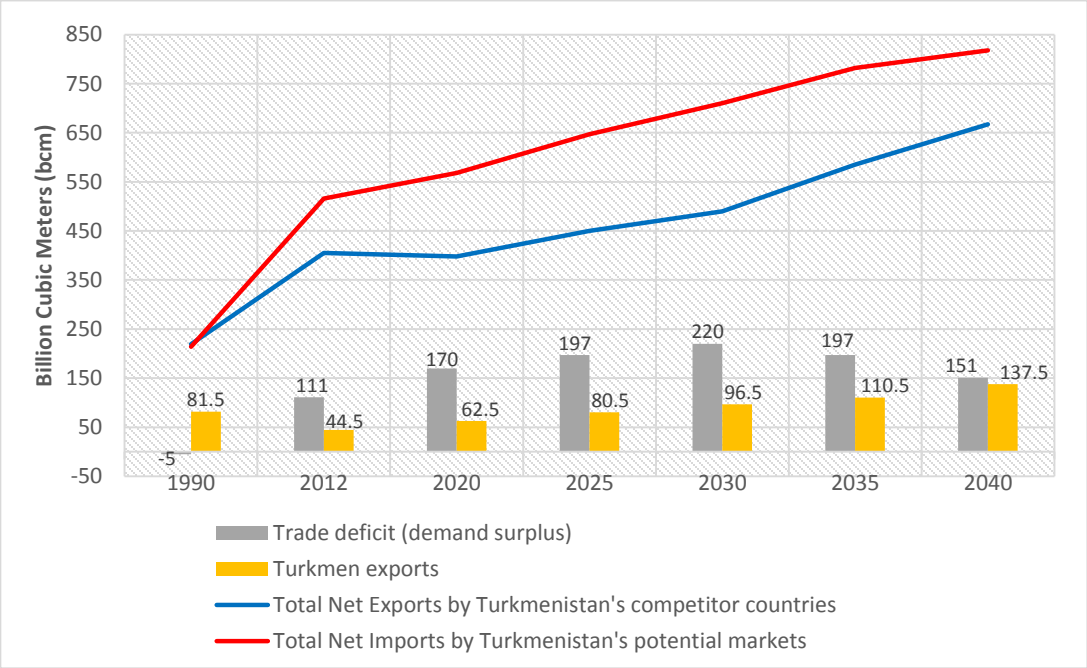
Source: Based on data from IEA (2014) Accessed 15/06/2015

* Excluding the American continent

Figure 37-B Future net importers of natural gas (Turkmenistan's potential markets)

Figure 37-C is based on the Figures 37-A and 37-B. Total export and import of natural gas in Turkmenistan's neighborhood throughout the coming years are combined on the same graph. This Figure clearly shows that total import of natural gas by the demanding

side (Turkmenistan's market) is much higher than the total export of natural gas by the supplying side (Turkmenistan's competitors), which means that there is a big demand surplus of natural gas which can be satisfied by Turkmen natural gas. When compared with Turkmenistan's export potential[19] of natural gas throughout the coming years, there is still a demand surplus of natural gas across the years. In other words, there is sustained demand potential for Turkmenistan's natural gas until 2040.



Source: Based on data from IEA (2014) Accessed 15/06/2015

* Excluding the American continent

Figure 37-C Potential demand for Turkmen natural gas

As can be seen from Figure 37-C, export of natural gas was slightly higher than import of natural gas in 1990 but since then circumstances have reversed. According to these projections Turkmenistan can meet 37 percent in 2020, 41 percent in 2025, 44 percent in

[19] Turkmenistan's natural gas export projections are based on the data of US EIA (2013) and IEA (2014). Trend of Turkmenistan's natural gas consumption is derived by taking into consideration consumption data for the period between 1992 and 2013. During this period (in 21 years) Turkmenistan's consumption of natural gas increased by approximately 21 bcm, which means that in each year consumption of natural gas increased by 1 bcm. Assuming that the same trend will continue in the future 1 bcm is added to Turkmenistan's natural gas consumption for each year. After predicting Turkmenistan's future consumption of natural gas, this predicted value is subtracted from IEA (2014) data about Turkmenistan's future production of natural gas in order to find Turkmenistan's future potential export of natural gas.

2030, 56 percent in 2035 and lastly 91 percent of demand surplus by its natural gas exports abroad.

Already present natural gas transporting infrastructure enables Turkmenistan to export 85 bcm of natural gas annually[20]. As mentioned earlier in section 2.2.2.1.3., by 2020s only China itself is going to import 65 bcm of natural gas annually from Turkmenistan and China is in search of increasing its imports further. Another two important importers of natural gas which are European Union and India are struggling in order to import natural gas. Being located at the center of three important natural gas importers (China, India and European Union), Turkmenistan is likely to be their first priority in satisfaction of their domestic natural gas demand.

5.1.2. Alternative scenarios

In this section the analysis is conducted by an alternative scenario in which current developments on the natural gas sector of Russia and Qatar which were evaluated in Chapter 4, sections 4.1. and 4.3. are taken into consideration. In other words, realization of Gazprom's and Qatargas' future projects is likely to increase Russia's and Qatar's natural gas exports to a much higher level than projected by IEA (2014). Therefore potential demand for Turkmen natural gas would be lower under this scenario. Table 9 and Figure 37 present the impact of Gazprom's and Qatargas' future projects about the exportation of natural gas on demand surplus of natural gas in the future.

As can be noticed from Table 9, Turkmenistan is going to export 62.5 bcm of natural gas annually by 2020 (yellow bar in Figure 37), according to IEA (2014). However, China itself pledged to import 65 bcm of natural gas annually from Turkmenistan[21] by 2020. This indicates that IEA (2014) underestimates Turkmenistan's potential export of natural gas.

[20] Central Asia – China and Turkmenistan – Iran pipeline enables the exportation of 85 bcm/a of natural gas in total.
[21] In 2013, Turkmenistan exported 60.8 bcm of natural gas abroad (US EIA, 2013)

Table 9 Future projections for natural gas (Gazprom's and Qatargas' projects considered) (in bcm) (2012-2040)

Years	Trade deficit (demand surplus) according to Base-case scenario	Additional supply from Gazprom's future projects	Additional supply from Qatargas' future projects	Turkmenistan's export of natural gas	Trade deficit (demand surplus) (Gazprom's and Qatargas' future projects)
1990	-5	--	--	81.5	-5
2012	111	--	--	44.5	111
2020	170	105	60	62.5	-5
2025	197	105	60	80.5	-32
2030	220	105	60	96.5	-55
2035	197	105	60	110.5	-32
2040	151	105	60	137.5	14

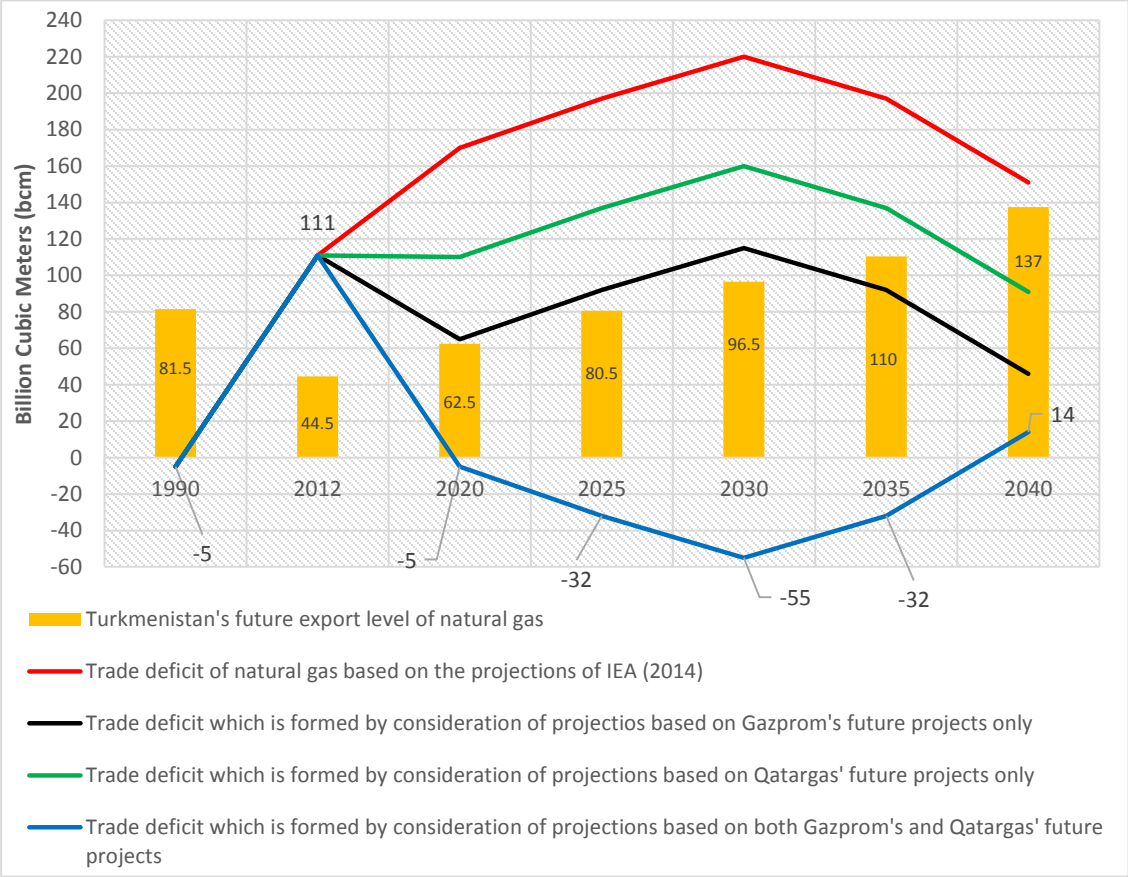
Source: Own calculations based on Figure 37-C; IEA (2014); Qatargas (2015); Gazprom (2015a-f); Accessed 09/08/2015

As can be observed from Figure 38, until 2030, trade deficit (demand surplus) of natural gas increases and thereafter displays a decreasing trend. However, according to the prediction of IEA (2014) Turkmenistan's projected export capacity of natural gas is much lower than the deficit of natural gas throughout the period 2012 and 2040, in other words, some demand surplus of natural gas will remain after deducting future exports of Turkmenistan.

Above mentioned pattern changes when future projections of Gazprom is taken into consideration. As stated in section 4.1.1., future export capacity of Russia is higher than projections of IEA (2014) by 105 bcm[22]. As a result, throughout the evaluation period, the gap between the demand and the supply of natural gas is 105 bcm lower when Gazprom's projects are taken into account, as can be noticed from Figure 37. In this case, until 2030 Turkmenistan's exports meet much of the demand surplus on natural gas (meet 96 percent in 2020, 87.5 percent in 2025 and 84 percent demand surplus in 2030). From the beginning of 2030, Turkmenistan's future exports is expected to exceed the demand surplus, such that in 2030 Turkmenistan would not be able to sell 18 bcm and in 2035, would not be able to sell 91 bcm of its natural gas abroad (black line in Figure 37).

[22] This value is predicted based on the Gazprom's current plans and future intentions about the natural gas transporting routes as explained in detail in section 4.1.

Another factor that is necessary to be taken into account is the future projects of Qatargas. As stated in section 4.3, future export level of Qatar is at least 60 bcm higher[23] than the projections of IEA (2014). As a result, when considering the Qatargas' future projects, future demand surplus of natural gas decreases by 60 bcm throughout the projection period. Until 2035, deficit in natural gas is quite bigger than the export level Turkmenistan. Thereafter, export level of Turkmenistan exceeds the demand surplus on natural gas (green line in Figure 38).



Source: Table 9, Accessed 10/08/2015. * Excluding the American continent

Figure 38 Future projections for natural gas (Gazprom's and Qatargas' projects considered)

In this case, Turkmenistan's share in satisfying the demand surplus on natural gas increases until 2035, but in 2040, export of Turkmen natural gas exceeds the demand surplus. Turkmenistan meets 57 percent in 2020, 59 percent in 2025, 60 percent in 2030,

[23] This value is predicted based on the Qatargas' current and future plans about the construction of the LNG vessels.

and 80 percent in 2035 and lastly meets all demand surplus in 2040, and there is excess supply of natural gas which Turkmenistan cannot sell.

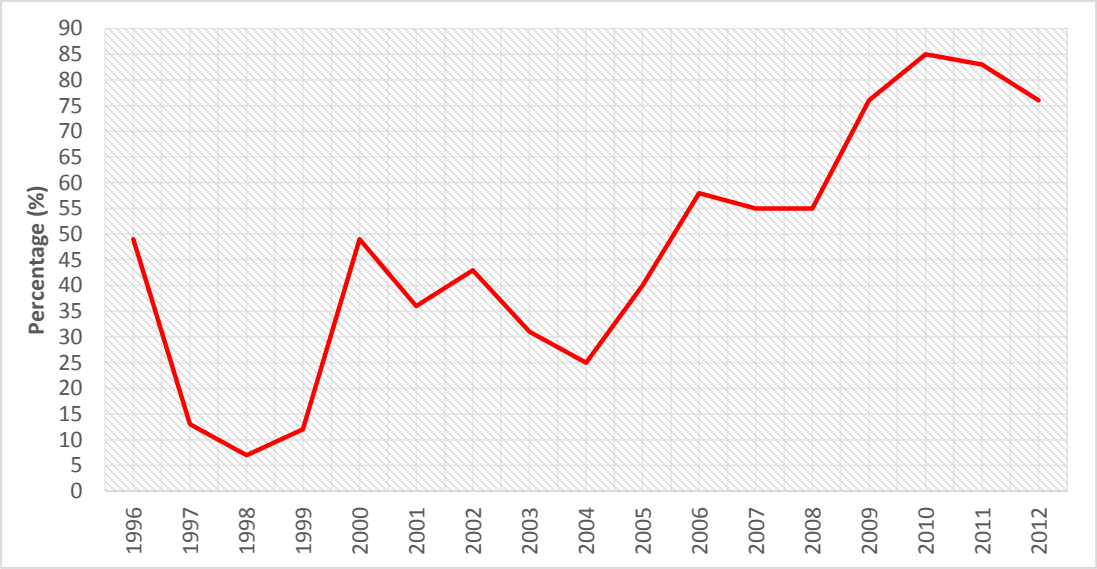
When both projections based on Gazprom's and Qatargas' future projects are taken into consideration simultaneously, future pattern of natural gas changes from deficit into excess of natural gas across the projection period. In other words, in 2020 there are 5 bcm, in 2025 there are 32 bcm, in 2030 there are 55 bcm and lastly in 2035 there are 32 bcm of excess supply of natural gas. Only in 2040, demand of natural gas is bigger than the supply of natural gas by 14 bcm. In this case there will be no need for Turkmen natural gas in the future until 2040.

To sum up, a future portrait of natural gas trade which was prepared based on the data from IEA (2014) changes when Russia's and Qatar's future projects are taken into consideration. To put it differently, our own projections which take into consideration Russia's and Qatar's future projects about the exportation of natural gas is much higher than the projections of IEA (2014). This is because International Energy Agency underestimates the future export capacities of Russia and Qatar.

5.2. Problems of single export product dependence

Having abundant natural gas reserves and being dependent on export of a single resource have both positive and negative impacts on the Turkmen economy. Increase in per capita GDP of the country brought about by high level of natural gas exports can be designated as the positive impact of natural gas as mentioned in section 2.2.3. However, there are also negative impacts of dependence on a single resource, which in literature, are referred to as "resource curse" (Atkinson and Hamilton, 2003; Wick and Bulte, 2009; Ross, 2014; Satti, Faroo, Loganathan, and Shahbaz, 2014) – the observation that countries with substantial amount of a natural resource are prone to grow more slowly than resource-poor countries (Sachs and Warner, 2001).

Atkinson and Hamilton (2003) reached to the conclusion that, if a country is in resource curse it means that genuine saving[24] is negative throughout the time. Due to the lack of reliable data, using gross saving rate of Turkmenistan as a proxy for genuine saving rate as shown in Figure 39 indicates that as time passed Turkmenistan managed to achieve very high saving rates. Considering that saving rate of Turkmen economy reached to 85 percent in 2010, it can be said that, in terms of saving rate, beginning from 2000s Turkmen economy managed to refrain from resource curse.



Source: World Bank, (2015b) Accessed 27/06/2015

Figure 39 Gross domestic saving of Turkmenistan

In this part, components of resource curse or in other words, components of negative impacts that Turkmenistan may face due to dependence on export of a single resource is investigated. Those negative impacts may be: Dependence on quantity of demand for natural gas (Rehner, Baeza and Barton, 2014); dependence on one buyer/monopsony (Ericson, 2012); dependence on price level of natural gas (Bacon and Kojima, 2008); Dutch Disease (Corden and Neary, 1982); and vulnerability to possible sabotage acts (Daly International Correspondent, 2009).

[24] Gross saving rate minus the depreciation rate of produced capital

5.2.1. Dependence on the demand from abroad

A major negative impact of having huge natural gas reserves is the dependence on the demand for natural gas (Rehner, Baeza and Barton, 2014), since it affects the amount of natural gas that Turkmenistan can export abroad. Figure 9 and 10 from in Chapter 2 show that during the first decade of its independence, Turkmen economy was very vulnerable to amount of natural gas that was exported abroad. From 1993 to 1998, due to the decrease in the amount of natural gas by 85 percent which was exported abroad, overall export of goods and services of Turkmenistan decreased by 68 percent and as a result of these developments, GDP of Turkmenistan has contracted by 18 percent in 1998 with respect to 1993. Turkmen economy could only manage to grow in 1996 and only in that year amount of exported natural gas increased.

These developments on the Turkmen economy during the first decade of its independence, reveal the grim reality of Turkmenistan. From the beginning of 2000 Turkmenistan's economy started to recover in which, main driver was the revenue gained from the exportation of natural gas. Further explanation of these developments are explained extensively in section 2.2.3. Still being dependent on a single resource, Turkmenistan's economy is still vulnerable to a reduction in demand, which would adversely affect the Turkmen economy.

5.2.2. Dependence on one buyer

Dependence only on one buyer is also another drawback (Ericson, 2012) which contracts Turkmenistan's room for maneuver during the negotiation process of natural gas trade. Beginning from its independence until 1997, Turkmenistan had been exporting natural gas only through Russia's Central Asia – Center gas pipeline. When country exports natural gas only to one customer then price of that natural gas is not determined by the seller but rather by the customer, which was the case between Turkmenistan and Russia until 2009. This situation weakened Turkmenistan's negotiating position and strengthened Russia's negotiating position during the sales and purchase agreements on natural gas. Detailed analysis of this case can be found in section 2.2.2.3., where it can

be observed that, as buyers of Turkmen natural gas increased, bargaining power of Turkmenistan has also increased compared with the case in which Turkmenistan has exported only to Russia (Lee, 2014).

It can be said that beginning from 2009 Turkmenistan's dependence on one buyer has disappeared. Currently, Turkmenistan is exporting natural gas to Russia, China, Iran and to some extent Kazakhstan[25]. However, in the horizon there is possibility of again being dependent on one buyer, namely being dependent on China unless new markets for Turkmen natural gas are discovered, because Russia is decreasing its imports from Turkmenistan[26]. Iran may also gradually decrease its imports from Turkmenistan once sanctions on Iran are lifted. As a result of that Turkmenistan is in search of new markets among which European countries, Pakistan and India are promising markets.

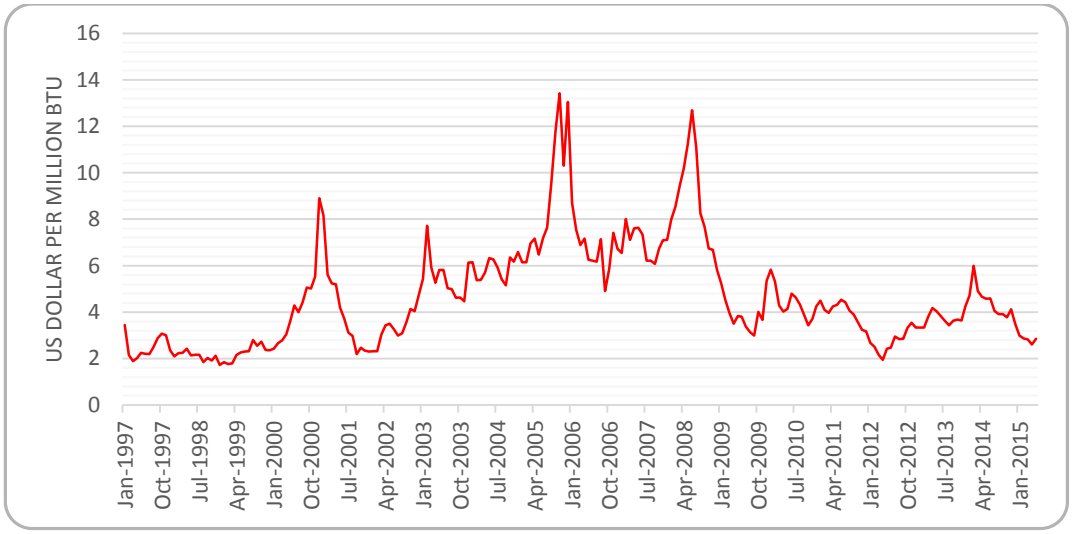
5.2.3. Dependence on price level of natural gas

If one economy is highly dependent on the exportation of only one good then it means that this economy is vulnerable not only to fluctuations in the amount but also the price of that good (Bacon and Kojima, 2008). Price of Turkmenistan's exported natural gas have not been announced throughout the years. Figure 38 shows Henry Hub[27] natural gas spot price as a proxy for price of Turkmen natural gas. It is not known whether Henry Hub natural gas spot price has any influence on the negotiation process of natural gas between Turkmenistan and the importing side. It is given in order to provide a general information about the fluctuation in the price of natural gas throughout the years.

When it is analyzed in context of Turkmenistan's case, during the first decade of its independence, internationally determined price of natural gas had a rather stable and low level with respect to the decade following it. Since the price of natural gas had shown a stable trend during the first decade of Turkmenistan's independence, amount of natural gas that is exported abroad was the main determining factor of revenue earned from exportation. Since internationally determined price of natural gas has shown increasing trend and volatility of price also increased (Pirani, 2012), from the beginning of 2000s,

[25] In 2014, Turkmenistan exported 0.5 bcm of natural gas to Kazakhstan (BP, 2015).
[26] In 2015, Russia is expected to import only 4 bcm of natural gas from Turkmenistan (Trend News, 2015a).
[27] Henry Hub is a distribution hub on the natural gas pipeline system, and it is a subsidiary of Chevron Corporation

price of natural gas was the main determining factor on the revenue gained from exportation of natural gas. However, as volatility on the price level of natural gas has increased, vulnerability of Turkmenistan has also increased.



Source: Based on data from US EIA, (2015) (17/06/2015) Accessed 20/07/2015

Figure 40 Henry Hub natural gas spot price

Although price of Turkmen natural gas is not announced, it is known that price of Turkmen natural gas is indexed to price of oil. From June 2014 until mid-2015, price of crude oil decreased from around 110 US dollars per barrel to around 60 US dollars per barrel (NASDAQ, 2015). In other words, in one year, price of crude oil has decreased by 45 percent, and it is likely to decrease further as a result of increase in oil production by Iran. This development will most probably influence the price of Turkmen natural gas. Due to the relatively more diversified economy of Turkmenistan with respect to the beginning of 1990s, during the first quarter of 2015, Turkmenistan has managed to achieve 10 percent growth (SCTS, 2015). However, if low levels in the price of crude oil persist, Turkmenistan will have to tackle with more challenges.

5.2.4. Dutch Disease

The term "Dutch disease" was first used in 1977 by *The Economist* to explain the contraction in the manufacturing sector in the Netherlands after the discovery of the large natural gas field in 1959 (The Economist, 1977). This term often referred to natural resource discovery, however it can also refer to "any development which will result in a large inflow of foreign currency, including a sharp increase in natural resource price, foreign assistance and foreign direct investment" (Ebrahim and Zadeh, 2003). Dutch Disease can be briefly explained as the distortion in the terms of trade of resource rich country due to the appreciation of domestic currency (Corden and Neary, 1982). Generally, it is difficult to determine whether a country has Dutch Disease or not, because it is difficult to link the relationship between an increase in natural resource revenue and the real exchange rate since an appreciation of domestic currency could be the result of other developments such as large capital inflows (De Gregorio and Wolf, 1994).

As for Turkmenistan's case, possible scenario leading to Dutch Disease can be explained as follows: when large amounts of natural gas is exported abroad it brings substantial amount of US dollars. Appreciation of domestic currency affects other export opportunities of the country adversely. In addition to that, appreciation in the domestic currency makes cost of import relatively cheaper, increasing imports, having an adverse effect on the current account deficit. However, Dutch Disease does not provide explanation for the Turkmen case due to two reasons: Firstly, the price of natural gas is determined in the international markets, in US dollars. Secondly Turkmenistan pursues a fixed exchange rate regime.

The fact that the price of natural gas is determined in the international market is not very effective on the Turkmen economy. When large amounts of foreign currency (US dollar) inflow into the treasury of Turkmenistan as a result of large amounts of natural gas exports, this foreign currency is used for large scale investments of Turkmenistan. Since main part of investments is realized by foreign construction firms, payments are made from the treasury of Turkmenistan in foreign currency form. A major portion of incoming US dollars are directly used in payment of investments without converting to Turkmen

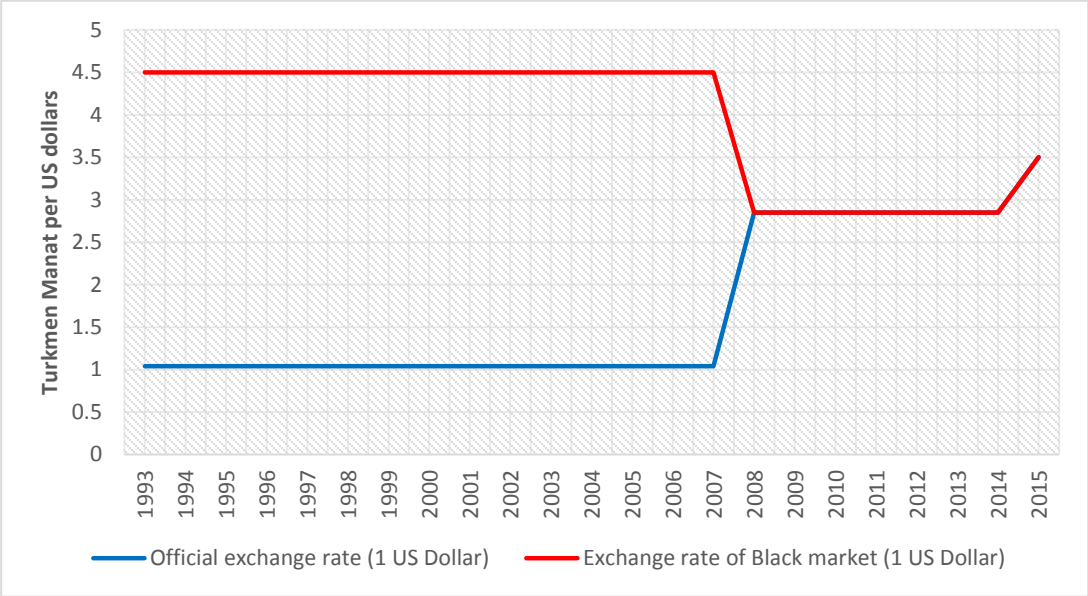
Manat. Therefore, inflow of huge amounts of foreign currency does not cause much pressure on Turkmen Manat towards appreciation.

Considering the second reason, if Turkmenistan were pursuing a flexible exchange rate regime, Turkmenistan's foreign trade would follow such a path: As more natural gas is exported abroad, more US Dollars would be expected to flow into the Turkmen economy. Increase in the inflow of US Dollars would appreciate the Turkmen Manat. Appreciation of Turkmen Manat would adversely affect the exporting sectors. For example, competitiveness in the textile sector of Turkmenistan, which is one of the main drivers of Turkmenistan's exports other than natural gas sector, would be distorted thus its production level would decrease. Same argument can be made for other exporting sectors of Turkmenistan, such as food sector and chemical sector. This would eventually decrease employment level in those exporting sectors of Turkmenistan. In other words, possible impact would be the concentration of employment in the natural gas sector of Turkmenistan and increase in the unemployment of non-extractive industries. On the other hand, the import level of Turkmenistan would increase due to the appreciation of Turkmen Manat. Distortion in the exporting sectors along with increase in the import level of Turkmenistan would have an adverse effect on the current account.

Above mentioned explanation is not valid for Turkmenistan, since the country pursues fixed exchange rate regime. Examination of the historical pattern of Turkmenistan's fixed exchange rate regime shows how Turkmenistan refrained from getting caught to Dutch Disease. Due to the insufficient amount of reliable data, assessment is done through nominal exchange rate, rather than the real exchange rate, comprising the time range from 1993 to 2015.

During the first decade of independence, Turkmen economy has suffered several contractions which can be followed from Figure 9 in Chapter 2. In 1999, eight years after gaining independence, Turkmenistan's economy has contracted by 23 percent with respect to 1991 due to the decrease in export revenue from natural gas. As a consequence, Central Bank of Turkmenistan was not able to meet all demand for foreign currency, and as a result of that, black market for foreign currency had emerged which had a flexible exchange rate. In the black market, exchange rate fluctuated around 1 US Dollar = 4.5

Turkmen Manat. Since the beginning of 2000s, Turkmen economy started to pick up, but these two exchange rate regimes were maintained until 1 January 2008. On that date, Central Bank of Turkmenistan has unified these two exchange rates as 1 US Dollar = 2.85 Turkmen Manat as shown in Figure 39. Central Bank of Turkmenistan guaranteed to provide as much US dollars as demanded at that exchange rate. In other words, Turkmenistan's foreign currency reserves reached to such high levels that Central Bank was able to guarantee this new exchange rate. These developments were a symptom of recovering economy.



Source: Central Bank of Turkmenistan (2015) Accessed 25/06/2015

Figure 41 Exchange rate of Turkmen Manat

Until 2008, only public enterprises could use 1 US Dollar = 1.04 Turkmen Manat exchange rate and civil citizens used 1 US Dollar = 4.5 Turkmen Manat. From the perspective of official exchange rate, Turkmen Manat has appreciated by 174 percent and from the perspective of Black market exchange rate, Turkmen Manat had depreciated by 36.6 percent. As a result, unification of these two exchange rates had caused substantial amount of increase in the welfare level of Turkmenistan's citizens, because exchange rate set at 1 US dollar=2.85 Turkmen Manat had increased the purchasing power of population by 36.6 percent in purchasing foreign products from abroad.

During 2014, energy sector has witnessed dramatic decrease in the price of oil. Since, price of Turkmen gas is indexed to price of oil, price of Turkmen natural gas also relatively decreased. Since Turkmenistan has high export dependency on natural gas[28], these developments in energy sector affected Turkmen economy adversely. Decrease in the price of Turkmen natural gas coupled with huge devaluation in Russian ruble obliged the Central bank of Turkmenistan to devalue Turkmen Manat from 1 US Dollar = 2.85 Turkmen Manat to 1 US Dollar = 3.5 Turkmen Manat, in other words, Turkmen Manat is devalued by 22.8 percent in 1 January 2015 (Central Bank of Turkmenistan, 2015). As a consequence of huge devaluation in Russian ruble, real estate prices in Russia decreased considerably which appealed Turkmen citizens to buy real estate in Russia as explained in section 2.1. Turkmen Manat is devalued in order to avoid the outflow of Turkmenistan's foreign currency reserves to Russia. Furthermore, government put more emphasis on import substitution policy aiming to curb the outflow of foreign reserves, since foreign currency earnings of Turkmenistan decreased significantly as a result of sudden decrease in the price of energy. Devaluation of national currency were not only pertinent to Turkmenistan. Due to their export dependency on energy resources, Azerbaijan and Kazakhstan also devalued their national currency.

During 1993-2015 period, due to two exchange rate regimes which were maintained until 2008, in terms of official exchange rate, Turkmen Manat was devalued by 236.5 percent and in terms of black market exchange rate Turkmen Manat was appreciated by 22.2 percent. Logic of Dutch disease is the appreciation of Turkmen Manat, but it has not been the case because most of exporting sectors were using the official exchange rate (because public enterprises were engaged in those sectors in which the exchange rate of 1 US dollar = 1.05 Turkmen Manat was valid). To sum up, it can be said that Turkmenistan's economy managed to avoid the Dutch disease, in other words, managed to refrain from one symptom of "resource curse".

[28] More detailed analysis can be found in section 2.2.3.

5.2.5. Accidents and possible sabotage acts

Another negative impact of relying mostly on natural gas in the export mixture is the vulnerability to accidents or possible sabotage acts on the natural gas transporting pipelines. Redirecting of the flow of natural gas under possible sabotage acts is a long and challenging process. Therefore under any possible explosion of pipeline, certain amount of natural gas is released to the atmosphere. More serious scenario may occur if explosion of pipeline takes place in a residential area.

Construction of TAPI pipeline has been delayed since 2003 due to various reasons. A major reason of delay is the security concerns. TAPI is projected to pass from the city of Kandahar in Afghanistan which is a sensitive zone in context of vulnerability to terrorist attacks. Possible sabotage acts along the way of TAPI, do affect the realization of such large scale projects adversely. The government of Afghanistan assures the signatories in terms of providing security along the pipeline. Although with very low possibility, already established pipelines may also be under the threat of possible sabotage acts depending on circumstances.

Other than sabotage acts, there may be also accidental explosions in the natural gas transporting pipelines. For example, at 1:32 a.m. on April 9, 2009 explosion occurred in the 302 mile segment of CAC pipeline system which is near the Turkmen-Uzbek border. Reason of this accidental explosion was short notice of Gazprom about reducing the amount of natural gas that it had been importing. Warning about the reduction of imported gas was given only one day in advance which was not sufficient time for Turkmen experts to reduce its flow into the pipeline network (Daly International Correspondent, 2009). Accidental explosions may also take place due to earthquakes or any other natural disaster.

5.3. Policy recommendations for optimal utilization of natural gas reserves

It has so far been very clear that Turkmenistan depends on export revenues from natural gas in order to achieve high growth rates. Therefore, Turkmenistan's major priority is to

have sustained, high export revenues by increasing the competitiveness of its natural gas sector. Eventual aim of increasing competitiveness of natural gas sector is to have sustained high export revenues. In order to increase competitiveness of natural gas sector Turkmenistan must be in constant search of finding new markets, conducting negotiations to this end, and building new pipelines so that it can ensure earning sustained export revenues from natural gas. Furthermore, it must also find ways and means of making optimum use of its export revenues with a view to achieve higher growth rates. This section consists of two subsection. 5.3.1. is about ensuring sustained and high export revenues from natural gas and 5.3.2. is about making optimal use of export revenues.

5.3.1. Ensuring sustained and high export revenues from natural gas

In order to obtain sustained and high revenues from the exportation of natural gas Turkmenistan needs to be in search of new markets for its natural gas, needs to develop ingenious negotiation techniques with concerning sides and needs to find new means for transportation of natural gas.

5.3.1.1. Exploring new markets

Currently, Turkmenistan is exporting natural gas to Russia, China and Iran. Exports to Russia and Iran are in small quantities when compared with exports to China. Therefore, unless Turkmenistan explores new markets, there is possibility to be dependent on one buyer, namely China, since both Russia and Iran are first and second natural gas rich countries in the world respectively. For the time being, European Union and India are promising markets among which India is even more appealing with its geographical proximity to Turkmenistan, its large population and its high economic growth rates. Exploring new markets is essential for Turkmenistan in order to ensure sustained and high export revenues from natural gas, and it can be realized only through intensified work of a specialized unit. Therefore an administrative mechanism is necessary in which experts would be constantly evaluating international developments regarding the energy issue and particularly natural gas.

5.3.1.2. Developing negotiation techniques

Developing new negotiation techniques which suits Turkmenistan's needs is another policy recommendation which may contribute to obtaining high export revenues from natural gas. Turkmenistan has a landlocked geography and it restricts Turkmenistan's export opportunities. This disadvantage can be eliminated through intensified bilateral relations which are based on mutual benefit and respect with countries in the neighborhood. Iran, Azerbaijan and Turkey seem to be very important partners in reaching international waters. Currently, Ministry of Foreign Affairs of Turkmenistan is conducting trilateral meetings with Azerbaijan and Turkey about the exportation of Turkmen natural gas to European markets. By developing appealing benefits for the Iranian side, exportation of Turkmen natural gas through Iran and reaching international markets via Iran may also be an option for Turkmenistan. That can also be achieved by a proper unit which is specialized in creative negotiation techniques on energy issues.

5.3.1.3. Exploring new means of transportation of natural gas

At present Turkmenistan is able to export natural gas only in traditional form (via pipelines). Due to its landlocked geography (Caspian Sea does not have access to international waters) Turkmenistan cannot export its LNG through LNG vessels, it exports small amounts of LNG with trucks to its neighbor Afghanistan. Turkmenistan needs to find new ways of transporting natural gas. For instance, possible cooperation with Iran in the area of natural gas could boost LNG export opportunities of Turkmenistan.

Substantial natural gas reserves of Iran is located in the southern part of Iran and currently Iran does not have sufficient network system to transport its gas to populous northern part. Whereas, Turkmenistan is now connected to northern populous part of Iran with two pipelines having overall 20 bcm/a delivery capacity. If the natural gas that Turkmenistan exports to Iran could be exchanged by natural gas in southern part of Iran and a Turkmen gas compressor station is established in southern Iran, then Turkmenistan can have the possibility of compressing natural gas to have LNG and can export this to

wherever in the world through the Persian Gulf. A major advantage of gas exchange is that Turkmenistan does not have to build a pipeline from Turkmenistan to southern part of Iran (only cost is the cost of constructing gas compressing station), and major advantage for Iran is that Iran does not have to build pipeline system connecting southern part of Iran to its northern part.

The experts specialized in energy negotiations proposed in the previous could develop a beneficial bilateral negotiation process with Iran by providing appealing opportunities for the Iranian side. By taking into account Turkmenistan's geographical location as well as locations of gas reserves and new ways and means of gas transportation can be developed under disciplined work of specialized units. Again an expert group is needed, which would specialize on issues regarding the transportation of natural gas which is suitable for Turkmenistan's case. This specialized unit could concentrate on diversifying transportation of natural gas in any form.

5.3.2. Making optimum use of export revenues

Apart from ensuring sustained and high export revenues from exportation of natural gas, optimal use of export revenues is another aspect of optimal utilization of natural gas resource. This must be done by taking into consideration that Turkmenistan needs to diversify its exports, increase productivity and increase competitiveness of its diversified export products in world markets. The administration of export revenues is also extremely important in making optimal use of export revenues from natural gas. Within this context, making optimum use of export revenues is examined under two topics: investment in diversification of export products and the stabilization fund.

5.3.2.1. Diversification of export products

Diversification of economy is often described as an effective means of counteracting the resource curse (Auty and Pontara, 2008: 1130), and vulnerability of Turkmenistan to both amount and price of natural gas can be prevented through diversification of Turkmenistan's production and exports. Turkmenistan's production and exports are not

diversified enough yet. Diversification of exported goods will eventually decrease the share of energy resources (not in absolute value but in share) in total exports of goods and services (Humphreys, Sachs, and Stiglitz, 2007) of Turkmenistan. Diversification is also necessary in sub-sectors of energy sector. Turkmenistan has already started to increase the range of exported chemical products. Recently, it started to export derivatives of oil, such as motor oil. This shift to high value added products should be done in other sectors of industry as well in order to decrease various vulnerabilities that Turkmen economy faces, and at the same time to ensure sustained and high export revenues. In order to increase its competitiveness in world markets, Turkmenistan needs to increase productivity and to this end needs increasing investment in physical capital, human capital and in research and development.

5.3.2.1.1. Investment in physical capital

It will be 24 years since Turkmenistan's independence on 27 October 2015. During this period, Turkmenistan has successfully completed the nation building process and eluded from the legacy of Soviet Union. However, Turkmenistan has not yet fully integrated into the world markets[29] and the Turkmen industry is not yet competitive enough in the world markets. In order to increase competitiveness and integration to world markets Turkmenistan should further increase current investment on infrastructure.

Turkmenistan needs to increase investments in infrastructure i.e. in construction of pipelines in order to diversify its export destinations. Among potential markets of Turkmen natural gas, European Union and India are most promising markets. Funds for investment in pipeline construction (possible construction of TAPI and Trans Caspian Pipeline) could be obtained from the export revenues. Apart from that, geographical location of Turkmenistan enables it to be a transit route for the transportation of goods and services from Asia to Europe and vice-versa, which is another area of infrastructure investment. A specialized unit is also necessary to decide on the most efficient allocation of funds to infrastructure investments.

[29] In 2014, Turkmenistan applied for the membership to the World Trade Organization

5.3.2.1.2. Investment in research and development and in human capital

Research and development is prerequisite for diversification of exports and exploring new means of transportation of natural gas. As a consequence Turkmenistan should allocate optimum amount of export revenues to research and development. Intensified research and development will lead to new products and new methods of production, i.e. innovation which will directly widen the range of production and exports of Turkmenistan.

Investment in human capital is indispensable for achieving efficient and productive research and development. Therefore, Turkmenistan needs to invest more in education. Investments in education will improve human capital leading to the further research, generating new knowledge. Enhancement in new knowledge will lead to new products and new methods of production, namely will lead to further innovation and further diversification of exports.

5.3.2.2. Stabilization Fund

In energy rich countries like Turkmenistan, inflow of export revenue (in Turkmenistan's case US dollars) can cause pressure on the domestic currency i.e. toward appreciation. In section 5.2.4. it was shown that this step is the starting point of Dutch disease. In that case a stabilization fund similar to the famous Norwegian Pension Fund may prevent the Turkmen economy from Dutch Disease.

A stabilization fund work as follows: total or certain amount of export revenue is invested in this fund. At least the amount of money that the economy cannot absorb is directed to the stabilization fund. Accumulated money in stabilization fund is invested abroad in order to cut the pressure toward the appreciation of domestic currency[30]. As a consequence, money which is invested abroad will bring financial returns without appreciating the domestic currency.

Another importance of stabilization fund is that; even if economy can absorb all inflowing foreign currency, energy resources of Turkmenistan, where Turkmenistan's

[30] By investing accumulated money in abroad demand for domestic currency decreases, and as a consequence pressure on Turkmen Manat toward revaluation eliminates.

main revenue come from, may end one day. Stabilization fund can serve as a saving mechanism (Humphreys, Sachs and Stiglitz 2007) for the future generations of Turkmenistan.

Outstanding example for stabilization fund is Norwegian Pension Fund. This fund was initiated in 1995 and when it came to 2014 market price of this pension fund reached around 823 billion US dollars. Revenue gained from the export of energy resource is directly oriented to this pension fund. Accumulated money in pension fund is invested abroad. This fund has investments in 9000 companies of 75 countries in the world. Between 1998 and 2014 fund's annual return was 5.8 percent and only financial return of this fund is used as budget revenue (Norges Investment Bank, 2015). A similar system can also be applied in Turkmenistan.

Another important positive aspect of stabilization funds is that it increases the transparency and accountability. By giving all details of investment operations which is conducted through that stabilization fund, citizens of resource rich country can follow all transactions, and citizens can become self-aware of their wealth. However, according to Humphreys, Sachs, & Stiglitz, (2007) often economic impact of stabilization funds is weak. Stabilization funds' weak impact would be observed in countries where there are weak governmental and non-governmental institutions and the countries' liberalization and integration level with international markets are rather weak (Humphreys, Sachs, and Stiglitz, 2007: 194-227).

For the case of Turkmenistan, a specialized administrative mechanism can be proposed for administering the Stabilization Fund, because a unit which consists of experts on finance should always monitor international markets in order to maximize the returns of Stabilization Fund. In overall, as was also mentioned in Weinthal and Luong (2006), both politicians and scholars are increasingly convinced that it is possible to avoid the resource curse through a broad array of policies which include Stabilization Funds, economic diversification and transparency and accountability. However, these solutions rely on the efficiency of the institutional structure (Weinthal, and Luong, 2006: 45). Therefore, an efficient administrative structure seems to be necessary in case of Turkmenistan for implementing all of the above mentioned policy recommenda

CHAPTER 6

CONCLUSION

Turkmenistan is a country with heavy dependence on the exports of its natural gas. As long as there is sufficient demand, it exports natural gas and this is reflected positively on its growth rate and economic performance. This thesis attempts to identify the positive and negative impacts of natural gas of Turkmenistan on the Turkmen economy and to derive policy recommendations for maximizing the benefits of energy resource ownership and minimizing the negative impacts of dependence on a single resource.

Second Chapter clarifies Turkmenistan's dependence on a single resource, namely natural gas. Due to delays in receiving payments for exported natural gas, production and exports of natural gas decreased gradually and this had direct adverse effects on the Turkmen economy, because of its high dependence on single resource ownership.

Turkmenistan's main export market was Russia until 2000, but beginning from mid-2000s, competition over Turkmen natural gas has intensified. Major actors of that competition over natural gas reserves of Turkmenistan were European Union, China, Russia, India, Turkey and lastly Iran. As a result of this intensification, bargaining power of Turkmenistan has increased significantly in negotiations. Until mid-2000s, Turkmenistan had been exporting natural gas abroad at very low prices with respect to market prices. However since then, export price of Turkmen natural gas started to increase i.e. started to approach the market price, which increased the export revenues of Turkmenistan from natural gas significantly. Currently, Turkmenistan is exporting natural gas to Russia, China and Iran and aims to diversify its export destinations further. European Union and India, which are quite promising markets are in negotiation process with Turkmenistan about the construction of necessary infrastructure for transporting Turkmen natural gas.

The major finding of third chapter which concentrates on the determination of potential demand for natural gas is that global demand for energy increases from 13.4 Mtoe in 2012 to 18.3 Mtoe in 2040, an increase by 37 percent. In the composition of this increase in global energy demand, natural gas increases the most in absolute terms rising from 2 844 Mtoe (3.4 tcm) in 2012 to 4 418 Mtoe (5.4 tcm) in 2040. In overall, demand for natural gas increases by 57 percent and average annual growth rate of demand for natural gas is 1.6, whereas trade of natural gas grows by 2 percent annually.

In doing so, special emphasis was put on the future world energy outlook taking New Policies Scenario of IEA (2014) as a reference. This scenario takes into account the policies and implementing measures affecting energy markets that had been adopted until mid-2014, and relevant policy proposals, even though specific measures necessary to put them into effect are not fully developed yet. According to the International Energy Agency, According to the projections of BP, 87 percent of global natural gas trade is expected to be conducted by LNG in 2013-2035, in which Turkmenistan does not have any share, since there have no direct access to international waters. So Turkmenistan currently no share in this trade. Therefore, Turkmenistan should not only depend on the exportation of natural gas through pipeline, but should also explore the prospects of LNG trade.

Turkmenistan exports natural gas to Russia, China, and Iran at present. Significant part of future demand for Turkmen natural gas comes from China, India and European Union. Turkmenistan is pursuing a policy of diversification of export destinations, and in recent years, efforts on the diversification of export routes has intensified which led to the development of close relations between European Union and India in the field of energy. Russia and Iran would not be considered as promising markets for Turkmen natural gas in the long run, due to their vast natural gas reserves.

Analysis of the major producers of natural gas in the neighborhood of Turkmenistan namely, Russia, Iran, Qatar, Kazakhstan and Uzbekistan in the fourth chapter shows that, in terms of its natural gas reserves Russia ranks in the first, Iran ranks in the second, Qatar ranks in the third place and Turkmenistan ranks in the fourth place in the world. Kazakhstan and Uzbekistan have very small levels of natural gas reserves with

respect to above mentioned four countries. In terms of consumption of natural gas Russia itself consumes more natural gas than the total of the rest of the five countries. Other countries with respect to consumption in descending order are Iran, Uzbekistan, Qatar, Turkmenistan and Kazakhstan. Descending order of countries in terms of production level is Russia, Iran, Qatar, Turkmenistan, Uzbekistan and lastly Kazakhstan. Lastly descending order of countries in terms of export capacity is Russia, Qatar, Turkmenistan, Uzbekistan, Iran and Kazakhstan.

Chapter 5 is devoted to determining whether there will be sufficient demand for Turkmen natural gas until 2040 and to avoiding the negative impacts of dependence on a single resource. The main findings of the theses are obtained in this chapter.

The first section of this chapter is dedicated to the investigation of Turkmenistan's export potential by presenting demand and supply projections of the countries in the neighborhood in a combined form until 2040. In doing so, two different approaches are adopted.

First approach is Base-case scenario which basically depends on the projections of IEA (2014). Five different years are used as reference points while predicting the future demand of natural gas. Projected global future demand surplus on natural gas is compared with Turkmenistan's future export potential of natural gas in order to find out whether Turkmenistan would be able to export all of its available natural gas. This analysis shows that according to the projections of IEA (2014) global trade deficit (demand surplus) in natural gas in the neighborhood is always higher than the future export potential of Turkmenistan throughout the projection period. According to these scenario it is determined that Turkmenistan will have sustained demand for its natural gas.

Different from first approach, second approach takes into consideration our own projections which take into account the future projects of Gazprom and Qatargas as well. According to these projects, it is deduced that Russia is expected to export at least 105 bcm of more natural gas with respect to the projections of IEA (2014), and Qatar is expected to export at least 60 bcm of more natural gas when compared with the projections of IEA (2014).

Based on these new projections, Turkmenistan would be able to export all of its available natural gas abroad except for the year 2040, when Qatargas future projects are taken into consideration. In other words, trade deficit (demand surplus) on natural gas is always bigger than the future export potential of Turkmenistan except for the year 2040. In that year, Turkmenistan would not be able to export 33 percent of its available natural gas. Future trade deficit decreases even more when Gazprom's future projects are taken into consideration. According to this case, Turkmenistan is expected to export all its available natural gas until 2035. Neighborhood's demand surplus of natural gas changes to the supply surplus of natural gas, i.e. Turkmenistan would not be able to export all its available natural gas beginning from 2035. When both Gazprom's and Qatargas' future projects are taken into consideration demand surplus changes into supply surplus. In other words, there may not be any demand for Turkmen natural gas until 2040. Only in that year there is demand for 14 bcm of Turkmen natural gas.

Considering that there may not be sustained demand for Turkmen natural gas, second section of chapter concentrates on the possible negative impacts of natural gas reserves of Turkmenistan. Initial negative impacts are dependence of Turkmenistan on demand from abroad, on one buyer/monopsony and price level of natural gas. It is observed that, due to Turkmenistan's high export dependence Turkmenistan is dependent on all of these three factors. Furthermore, as a result of using fixed exchange rate regime, it is observed that Turkmenistan managed to refrain from the Dutch Disease. Lastly, it is also obtained that Turkmenistan is vulnerable to possible sabotage acts.

Third section of this chapter, presents policy recommendations for optimal utilization from natural gas resources of Turkmenistan. This section emphasizes the importance of ensuring of sustained and high export revenues from natural gas and making optimum use of export revenues. For ensuring sustained and high export revenues from natural gas major policy recommendations are exploring of new markets, developing negotiation techniques and exploring new means of transportation. For optimum use of export revenues investing in diversification of exported goods and developing stabilization fund are highlighted. In realizing above mentioned recommendations,

importance of a specialized administrative structure is emphasized in order to maximize the efficiency of those policy recommendations.

As a conclusion of comprehensive examination of energy and especially natural gas sector of Turkmenistan it can be said that, Turkmenistan has managed to benefit from its natural gas reserves considerably, however by taking the proper steps and making optimal use of its export revenues Turkmenistan can achieve higher growth rates and increase the living standards further.

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APPENDICES

APPENDIX A: ASHGABAT DECLARATION

Declaration on the development of cooperation in the field of energy between Turkmenistan, the Republic of Azerbaijan, the Republic of Turkey and the European Union

We, the Director of the State Agency for Management and Use of Hydrocarbon Resources at the President of Turkmenistan Yagshygeldi Kakayev, the Minister of Energy of the Republic of Azerbaijan Natig Aliyev, Minister of Energy and Mineral Resources of the Republic of Turkey Taner Yildiz and the Vice-President of the European Commission in charge of Energy Union Maros Sefcovic (hereinafter referred to as the Parties),

Noting the importance of sustainable energy in modern world and the provision of global energy security,

Basing on the principles of equal and fair access to energy and unrestricted export of energy to international energy markets,

Calling for creating maximum favorable conditions for ensuring reliable, stable and long-term international energy cooperation by an equal consideration of the interests of energy producing, transiting and consuming countries,

Considering that international relations in the field of energy should primarily be carried out on the basis of diversification of energy sources, delivery routes and sales markets, and therefore, emphasizing the importance of developing efficient cooperation between Turkmenistan, the Republic of Azerbaijan, the Republic of Turkey and the European Union,

Also in compliance with the Memorandum of Understanding and Cooperation in the field of energy between Turkmenistan and the European Union signed on 26 May 2ÖÖ8, the Memorand um of Understanding on Strategic Partnership in the field of energy between the European Union and the Republic of Azerbaijan signed on 7 November 2006, and the Joint Declaration on Southern Gas Corridor between the European Union and the Republic of Azerbaijan signed on 13 January 2011, the Joint Press Statement of the Southern Gas Corridor Advisory Council issued on 12 February 2015, the Agreement concerning the transit passage of natural gas between the Government of the Republic of Azerbaijan and the Government of the Republic of Turkey signed in October 2011; the Memorandum of Understanding concerning the development of a standalone pipeline signed in December 2011; the Agreement concerning Transit Anatolian Natural Gas Pipeline (TANAP) signed in June 2012; the Agreement concerning the Trans Caspian Turkmenistan-Turkey-Europe Natural Gas Pipeline Project between the Government of the Republic of Turkey and Government of Turkmenistan signed in October 1998; the Framework Agreement on the cooperation on transportation of natural gas from Turkmenistan to the Republic of Turkey signed in May 2013, as well as the Joint Declaration of Turkey-EU High Level Energy Dialogue Strategic Energy Cooperation dated March 2015,

We declare the following:

1. The Parties recognize the importance of equal and mutually bénéficiai cooperation in ensuring reliable natural gas supplies from Turkmenistan to Europe.

2. The Parties consider it necessary to facilitate joint efforts for the preparation of the draft of a legal Framework Agreement on natural gas supply from Turkmenistan to Europe.

3. In the view of considering organizational, legal, commercial, technical and other issues, related to natural gas supply from Turkmenistan to Europe, the Parties agreed to establish a Working Group at the level of Deputy Ministers (or equivalent) in charge of energy sphere of Turkmenistan, the Republic of Azerbaijan, the Republic of Turkey and the European Union. The composition of the Working Group and the schedule of talks for

2015 will be agreed among the Parties within one month. Georgia will also be invited to the next meeting.

4. The Parties note the significance of initiative on establishing the Caspian Development Corporation and welcome the consultations carried out with gas companies in the context of the study to define the appropriate modalities and parameters for establishing and efficient functioning of such corporation.

5. The Parties highlight the necessity to develop constructive dialogue on formation of transport infrastructure necessary for providing reliable supply of natural gas from Turkmenistan to Europe. Meanwhile the Parties pay attention to the fact that construction of this transport infrastructure shall be carried out in strict compliance with the relevant norms and standards, including those related to safety and environmental protection.

6. The Parties welcome the completion of the preliminary environmental study on the Trans-Caspian Pipeline, with financial support of the European Union, and World Bank, which will be published before the end of 2015.

7. The Parties support the establishment of appropriate commercial frameworks which, in accordance with international legal acts and the European Union Legislation, where applicable, will be aimed at supporting long-term supply of natural gas from Turkmenistan to Europe.

8. The Parties highly appreciate their pursuit to continue actively interact in the framework of international organizations on the issues of establishing efficient international mechanism aimed to achieve energy security.

This Declaration is adopted by the Parties in Ashgabat on 1 May 2015.

APPENDIX B: TABLES

Table B1: Exports as percentage of GDP, FDI and energy resources as percentage of exports of Turkmenistan

Year	Exports (% of GDP) (1)	Energy resources (% of Export) (2)	Net foreign Direct Investment Inflow (million US dollar) (1)
1991	39	--	--
1992	67	--	--
1993	85	--	79
1994	85	--	103
1995	84	17	233
1996	75	45	108
1997	43	84	108
1998	33	42	62
1999	56	66	125
2000	96	80	131
2001	81	88	170
2002	69	88	276
2003	62	88	226
2004	62	87	354
2005	65	90	418
2006	73	86	731
2007	75	91	856
2008	64	93	1 277
2009	75	78	4 553
2010	78	70	3 631
2011	75	90	3 399
2012	73	93	3 117
2013	--	--	3 061

Source: Based on data from (1) World Bank, (2015b), (2) Observatory of Economic Complexity (2015)

Table B2: Annual growth rate of world primary energy demand

Annual growth rates of demand	Projections of BP (2015b) (2013-2035) (1) (%)	Projections of IEA (2014)* (2012-2040) (2) (%)
World primary energy demand	1.4 (37 % in 22 years)	1.1 (37 % in 28 years)
Coal	0.8	0.5
Natural gas	1.9	1.6
Oil	0.8	0.5
Nuclear Energy	1.8	2.3
Renewables	6.3	6.9

Source: Based on data from (1) BP (2015b); (2) IEA (2014), Accessed 18/08/2015

* New Policies Scenario

Table B3: Indicators of natural gas sector, energy intensity and growth rate of China

Year	Production (bcm) (1)	Consumption (bcm) (1)	Imports (bcm) (1)	Exports (bcm) (1)	Energy Intensity (Btu) (1)	GDP annual growth (%) (2)
1992	15.1	14.6	0.0	0.4	44 639	14
1993	15.8	15.3	0.0	0.5	39 311	14
1994	16.7	16.1	0.0	0.5	39 371	13
1995	17.1	16.5	0.0	0.6	36 903	11
1996	20.2	18.3	0.0	1.9	35 589	10
1997	22.7	19.7	0.0	2.9	31 913	9
1998	23.3	20.2	0.0	2.7	30 024	8
1999	25.2	22.1	0.0	3.0	28 326	8
2000	27.2	24.5	0.0	2.7	28 062	8
2001	30.3	27.6	0.0	2.7	26 847	8
2002	32.6	30.0	0.0	2.6	25 968	9
2003	34.3	32.4	0.0	1.9	27 136	10
2004	40.7	38.3	0.0	2.5	28 560	10
2005	49.9	46.9	0.0	3.0	28 544	11
2006	58.5	56.4	0.9	3.0	27 675	13
2007	69.3	70.5	3.9	2.7	25 770	14
2008	76.0	77.2	4.5	3.4	24 797	10
2009	84.2	88.5	7.5	3.2	24 733	9
2010	94.4	106.7	16.3	4.0	24 720	10
2011	102.8	130.9	31.4	3.2	24 708	9
2012	103.8	143.7	42.7	2.9	--	8
2013	112.8	163.1	52.9	2.7	--	8
2014	--	--	--	--	--	7

Sources: Based on data from (1) US EIA (2013); (2) World Bank (2015a) Accessed 04/08/2015

Table B4: Indicators of natural gas sector, energy intensity and growth rates of Russia

Year	Production (bcm) (1)	Consumption (bcm) (1)	Imports (bcm) (1)	Exports (bcm) (1)	Energy Intensity (Btu) (1)	GDP annual growth (%) (2)
1992	640.4	466.7	20.8	194.5	49 754	-15
1993	617.8	458.3	20.2	179.6	48 853	-9
1994	607.4	430.8	7.3	183.9	53 474	-13
1995	594.8	410.8	8.2	192.2	53 310	-4
1996	562.5	370.5	4.6	196.6	51 310	-4
1997	535.2	348.2	3.0	189.9	47 625	1
1998	553.7	356.9	2.0	198.8	50 058	-5
1999	554.8	356.3	4.2	202.7	49 136	6
2000	547.5	369.8	8.9	186.6	46 068	10
2001	544.3	365.5	0.0	178.8	43 110	5
2002	557.4	384.1	2.2	175.5	42 688	5
2003	580.7	402.2	13.8	192.3	40 879	7
2004	594.4	412.5	22.5	204.4	39 185	7
2005	601.0	405.8	27.4	222.6	36 508	6
2006	615.5	431.1	53.5	237.9	35 152	8
2007	611.5	441.2	51.5	233.1	32 396	9
2008	609.2	431.6	56.2	233.8	31 307	5
2009	546.6	382.4	35.1	199.3	30 808	-8
2010	609.8	438.1	38.0	209.7	33 169	5
2011	629.0	434.0	31.8	226.8	32 294	4
2012	616.3	444.9	31.8	203.2	--	3
2013	626.9	441.7	35.7	220.9	--	1
2014	--	--	--	--	--	1

Source: Based on data from (1) US EIA (2013), (2) World Bank (2015c). Accessed 13/05/2015

Table B5: Indicators of natural gas sector, energy intensity and growth rates of EU

Year	Production (bcm) (1)	Consumption (bcm) (1)	Imports (bcm) (1)	Exports (bcm) (1)	GDP annual growth (%) (2)	Energy Intensity (Btu) (1)
1992	223.5	372.8	203.9	47.4	--	6 730
1993	237.1	385.4	202.5	48.6	--	6 745
1994	236.7	388.4	204.5	46.2	--	6 560
1995	244.7	418.0	228.3	47.5	--	6 527
1996	270.4	449.4	246.1	56.8	--	6 620
1997	253.9	438.7	247.2	52.6	--	6 433
1998	247.7	446.7	250.1	49.6	--	6 302
1999	250.6	460.8	272.4	54.9	--	6 140
2000	255.2	472.5	294.1	65.8	--	5 974
2001	256.5	487.4	304.6	76.4	--	5 954
2002	252.1	489.9	326.1	77.6	--	5 848
2003	245.1	503.1	342.4	76.1	1.5	5 838
2004	250.9	519.9	359.4	79.1	2.5	5 807
2005	233.6	533.3	388.7	79.6	2	5 713
2006	224.7	530.5	406.7	86.4	3.4	5 561
2007	212.5	519.2	397.8	90.8	3.1	5 353
2008	213.9	532.9	422.5	98.9	0.5	5 343
2009	195.0	497.2	405.1	95.6	-4.4	5 266
2010	199.4	533.9	438.0	110.6	2.1	5 362
2011	178.0	491.6	422.5	103.5	1.7	5 143
2012	171.4	474.7	409.5	114.9	-0.5	--
2013	171.1	468.6	414.6	120.1	0.1	--
2014	--	--	--	--	1.3	--

Source: Own Calculations based on data from (1) US EIA (2013); (2) Eurostat (2015), Accessed 13/05/2015

Table B6: Indicators of natural gas sector, energy intensity and growth rate of India

Year	Production (bcm) (1)	Consumption (bcm) (1)	Imports (bcm) (1)	Exports (bcm) (1)	GDP annual growth (%) (2)	Energy Intensity (Btu) (1)
1992	13.5	13.5	0.0	0.0	5	23 665
1993	15.1	15.0	0.0	0.0	5	22 315
1994	16.8	16.8	0.0	0.0	7	23 985
1995	17.8	17.8	0.0	0.0	8	25 666
1996	19.7	19.7	0.0	0.0	8	22 525
1997	20.3	20.3	0.0	0.0	4	22 816
1998	21.5	21.5	0.0	0.0	6	22 499
1999	21.3	21.3	0.0	0.0	9	22 420
2000	22.5	22.5	0.0	0.0	4	22 326
2001	24.1	24.1	0.0	0.0	5	22 022
2002	26.2	26.2	0.0	0.0	4	21 025
2003	27.3	27.3	0.0	0.0	8	20 040
2004	28.2	30.8	2.6	0.0	8	20 079
2005	29.9	35.9	6.0	0.0	9	19 686
2006	30.8	38.8	7.9	0.0	9	19 305
2007	31.4	41.3	9.9	0.0	10	18 971
2008	32.2	42.9	10.7	0.0	4	18 677
2009	40.7	53.3	12.6	0.0	8	18 750
2010	52.3	64.5	12.1	0.0	10	18 256
2011	47.6	64.0	16.4	0.0	7	17 485
2012	41.0	58.9	17.9	0.0	5	--
2013	34.5	51.6	17.1	0.0	7	--
2014	--	--	--	--	7	--

Source: Own calculations based on data from (1) US EIA (2013); (2) World Bank (2015d), Accessed 11/05/2015

Table B7: Indicators of natural gas sector, energy intensity and growth rate of Iran

Year	Production (bcm) (1)	Consumption (bcm) (1)	Imports (bcm) (1)	Exports (bcm) (1)	GDP annual growth (%) (2)	Energy Intensity (Btu) (1)
1992	25.0	25.0	0.0	0.0	4	27 120
1993	27.1	26.6	0.0	0.5	-2	26 548
1994	31.8	31.8	0.0	0.0	0	30 368
1995	35.3	35.2	0.0	0.1	3	30 702
1996	40.2	40.1	0.0	0.1	7	29 679
1997	47.0	47.1	0.1	0.0	3	32 132
1998	50.0	51.8	1.8	0.0	3	32 326
1999	57.8	59.8	2.0	0.0	2	33 477
2000	60.2	62.9	2.7	0.0	5	33 046
2001	66.0	70.2	4.3	0.1	4	34 218
2002	75.0	79.2	4.9	0.7	8	34 565
2003	81.0	82.4	4.9	3.5	7	33 605
2004	83.9	85.5	5.2	3.6	5	32 814
2005	103.5	104.9	5.8	4.3	5	36 464
2006	108.6	108.7	5.8	5.7	6	36 526
2007	111.9	113.0	7.3	6.2	6	34 709
2008	116.3	119.3	7.1	4.1	2	36 519
2009	141.2	141.4	6.1	5.9	2	41 093
2010	146.1	144.6	6.8	8.4	7	39 559
2011	151.8	153.3	10.6	9.1	4	39 525
2012	159.9	156.1	5.3	9.2	-7	--
2013	161.3	157.3	5.3	9.3	-2	--
2014	--	--	--	--	1	--

Source: Own calculations based on data from (1) US EIA (2013); (2) World Bank (2015f), Accessed 14/05/2015

Table B8: Indicators of natural gas sector, energy intensity and growth rate of Turkey

Year	Production (bcm) (1)	Consumption (bcm) (1)	Imports (bcm) (1)	Exports (bcm) (1)	GDP annual growth (%) (2)	Energy Intensity (Btu) (1)
1992	0.2	4.6	4.4	0.0	5	7 385
1993	0.2	5.2	4.9	0.0	8	7 478
1994	0.2	5.4	5.3	0.0	-5	7 577
1995	0.2	7.0	6.9	0.0	8	7 894
1996	0.2	8.2	8.0	0.0	7	8 141
1997	0.3	9.8	9.6	0.0	8	8 063
1998	0.6	10.4	9.9	0.0	2	8 003
1999	0.7	12.5	12.0	0.0	-3	8 036
2000	0.7	14.8	14.4	0.0	7	8 170
2001	0.3	15.9	15.7	0.0	-6	7 919
2002	0.4	17.6	17.1	0.0	6	8 105
2003	0.6	21.2	20.6	0.0	5	8 103
2004	0.7	22.4	21.7	0.0	9	7 847
2005	0.9	27.4	26.6	0.0	8	7 690
2006	0.9	31.2	30.2	0.0	7	7 836
2007	0.9	36.6	35.8	0.0	5	8 069
2008	1.0	36.6	37.1	0.4	1	7 811
2009	0.7	35.1	35.8	0.7	-5	8 208
2010	0.7	38.1	38.0	0.6	9	7 965
2011	0.8	44.7	43.9	0.7	9	7 991
2012	0.6	45.2	45.9	0.6	2	--
2013	0.5	45.6	45.3	0.6	4	--
2014	--	--	--	--	3	--

Source: Own calculations based on data from (1) US EIA, (2013); (2) World Bank, (2015e). Accessed 15/03/2015

APPENDIX C: TURKISH SUMMARY

SSCB'nin 1991'de dağılmasından sonra 15 yeni Cumhuriyet ortaya çıktı. Bu ülkelerden coğrafi olarak Orta Asya'da yerleşen 5 tanesi Orta Asya ülkelerini oluşturuyor. Bu tezin amacı bu beş Orta Asya ülkesinden biri olan Türkmenistan'ın doğal gaz kaynaklarının Türkmenistan'ın ekonomik kalkınmasına yapmış olduğu ve yapacağı etkinin araştırlmasından oluşuyor. Türkmenistan'ı diğer ülkelerden farklı kılan özellik ise Türkmenistan'ın coğrafi yerleşimi ve sahip olduğu zengın doğal gaz kaynaklarıdır. Türkmenistan doğal gaz rezervleri bakımından dünyada dördüncü sırada ve Orta Asya'da birinci sırada bulunmaktadır. Türkmenistan'ın sahip olduğu ispatlanmış doğal gaz rezervleri 17.5 trillion küp metredir ve dünyanın ispatlanmış doğal gaz rezervlerinin yüzde 10'na tekabül etmektedir.

Tez 6 bölümden oluşmaktadır. Ilk bölüm çalışmanın ana çerçevesini sunmaktadır. Ikinci bölümde ise Türkmenistan ekonomisinin ve doğal gaz sektörünün genel analizi yapılmıştır. Çalışmanın üçüncü bölümünde dünya enerji piyasasının gelecekteki genel gürünümü sunulmuştur. Ayrıca, Türkmen doğal gazının halihazırdakı ve olası müşterisi olabilecek ülkeler ele alınmıştır. Doğal gaz sektöründe Türkmenista'ın potansiyel rekabetçileri olabilecek ülkeler incelenmiştir. Bunu yaparken ele alınan rekabetçi ülkelerinin doğal gaz üretim kapasiteleri incelenmiştir. Beşinci bölümde Türkmenistan'ın doğal gaz ihracat potansiyeli araştırlmıştır. Bundan başka da Türkmenistan'ın ihraccatta tek mala bağımlı olmasının beraberinde getirdiği olumsuz etkilerden korunmak için gereken politika önerileri sunulmuştur.

1990'ların sonlarından itibaren Türkmen ekonomisi yüksek ve istikrarlı büyüme oranlarını yakalayabilmeyi başardı. Türkmenistan'ın 1998 ile 2014 arasındaki ortalama büyüme oranı 8.9'a tekabül ediyor. Bir başka deyişle, 16 senede Türkmenistan GSYİH'sı 18 kat arttı ve tranddeki yükselme dünya finansal krizi esnasında bile salınım göstermedi. 2014 senesinde Türkmenistan'ın kişi başı geliri 9 032 ABD doları ve satın alma gücü paritesi bazında ise 15 474 ABD doları olarak gerçekleşmiştir. Resmi açıklanan verilere göre Türkmenistan'ın işsizlik oranı tarihsel süreç boyunca yüzde 11 civarlarında

dalgalanmaktadır. Bağımsızlığının ilk senelerinde Türkmenistan'daki enflasyon oranları astronomik rakamlara ulaşarak 1992 senesinde yüzde 3 100 ve 1993 senesinde ise yüzde 1 134 kadar çıkmıştır. Daha sonraki yıllarda Türkmen yetkililer çok yüksek enflasyon oranlarını dizginlemeyi başardılar. Bir tek istisna olarak 2008 senesinde enflasyon oranı yüzde 60 olmuştur ve bu yüksek enflasyonun ana sebepleri de Türkmen Manat'taki değer kaybı ve dizel ve benzindeki ani fiyat artışlarıdır. 1997'den 2013'e kadar devletin yıllık gelirleri yüzde 30 azaldı ve bu da Türkmen ekonimisinin özelleşme aşamasında olduğunun bir göstergesidir. Aynı dönem içinde Türkmenistan'ın dış borcu 2010'a kadar sabit seyir izlemiştir. Ancak, 2010'dan itibaren aniden yükseliş eğilimine geçmiştir. Dış borçdaki yükselişin ana belşrleyicileri ise doğal gaz ve inşaat sektöründeki muazzam yatırımlardır. Türkmen para birimi olan Türkmen Manat 1993 senesinde tedavüle sokulmuştur. Türkmenistan sabit kur rejimi uygulamakta ve ilk başda 1 ABD doları = 1.05 Türkmen Manat olarak belirlenmiştir.

Türkmenistan'ın petrol rezervleri doğal gaz rezervlerine nazaran daha düşük seviyede. Esas petrol rezervleri ülkenin batı kısımlarında ve doğu kısımlarında bulunmaktadır ve ispatlanmış petrol rezervleri 600 million varil civarındadır. Türkmen ekonomisinin doğal gaza bağımlılığı yüksek düzeydedir ve doğal gaza olan talebin hepsini yurt içi üretim ile karşılamaktadır. Türkmenistan rekor doğal gaz üretim seviyesine 1989 senesinde ulaştı ve bu rakam 89.9 milyar metre küp olarak gerçekleşti. 2013 senesine gelindiğinde Türkmenistan yıllık doğal gaz üretimi (84.8) rekor üretim seviyesinin hala 5 milyar metre küp altındadır. 1989'tan itibaren doğal gaz üretimi ve böylece doğal gaz ihracatı istikrarlı bir biçimde düşüş gödtermiştir ve bu düşüş 1998 senesine kadar devam etdi. Doğal gaz ihracatındaki bu azalmanın nedeni ihraç edilen doğal gazın ödemelerindeki gecikme olmuştur. 1998'ten itibaren hem doğal gaz üretimi hem doğal gaz ihracatı istikrarlı bir şekilde artmaya başlamıştır ve bu artış 2009'a kadar devam etmiştir. 2009 Nisan ayında Türkmenistan'ı Rusya'ya bağlayan doğal gaz boru hattındakı gerçekleşen patlama sonucu Türkmenistan'ın doğal gaz ihracatı ani düşüş sergilemiştir. Çin'e başlatılan doğal gaz ihracatı ile Rusya'ya yapılmakta olan ihracattaki ani düşüş kompanse edilmiştir. Aynı süre içerisinde ülkenin doğal gaz tüketimi istikrarlı bir şekilde yükselmiştir. Bir başka deyişle, 21 senede doğal gaz tüketimi 21 milyar metre küp artmıştır. Yani aynı süre içerisinde doğal gaz tüketimi 5 kat artmıştır. Türkmenistan halihazırda Rusya'ya, Cin'e ve İran'a

doğal gaz ihraç etmekte ve 2013 senesinde 60.8 milyar metre küp doğal gaz ihraç edilmiştir.

Türkmenistan'ın esas doğal gaz rezervleri ülkenin merkezinde ve doğusunda bulunmaktadır. Ilk doğal gaz rezervi 1956 senesinde Türkmenistan'ın merkezinde yerleşen Derveze'de bulumuştur. Önemli miktarlardaki doğal gaz rezervi ülkenin batı kısımlarında da bulunmaktadır ve Hazar denizinin Türkmen tarafında takriben 1.3 trillion küp metre doğal rezervi bulunmaktadır. Türkmenistan'ın en büyük doğal gaz kuyusu Galkynyş doğal gaz kuyusudur ve bu kuyu büyüklüğü bakımından dünyada üçüncü sıradadır. Bu doğal gaz kuyusu Türkmenistan'ın Marı ilinin Yolöten ilçesi yakınında yerleşmektedir. Bagtyyarlyk doğal gaz kuyusu Türkmenistan'ın bir başka önemli gaz kuyusudur.

Türkmenistan 4 farklı doğal boru hattından doğal gaz ihraç etmektedir. Onlardan ilki olan 'Central Asia – Center' boru hattı Türkmen doğal gazını Rusya'ya taşımaktadır. Bu boru hattının inşaatına 1960 senesinde başlandı ve boru hattının ilk bölümü 1967 senesinde tamalandı. Bu doğal gaz boru hattının yarıçapı 1200 ile 1400 mm arasında değişmektedir ve maksimum kapasitede yıllık 80 milyar metre küp doğal gaz taşıyabilmektedir. Bu boru hattından Rusya'ya yapılan ihracatın ödeme şekli iki farklı yöntem ile gerçekleşiyor. Ihraç edilen doğal gazın belli bir kısmı nakit para ile ödenmekte ve geri kalan kısmın ise mal cinsinden ödeme yapılmaktadır. Örneğin Rus sanayi ürünlerinden olan KAMAZ kamyonları Türkmen doğal gazına karşılık verilen esas ürünlerdir. Bu yüzden Rusya'ya yapılan ihracatın Türkmen ekonomisine yaptığı etki tam olarak ölçülemiyor. 2009 senesine kadar Rusya, Türkmen doğal gazının en önemli alıcısı konumundaydı ve o tarihten itibaren Rusya'nın Türkmenistan'dan yaptığı ithalat miktari istikrarlı bir şekilde düşüş göstermiştir ve bu düşüş daha da devam edecektir.

Türkmenistan'ı Iran'a bağlayan iki tane doğal gaz boru hattı vardır. Bunlardan ilki 1997 senesinde faaliyete geçmiştir. Bu doğal gaz boru hattı Türkmenistan'ın bağımsızlıktan sonra faaliyete geçirdiği ilk doğal gaz boru hattı olması hasebiyle ayrı bir öneme haizdir. Bu doğal gaz boru hattının uzunluğu 200 km olup maksimum taşıma kapasitesi yıllık 8 milyar metre küptür. Türkmenistan'ı Iran'a bağlayan ikinci boru hattı ise 2010 senesinin Ekim ayında faaliyete geçmiştir. Bu boru hattının toplam uzunluğu 182 km olup

maksimum taşıma kapasitesi yıllık 12 milyar metre küptür. Bu iki boru hattı ile beraber Türkmenistan yıllık 20 milyar metre küp doğal gazı Iran'a ihraç edebilecek kapasiteye ulaşmıştır.

Halihazırda faaliyette olan diğer doğal gaz boru hattı ise Orta Asya – Çin doğal gaz boru hattıdır. Bu doğal gaz boru hattı 4 farklı hattan oluşmaktadır. Ilk 3 hat, Line A, Line B, Line C birbirine paralel şekildedir. Bu 3 hat Türkmenistan ve Özbekistan'ın sınırındaki Gedaim şehrinden başlayarak Çin'in Horgon şehrine kadar uzanmaktadır. Bu hatların herbirinin uzunluğu 1 830 km'dir. Line A 2009 senesinin Aralık ayında ve Line B 2010 senesinin Ekim ayında faaliyete geçti. Bu iki hattın toplam maksimum taşıma kapasitesi yıllık 30 milyar metre küptür. Line C'nin inşaatına 2012 senesinin Eylül ayında başlandı ve 2014 senesinin Mayıs ayında faaliyete geçti. Line C'nin maksimum taşıma kapasitesi yıllık 25 milyar metre küptür. Line C'nin faaliyete geçmesiyle Orta Asya – Çin doğal gaz boru hattının yıllık taşıma kapasitesi 55 milyar metre küpe ulaştı. Eylül 2013'te ise Orta Asya – Çin doğal gaz boru hattının son parçasi olan Line D'nin inşaatına başlandı ve Line D 2017 senesinin sonlarına doğru faaliyete geçmesi beklenmektedir. Line D'nin maksimum taşıma kapasitesi yıllık 30 milyar metre küp olup toplam uzunluğu 1000 km'dir. Line D faaliyete geçtikten sonra Türkmenistan'nın doğusunda yerleşen Galkynyş gaz kuyusundan doğal gaz taşıması hedeflenmektedir.

Türkmenistan enerji kaynakların ihracatında enerji kaynaklarını kendi sınırına kadar getirmeyi tahhüt altına almaktadır ve bundan dolayı da doğal gaz boru hatlarının kendi sınırına kadar olan kısmının yapımını üstlenmektedir. Yani, doğal gaz boru hatlarının sadece Türkmenistan'ın sınırları içerisinde olan kısmının maliyeti Türkmenistan ekinomisi tarafından karşılanmaktadır. Çin'e ilk doğal gaz akışı 2009 Aralık ayında başlamıştır ve her sene ihraç edilen doğal gaz miktarı giderek artmıştır. 2014 Aralık ayına kadar Türkmenistan'ın Çin'e ihraç ettiği toplam doğl gaz miktarı 90 milyar metre küpe ulaştı. Ihraç edilen doğal Çin'e yapılan toplam ihracatın yüzde 95'ne tekabül ediyor. 2010'dan itibaren Çin'e doğal gaz ihracatının başlaması ile Türkmenistan'ın dış dünyaya yaptığı toplam ihracatın büyüme oranı hızlanmıştır. Ihracatın büyüme oranının artmasıyla beraber Türkmenistan'ın GSYIH büyüme oranı da hızlanmıştır. Sonuçta 2010 senesi Türkmenistan için dönüm noktası olmuştur.

Yukarıda bahsedilen halıhazırda faaliyette olan doğal gaz boru hatlarından başka da Türkmenistan yeni doğal gaz boru hatları üzerinde de çalışmaktadır. Olası doğal boru hatları olarak Türkmenistan – Afganistan – Pakistan – Hindistan (TAPH) ile Trans Hazar doğal gaz boru hatları örnek gösterilebilir. TAPH doğal gaz boru hattının planlanan uzunluğu 1 820 km'dir ve Türkmen doğal gazını Hindistan'a kadar ulaştırması planlanmaktadır. Adından da belli olacağı gibi, boru hattı Türkmenistan'dan başlayarak Afganistan, Pakistan ve nihayetinde Hindistan'a ulaşması hedeflenmetedir. Bu boru hattın planlanan taşıma kapasitesi yıllık 33 milyar metre küp olup 5 milyar metre küpü Afganistan'a, 14 milyar metre küpü Pakistan'a ve 14 milyar metre küpü Hindistan'a ayrılmıştır. Bu doğal gaz boru hattının inşaatına 2015 senesinin sonlarına doğru başlanması planlanmaktadır ve 3 sene içinde bitirilerek 2018 sonlarına doğru faaliyete geçmesi hedeflenmektedir.

Trans Hazar doğal gaz boru hattı 1990'ların sonlarından beri gündemdedir, ancak Hazar denizin kıyıdaş ülkeler arasında paylaşılmamış olması bu boru hattın gerçekleşmemisinin ilk nedenidir. Olası Trans Hazar doğal gaz boru hattı yaklaşık 300 km civarında olup Türkmenistan ile Azerbaycan'ı birbirine bağlaması hedeflenmektedir. Bu boru hattının inşa edilmesi durumunda Türkmenistan yeni farklı bir rota ile Avrupa pazarlarına ulaşabilecektir. Bu boru hattının olası taşıma kapasitesinin tahmin edebilmek için Azerbaijan ve Türkiye'nin doğal gaz sektörlerinin incelenmesi gerekmektedir. Güney gaz koridoru Azerbaijanı Avrupa ülkelerine bağlayacak olan boru hattıdır. Bu gaz koridoru Trans Hazar doğal gaz boru hattının da devamı olarak görülmektedir. 2018'den sonra Azerbaijan bu gaz koridorundan yıllık 16 milyar metre küp doğal gaz ihraç edecektir ve bu 16 milyar metre küp doğal gazın 6 milyar metre küpü Türkiye'ye ihraç edilecek olup geri kalan 10 milyar metre küp doğal gaz Avrupa ülkelerine ihraç edilecektir.

TANAP doğal gaz boru hattı Güney gaz koridorun bir parçasıdır ve TANAP'ın inşaatına 2015 Mart ayında başlandı ve 2018 senesinde bitirilmesi planlanmaktadır. Bu doğal gaz boru hattın yıllık maksimum taşıma kapasitesi 31 milyar metre küptür. Yani 2018'ten sonra Azerbaijan'ın yıllık 16 milyar metre küp doğal gaz ihraç edeceği dikkate alınırsa geriye Trans Hazar doğal gaz boru hattının inşaatının gerçekleşmesi durumunda Türkmenistan yıllık 15 milyar metre küp Türkmen doğal gazını Avrupa pazarlarına ihraç edebilecektir.

2005'ten sonra Rusya, Avrupa, Çin ve Hindistan Türkmen doğal gazı üzerindeki rekabeti artmıştır. Başka bir deyişle, Türkmen doğal gazına olan talep artmıştır ve bu artan talep Türkmenistan'ın pazarlık gücünü arttırmıştır. Örneğin 2005 senesinde Rusya'nın Türkmenistan'dan ihraç ettiği doğal gazın 1000 metre küp fiyatı 44 ile 60 ABD doları arasında değişmiştir. Rusya aynı doğal gazı Avrupa pazarlarına 1000 metre küpünü 213.7 ABD doları karşılığında ihraç etmiştir. 2006 sensinde ise Rusya Türkmenistan'dan ithal ettiği her 1000 metre küp Türkmen doğal gazına 65 ABD doları ödemeye başladı ve aynı doğal gazı Avrupa pazarlarında 1000 metre küpünü 285 ABD doları karşılığında ihraç etmeye başladı. Başka bir deyişle, Rusya Türkmen doğal gazına Avrupa pazarlarına 4.4 kat yüksek fiyata satmıştır. Bu alım satım işleminden Rusya her 1000 metre küp Türkmen doğal gazından 220 ABD doları kadar kar elde etmiştir. 2006'dan sonra Çin'in Türkmen doğal gazı ile ilgilenmeye başlaması ile Türkmenistan pazarlık payı arttı. Bu gelişmelerin sonucunda Türkmenistan Rusya'ya ihraç ettiği doğal gaz için daha fazla fiyat talep etmeye başladı. 2007 senesinde Türkmenistan 1000 metre küp doğal gazını 100 ABD dolardan ihraç etmeye başladı. Aynı sene boyunca Rusya doğal gazını Avrupa pazarlarına 294 ABD dolarından ihraç etti. 2008'te Türkmenistan ihraç ettiği doğal gazın fiyatını daha da arttırarak 130-150 ABD doları arasında ihraç etti. Aynı sene içinde Rusya doğal gazı 418 ABD dolarından Avrupa pazarlarına ihraç etti. 2009 senesinde Türkmenistan, Üzbekistan ve Kazakistan kendi ihraç ettikleri doğal gaz için en fazla fiyat artışını talep ederek doğal gazın Avrupa fiyatlarını talep etti. Rusya Türkmenistan pazarını kaybetmemek için bu fiyat artışınıda kabul etti. Bu anlaşmaya göre 2009 senesinde ithal ettiği Türkmen doğal gazın fiyatını iki katına çıkarmayı kabul etti. 2009 senesinde ortaya çıkan global finansal kriz sonucu Avrupa ülkelerinin ekonomileri küçüldü ve bu ekonomik küçülmenin sonucu bu ülkelerin doğal gaza olan talebi de küçüldü. Doğal gaza olan talepdeki düşüş nedeniyle Rusya'nın Avrupa pazarlarına ihraç ettiği doğal gazın fiyatı azaldı. Bir başka deyişle Rusya'nın Türkmen doğal gazının 1000 metre küpüne ödediği fiyat Avrupa pazarlarına ihraç doğal gaz fıyatından daha fazla olduğu için Rusya Türkmen doğal gazını ithal ederek bu ithal edilen doğal gazı tekrar Avrupa pazarlarına ihraç etme işleminden zarara uğramaya başladı. Bütün bu gelişmelerden sonra 12 Nisan 2009 senesinde Türkmen doğal gazını Rusya'ya taşıyan boru hattında patlama meydana geldi. Ikinci bölümün son alt bölümünde Türkmenistan'ın doğal gaz ihracatının yıllar itibariyle Türkmen ekonomisine

nasıl etki yaptığı incelenmiştir. Bu ıncelemenin sonucunda Türkmenistan ekonomisinin doğal gaz ihracatına yüksek düzeyde bağımlı olduğu gözlemlenmiştir.

Çalışmanın üçüncü bölümü gelecekteki global enerji talebinin nasıl bir seyir izleyeceğinin araştırılmasına ayrılmıştır. Bu araştırmanın sonucunda global enerji talebi 2012 senesindeki 13.4 Mtoe seviyesinden 2040 senesinde 18.3 Mtoe seviyesine çıkacağı bulgusuna ulaşılmıştır. Başka bir deyişle, global enerji talebi 2012 ve 2040 seneleri arasında yüzde 37'lik bir artış sergileyecektir. Global enerji talebinin artış kompoziyonunda doğal gaz talebi mutlak miktarda en fazla artan enerji türüdür. Doğal gaza olan talep 2012 senesinde 3.4 tcm iken 2040 senesinde doğal gaza olan talep 5.4 tcm'a çıkacaktır. Toplamda doğal gaza olan talep yıllık yüzde 1.6 pranında artacaktır ve 2012'den 2040' kadar yüzde 57 artacaktır. Aynı zaman aralığında doğal gazın ticareti yıllık yüzde 2 oranında artacaktır, bir başka deyişle doğal gaz ticaret doğal gaz talebinden daha hızlı artacaktır. Bu araştırma yapılırken Uluslarası Enerji Ajansı (2014) '*New Policies Scenario*' dikkate alınmıştır. Bu senario 2014 senesinin ortalarına kadar enerjinin kullanımına dair kabul edilen ve gelecekte de kabul edilecek politikaları dikkate almaktadır.

Bundan başka da BP'nin enerji ile ilgili geleceğe dair tahminleri de baz alınmıştır. BP'nin tahminlerine göre global enerjiye olan talep 2013 ve 2035 seneleri arasında yüzde 57 artacaktır ve aynı zaman aralığında toplam doğal gaz ticaretinin yüzde 87'si LNG ticareti şeklinde gerçekleştirilecektir. Bu gelişmeler çerçevesinde Türkmenistan kendi doğal gazının sadece boru hatları ile taşınması konusuna odaklanmamalıdır. Bundan başka kendi doğal gazını LNG formunda taşımanın da yollarını araştırmalıdır. Mesela İran ile doğal ticareti konusunda olası bir işbirliği ile Türkmenistan sıvılaştırılmış doğal gazı dünya piyasalarına ulaştırabilecektir. Iran'ın zengin doğal gaz rezervleri ülkenin güney kısmında yerleşmektedir ve nüfusun büyük çoğunluğu ülkenin küzey kısmında yerleşmektedir. Bu yüzden Iran güneyindeki zengin doğal rezervlerini küzeyinde yoğun nüfusun yaşadığı coğrafyaya yeterince bağlayabilmiş değildir. Bunun asıl sebebi de Iran'ın halihazırda bu yatırımları gerçekleştirebilecek sermayeye sahip olmamasıdır. İran'ın küzeyinde Türkmenistan yıllık taşıma kapasitesi toplam 20 milyar metre küp olan iki farklı boru hattı ile Iran'ın küzey eyaletleri ile bağlanmıştır. Iran küzeyindeki nüfusun talep ettiği doğal gazı Türkmenistan'dan ihraç ederek karşılayabilir ve Türkmenistan'dan ithal ettiği kadar

doğal gazı Iran kendi güneyindeki zengin doğal gaz rezervlerinden Türkmenistan adına çıkartabilir. Neticede Iran'ın güneyindeki doğal gaz rezervlerinden Türkmenistan adına çıkartılmış olan doğal deniz yoluyla uluslararası piyasalara ulaştırılabilecektir. Bu ticaretin iki tarafa için de büyük faydaları bulunmaktadır. Iran açısından bakmak gerekirse, Iran güneyinden küzeyine boru hattı döşemek zorunda kalmayacaktır. Türkmenistan açısından faydası ise Türkmenistan uluslararası pazarlara ulaşabilmek için yeni bir boru hattı yapmak zorunda değildir, bir başka deyişle mevcut faaliyette olan doğal gaz boru hatları sayesinde ve Iran ile yapılabilecek işbirliği sayesinde uluslararası pazarlara ulaşabilecektir. Türkmen doğal gazının uluslararası pazarlara ulaştırlmasında ortaya çıkacak tek maliyet ise doğal gazı sıvılaştıran tesislerin yapımıdır.

Türkmenistan halihazırda Rusya, Çin ve Iran'a doğal gaz ihraç etmektedir. Avrupa ülkeleri, Hindistan ve Türkiye Türkmen doğal gazının potansiyel müşterileri olabilecek konumdadırlar. Yukarıda bahsedilen ülkeler arasından Çin, Hindistan, Avrupa ülkeleri ve Türkiye Türkmen doğal gazını sürekli talep edebilecek ülkelerdir. Rusya ve İran kendilerinin doğal gaz rezervi bakımından dünyada sırasıyla birinci ve ikinci sırada olması hasebiyle Türkmen doğal gazını gelecekte sürekli talep edebilecek ülkeler olarak değerlendirilmemelidir.

Çalışmanın dördüncü bölümünde doğal gaz ticaretinde Türkmenistan'ın rakibi olabilecek ülkeler olan Rusya, Iran, Katar, Özbekistan ve Kazakistan incelenmiştir. Bunlar yapılırken, doğal gazın üretmi, tüketimi ve ihracatı açısından bu ülkeler karşılaştırılmıştır. Doğal gaz rezervleri bakımında Rusya birinci sırada, İran ikinci sırada, Katar üçüncü sırada ve Türkmenistan dördüncü sıradadır. Özbekistan ve Kazakistan'ın doğal gaz rezervleri yukarıda bahsedilen dört ülkeye nazaran düşük seviyededir. Doğal gaz tüketimi açısından ilk sırada Rusya, ikinci sırada Iran, üçüncü sırada Özbekistan, dördüncü sırada Katar, beşinci sırada Türkmenistan ve son sırada ise Kazakistan gelmektedir. Doğal gazın üretimi açısından yine Rusya birinci sırada, Katar ikinci sırada, Iran üçüncü sırada ve Türkmenistan dördüncü sıradadır. Doğal gazın ihracatı açısından Rusya birinci sırada, Katar iknci sırada ve Türkmenistan üçüncü sıradadır. Özbekistan, İran ve Kazakistan sırasıyla 4., 5., ve 6. sıradadırlar. Enerji yoğunluğu açısından Türkmenistan en düşük ikinci ülkedir ve bu durum Türkmenistan'ın daha da fazla doğal gaz ihraç edebilmesine

imkan tanımaktadır. Yukarıda araştırılan ülkeler arasında enerji yoğunluğu en düşük olan ülke ise Katar'dır.

Çalışmanın beşinci bölümü 2040 senesine kadar Türkmen doğal gazına sürekli ve istikrarlı talebin araştırılmasına odaklanmıştır. Bundan başka da bir tek enerji kaynağına bağımlı olmanın getirdiği olumsuz etklerden kaçınmanın yollarını araştırmaktadır. Bu bölümün birinci alt bölümü Türkmenistan'ın 2040 senesine kadarki ihracat potansiyelini sunmaktadır. Bunu yaparken 2 farklı yaklaşım kullnılmıştır. Bunlardan ilki baz senaryo ve ikincisi ise alternatif senaryodur.

Baz senaryoda Uluslararası Enerji Ajansının verilerine dayanarak 2040 senesine kadar Türkmen doğal gazının potansiyel talebi bulumuştur. Araştırmanın sonucu Türkmenistan 2040 senesine kadar ihraç edebielecek kapasitedeki doğal gazın hepsini ihraç edebileceği gözlemlenmiştir. Alternatif senaryo da yine Uluslararası Enerji Ajansının verilerine dayandırılmıştır. Ancak o verilerden başkada Türkmenistan'ın rakibi olabilecek Rusya ve Katar'ın doğal gaz sektörlerinin geleceğine dair yapmayı planladıkları projelerde dikkate alınmıştır. Bu ülkelerin geleceğe dair yapmayı planladıkları projeler dikkate alındığında bu ülkelerin potansiyel ihracat kapasitelerinin Uluslararası Enerji Ajansının verilerinden fazla olduğu ortaya çıkmıştır. Be yeni veriler de dikkate alındığı takdirde Türkmenistan'ın gelecekte üreteceği doğal gazın hepsini ihraç edemeyebileceği gözlemlenmiştir.

Beşinci bölümün ikinci alt bölümünde ise Türkmenistan'ın ihracatta tek enerji kaynağına bağımlı olmanın ortaya çıkarabileceği olumsuz etkiler araştırılmıştır. Bu araştırmanın sonucunda Türkmenistan'ın ihraç edilen doğal gaz miktarına ve doğal gazın fiyatına bağımlı olduğu sonucuna varılmıştır. İhracatta tek enerji kaynağına bağımlı olmanın ortaya çıkardığı olumsuz etkilerden kaçınmak için Türkmenistan ilk önce ihracatta ürün çeşitlendirmesine gitmelidir. Bundan başkada Türkmen doğal gazına boru hatlarından başka da uluslarası pazarlara ulaştırmanın yollarını araştırmalıdır.

Sonuç olarak, Türkmenistan'ın doğal gaz sektörünün kapsamlı bir şekilde araştırılmasından sonra Türkmenistan'ın kendi doğal gaz rezervlerinden kayda değer bir biçimde faydalanabildiği söylenebilir. Ancak Türkmenistan enerji ihracatından elde ettiği gelirleri optimal bir şekilde kullanarak daha da yüksek büyüme oranları ve daha da yüksek yaşam standartları yakalayabilecektir.

APPENDIX D: TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı :
Adı :
Bölümü :

TEZİN ADI (İngilizce) :

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ☐

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: