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SIGNIFICANCE OF THE

TRANS ANATOLIAN NATURAL GAS PIPELINE

FOR THE ENERGY SECURITY

OF ITS SOURCE AND CONSUMER COUNTRIES

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APPROVAL PAGE

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ABSTRACT

SIGNIFICANCE OF THE

TRANS ANATOLIAN NATURAL GAS PIPELINE

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OF ITS SOURCE AND CONSUMER COUNTRIES

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This thesis analyzes the significance of the TANAP Trans Anatolian Natural Gas Pipeline for the energy security of its source and consumer countries. The natural gas pipelines between east and west deliver gas from the east to consumers in the west through Russian and post-Soviet territory. The EU and Turkey are over dependent on Russian gas. TANAP is the first east-west pipeline that completely runs through territory which is not under Russian control. Its source is not in Russia but in Azerbaijan. Taking into consideration the significant gas shortages that were the result of Moscow's use of gas a s a foreign policy tool during times of Russian –Western tension, TANAP stand out as a long term strategic asset for the Energy security of Turkey and the EU. With its route through NATO territory it also provides Azerbaijan with vital energy export security.

Keywords: Energy security, natural gas, Russia, Turkey, EU, Azerbaijan

ÖZET

TRANS ANADOLU DOĞALGAZ BORU HATTININ
KAYNAK VE TÜKETİCİ ÜLKELERİNİN
ENERJİ GÜVENLİĞİ AÇISINDAN ÖNEMİ

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Bu tez Trans Anadolu Doğalgaz Boru Hattı'ı TANAP'ın, kaynak ve tüketici ülkelerinin enerji güvenliğine yaptığı katkıyı inceler. Batı'daki tüketici ülkelere Doğu'daki üretici ülkelerden doğal gaz taşıyan boru hatları Rus ve eski Sovyet coğrafyasından geçmekte. AB ve Türkiye Rus doğal gazına fazlasıyla bağımlı durumdalar. TANAP, doğu –batı ekseninde doğal gaz taşıyıp, hiç bir kısmı Rus denetiminde olan topraklardan geçmeyen ilk doğal gaz boru hattıdır. Diğer hatların aksine kaynağı Rusya'da değil Azerbaycan'dadır. Geçmişte Rusya ve Batı arasında yaşanan gerginlikler sırasında Moskova'nın doğal gazı bir dış politika racı olarak kullanması sonucu ortaya çıkan kayda değer gaz kesintileri göz önüne alındığında, TANAP, AB ve Türkiye'nin enerji güvenliği için stratejik bir değer olarak ortaya çıkıyor. TANAP, NATO topraklarından geçen rotası sebebiyle Azerbaycan'a da hayati enerji ihraç güvenliği sunmakta.

Anahtar kelimeler: Enerji güvenliği, Doğal Gaz, Rusya, Türkiye, Avrupa Birliği, Azerbaycan

DEDICATION

To my partner in life.

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The contribution of above mentioned persons and others has enriched this research. Any possible shortcomings would be that of the authors.

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LIST OF ABBREVIATIONS

AGSC: Azerbaijan Gas Supply Company

AIIB: Asian Infrastructure Investment Bank

AIOC: Anglo Iranian Oil Company

ARAMCO: Arabian American Oil Company

BOTAŞ: Boru Hatları İle Petrol Taşıma Anonim Şirketi

BP: British Petrol

BTC: Baku Tbilisi Ceyhan Oil Pipeline

BTE: Baku Tbilisi Erzurum Pipeline

CEF: Connecting Europe Facility Program

CIA: Central Intelligence Agency

EBRD: European Bank for Reconstruction and Development

EIA: Energy Information Agency

EIB: European Investment Bank

ELN: National Liberation Army

ENTSO-G: European Network of Transmission Operators

ESIA: Environment and Social Impact Assessment

EU: European Union

EUROSTAT: Directorate General of the European Commission for Statistics

EUNAVFOR: European Naval Force

FARC: Revolutionary Armed Forces of Colombia

GCC: Gulf Cooperation Council

IBRD: International Bank for Reconstruction and Development

IEA: International Energy Agency

IGU: International Gas Union

ISO: Industry Standard Operation

LNG: Liquid Natural Gas

MEND: Movement for the Emancipation of the Niger Delta

MIGA: Multilateral Investment Guarantee Agency

NATO: North Atlantic Treaty Organization

OECD: Organization of Economic Cooperation and Development

OPEC: Organization of Petroleum Exporting Countries

OHSAS: Occupational Health and Safety Assessment System

OSCE: Organization for Security and Cooperation in Europe

SDH2: Shahdeniz Consortium 2

SGC: Southern Gas Corridor

SOCAR: State Oil Company of Azerbaijan Republic

TANAP: Trans Anatolian Natural Gas Pipeline

TAP: Trans Adriatic Pipeline

UNITAR: United Nations Institute for Training and Research

URR: Ultimately Recoverable Resource

1. INTRODUCTION

Energy plays a key role for any modern state as it is the lifeblood of industrial capacity and therefore a key factor of economic growth, as well as military capacity. Economic growth can only be sustained with an industrial capacity that is able to produce at competitive costs in comparison to global markets. Social stability is directly related to economic welfare, which in turn, can only be maintained with economic growth.

Energy is also a key requirement for military capabilities and therefore an issue directly related to national security. Due to this fundamental key position of energy, every developed nation has an energy security policy which is most of the time also an influential factor of the country's foreign policy and national security policy.[1] Therefore industrialized nations have built their energy policies around the concept of energy security. Energy security can be defined as gaining and maintaining stable and affordable access to energy sources. The IEA (International Energy Agency) defines energy supply to be "secure" if it is adequate, affordable and reliable. [2]

Such an access primarily serves the purpose of maintaining and expanding industrial production capacity. Social stability is also directly affected by energy security due to the fact that a disruption in energy would lead to a decline in production and therefore a rise in unemployment and social unrest. Bohi and Toman refer to energy insecurity as "the loss of economic welfare that may occur as a result of a change in the price and availability of energy" [3]

[1] Stanford University Precourt Institute for Energy, (03.02.2018) https://energy.stanford.edu/research/policy-economics/national-security

[2] Ölz S., Sims R., Kirchner N., 2007, IEA Contribution of Renewables to Energy Security, (03.02.2018) https://www.iea.org/publications/freepublications/publication/so_contribution.pdf

[3] Bohi, D. R... & Toman M.A. (1996). The economics of energy security. Boston. Kluwer Academic Publishers.p.1

Energy rich source countries rather shape their energy policies by regarding energy as a source of revenue and a tool to be used for achieving the country's foreign policy goals.

With the exception of the United States, Russia and Norway, industrialized countries are mainly energy consumers and consume more energy than they hold resources. While the energy outlook of countries and regions changes constantly, the general direction for the European Union in the last decade and the next decade shows that it still is and will remain the main energy consuming region after China, followed by the US.[4] While new investments in renewable energy have increased throughout Europe, natural gas imports are on the rise. The reason for this trend is a decrease in European natural gas extraction and a preference of natural gas over coal due to emissions. Natural Gas is a preferred energy source due to its relatively low environmental impact. It emits 50-60% less CO2 than coal and 15-20% less than oil when burned.[5]

This study will concentrate on the Trans Anatolian Natural Gas Pipeline and the role it plays in the energy policies of its source, transit and consumer countries. The EU and Turkey are main consumers, Turkey is simultaneously a transit country, while Azerbaijan is the source country. We will focus on its relevance for the EU, Turkey and Azerbaijan while omitting Georgia due to its relative low profile in the southern gas corridor.

The EU climate policy aims to decrease gas emissions substantially. As part of this policy, the EU has declared in its 2050 Energy Roadmap that it aims to reduce its greenhouse emissions by 80% to 95% by the year 2050. A reduction in emissions requires reducing the use of coal as an energy source due to its high emission. The most viable alternative is natural gas.[6] Natural Gas is used in three main areas. The largest amounts of natural gas, namely 38 % is used to generate electricity. This process has an efficiency rate of around 35% to 40 %, while this rate can be increased to around 50% with the use of

[4] World Energy Council. 2017. World energy index. (03.04.2018). https://www.worldenergy.org/wp-content/uploads/2017/11/Energy-Trilemma-Index-2017-Report.pdf
[5] Union of Concerned Scientists, (03.04.2018)
[6] BP. 2017. Energy Outlook. (03.04.2018) https://www.bp.com/content/dam/bp/pdf/energy-economics/energy-outlook-2017/bp-energy-outlook-2017.pdf

advanced equipment. 30% are used in industrial processes such as to generate heat and power and as an ingredient for the production of chemicals and fertilizers. 17 % are used for residential means, such as heating of living areas and cooking. [7]

By 2015 the EU's energy imports reached 54% of its total consumption, meaning that the EU has one of the highest energy dependency rates among developed nations. The trend between 2005 and 2015 shows that EU imports of natural gas rose faster than that of oil, with 12% compared to 6.4%. Russia is the main supplier of natural gas to the EU with around 40%, followed by Norway, Algeria, Nigeria and Qatar.[8] While Norway supplies 25 % of the EU's total gas demand, its biggest gas fields, namely Ekofisk, Statfjord, Gullfaks and Oseberg, are reaching exhaustion limits. New fields have been found but even if they turn out to be of the same capacity, Norway alone cannot be sufficient to ensure long term gas supply to the EU.[9] Algeria, Nigeria and Qatar have all experienced internal turmoil, terrorism or other political instability issues that led to long term or temporary drops in their natural gas production. Algeria's civil war between 1991 and 2002, terrorism in Nigeria's Niger Delta and the recent embargo of the GCC Gulf Cooperation Council Countries against Qatar are signs of the volatile political situation of above mentioned countries, limiting the chances of them to be regarded as stable long term natural gas suppliers to the EU.

Additional demand for natural gas in the Far East have also changed the demand outlook for natural gas. Likely to European energy and environmental policies, pacific countries such as China, which have traditionally relied heavily on coal based energy production, are also trying to decrease their share of coal based energy in favor of cleaner natural gas due to environmental concerns.[10] Although China is the leading consumer followed by the US, environmental concerns, lower gas prices, new capacity development in renewable energy and improvements that increase energy efficiency have led to a steady

[7] European Council Eurostat, (03.04.2018)
[8] European Council Eurostat, EU imports of energy products (03.04.2018)
[9] Norsk Petroleum, (03.04.2018)
[10] Wong E. (03.05.2016). Statistics from China say coal consumption continues to drop. The New York Times. https://www.nytimes.com/2016/03/03/world/asia/china-coal-consumption-down.html

drop in global coal demand. A drop of 3% is foreseen in forecasts into 2022.[11] Russia is the largest supplier of natural gas to the EU. All of Russian gas that is exported to the West is transported with pipelines. While the environmentally friendly features of natural gas are an advantage, its transportation and storage is more complicated than that of crude oil or coal. Since its natural state is that of a gas, it requires more volume to be stored and also more technologically advanced storage facilities. Therefore the most cost effective way of transportation for natural gas is the use of a pipeline. That way it will be extracted in its natural form and delivered to end use in the same way. Another form of transportation is the liquefying of natural gas which we call LNG Liquid Natural Gas. This process is used for long distance shipment, but is more costly because the gas has to be liquefied for transport with tankers, and then once again gasified for consumption. The cost of liquefying and gasifying natural gas can reach up to 70 percent of the purchase price of the original gas. [12]

Russia being the largest supplier of gas to Europe, poses the biggest dependency risk for the EU. For the last decade relations between the West and Russia have been tense due to geopolitical moves such as NATO and EU expansion towards Russia's geographical borders and a general disagreement over international issues. The most significant manifestations of tension can be counted as the Russian – Georgian War of 2008, the standoff between the Ukraine and Russia in 2006 and 2009 over gas prices, the ongoing Ukrainian civil war between pro-government and pro-Russian forces that started in 2015 and the subsequent occupation and annexation of Crimea by Russia. Specifically the conflicts involving the Ukraine had an important effect on the EU's and Turkey's energy security understanding. Since a substantial part, almost 80 % of all East – West pipelines that transport natural gas from Russia or former Soviet republics to Europe run through the Ukraine, specifically conflicts in that country had an immediate effect on the EU's gas supply. The fact that the crisis between the two countries started immediately after public protests resulted in the so called 'Orange Revolution' which saw pro-Western Yuschchenko come to power in the Ukraine, gave rise to suspicions that Russia used its

[11] International Energy Agency. (03.05.2018)

[12] Platts. (2016). Special report: natural gas (03.05.2018) https://www.platts.com/IM.Platts.Content/InsightAnalysis/IndustrySolutionPapers/SR-us-lng-pipeline-gas-european-market-share-0916.pdf

position as energy supplier to 'punish' and destabilize the Ukraine. Therefore in the perception of the EU and other involved nations Russia had used energy as a political tool.[13] With Russia cutting off all gas to 18 countries of Europe via the Ukraine in 2009, the EU started to question whether Russia could be trusted as a reliable long term partner. Although EU officials were not able to implement alternative solutions such as integrating the European market or diversification through other resources right away, the process of considering alternatives had nevertheless gained momentum.[14]

Likewise Turkey, which is also a country that depends heavily on Russian gas imports, has realized through above mentioned crisis that a diversification of sources would be in its interest in terms of energy security. Turkey is importing 85% of its natural gas from three countries, Russia, Iran and Azerbaijan. 55% of that import is from Russia. Turkey imports natural gas through four pipelines apart from the Trans Anatolian Natural Gas Pipeline. Two of them, the West Pipeline and Blue Stream are carrying gas from Russia, one from Iran and another from Azerbaijan. The two Russian pipelines are totaling 30 billion cm while the Iranian and Azerbaijani pipelines are only 16.6 billion cm in total.[15]

Azerbaijan on the other hand is not a consumer like the EU or Turkey, but a source country. Its interest lies in its ability to export its energy on a long term stable basis. The crisis between the West and Russia have also moved Azerbaijan towards search for alternative export routes. While Azerbaijan has pipelines transporting its oil through Russia dating back from Soviet times, it wasn't exporting natural gas in the past. Instead, it relied on Russian gas imports. [16] After the Soviet era, the Baku –Tbilisi – Ceyhan oil pipeline was the first major pipeline to be built out of Azerbaijan that did not run through Russian territory. The idea was envisioned in several meetings from 1992 to 1994. Project realization started with the signing of the 'Host Government Agreement' in October 2000.

[13] Reuters. Gas crises between Russia and Ukraine, (03.05.2016) https://www.reuters.com/article/us-russia-ukraine-gas-timeline-sb/timeline-gas-crises-between-russia-and-ukraine-idUSTRE50A1A720090111

[14] Gow D. (2009), Russia-Ukraine gas crisis intensifies as all European supplies are cut off. The Guardian. pp.1-2 https://www.theguardian.com/business/2009/jan/07/gas-ukraine

[15] Kazokoglu C., (2015) Türkiye doğalgazda Rusya'ya ne kadar bağımlı? (How dependent is Turkey on Russian Natural gas?). BBC Türkçe. pp. 2-3 http://www.bbc.com/turkce/ekonomi/2015/12/151204_rusya_turkiye_dogalgaz_cuneyt_kazokoglu

[16] Roker S., (2015). Azerbaijan: moving natural gas. World Pipelines. (04.05.2016) https://www.worldpipelines.com/project-news/15102015/azerbaijan-moving-natural-gas/

Construction began in 2002 and was completed in 2005. In March 2007 the Baku-Tbilisi-Erzurum gas pipeline was built. This pipeline was built to transport gas to the Turkish market only. [17]With increasing gas extraction capacity, Azerbaijan started to look for options to export its gas to the world market. Due to relative geographical proximity, the EU is an ideally situated consumer for Azerbaijani gas. Confronted with a choice for the new route, Azerbaijan preferred not to export its gas through Russia but through a politically closer ally, Turkey. The first project in this direction was the Nabucco pipeline. It was supposed to carry Azerbaijani natural gas from the Caspian Shadeniz fields to Europe, through Georgia, Turkey, Greece and Albania on to Italy. The intergovernmental agreement for the Nabucco pipeline was signed on the 13th of July 2009.[18] The pipeline however was never built due to lack of international support and supply contracts. [19]

This failure to realize a project of importance to both Azerbaijan and Turkey, led to an effort of both countries to envision a new pipeline that would follow the same route, but would rely financially more on the two countries than its predecessor. The new pipeline project was coined TANAP, Trans Anatolian Natural Gas Pipeline.

Throughout this study, we will explore in the first chapter the concept of energy security, its implications and the status of global energy reserves. Following in the second chapter, we will take a look at TANAP in the context of the EU's, Turkey's and Azerbaijan's existing pipeline systems, their routes and capacity as well as the specifications of the TANAP project. The third chapter will outline the contribution of TANAP to the energy security of its source, consumer countries. To this end we shall look into the energy outlook of Azerbaijan, Turkey and the EU, the energy regulatory policies of the main consumer which is the EU, reasons for the need of diversification and finally TANAP's significance in the context of the need for source and route diversification.

[17] SOCAR, Pipeline Transmissions, (04.05.2018) http://www.socar.az/socar/en/activities/transportation/baku-tbilisi-erzurum-gas-pipeline

[18] Uluslararası Gündem. NABUCCO Doğal Gaz Boru Hattı Projesi. (04.05.2018) , http://uluslararasigundem.com/nabucco-dogal-gaz-boru-hatti-projesi/

[19] Dempsey J., (2011) Europe's Nabucco Pipeline Delayed Again. International New York Times, pp. 2. (04.05.2018). https://www.nytimes.com/2011/05/10/business/global/10nabucco.html?_r=1

1. ENERGY SECURITY

Energy security is a concept that has been coined at the beginning of the 20th century but the definition remains fluid as the concept takes different meanings according to who makes the definition and in which context.

1.1 The concept of energy security

"The definition of energy security is still being worked out and there is no commonly accepted general definition."[20] "Energy Security has not been clearly defined."[21]

It is a multidimensional concept. It encompasses economical, geopolitical and security dimensions. Mulligans enlarged definition looks beyond energy itself as a comodity and tries to hint at the end value of energy to all involved actors. He stated that "energy is largely a means to the security of another valued entity (the state, economic activity, livelihoods, identities). That is, securing energy supplies is a means to maintaining all that such energy makes possible." Shane Mulligan, The Changing Face of Energy Security, Paper prepared for the 80th Annual Conference of the Canadian Political Science Association, Vancouver, Canada, 4-6 June (2008) To understand the concept of energy security only as the securing of energy sources and their transport network would be flawed. The concept can only be understood fully by taking into account the results that are achieved through energy security, e.g. economic welfare, social stability, military capacity etc.

[20] Azzuni A., Breyer C., Definitions and dimensions of energy security: a literature review, p.38. Winzer C. Conceptualizing energy security. Energy Policy (2012), pp.46-47. (04.06.2018)
[21] Winzer C., Conceptualizing energy security. (2001). p 1. (04.06.2018)

1.1.1 Major approaches to the concept

The first centers on the 'availability' of energy. This is usually the approach of consuming countries. As an example to this approach we can site the International Energy Agency. The IEA defines energy security as: "the uninterrupted availability of energy sources at an affordable price".[22]

The United Nations defines energy supply security as "the continuous availability of energy in varied forms, in sufficient quantities, and at reasonable prices".[23]

The second approach in the search for a definition is that which centers around who makes the definition. Supplier countries, transit countries and consumer countries have different definitions for energy security. For supplier countries energy security means "the security of demand" and "the ability to export energy uninterrupted and at market prices." [24]

The International Energy Agency whose definition of energy security has been cited above is an international organization with 29 member countries. A majority of these are energy importers. The definition the IEA presents for energy security mirrors the status of its members as energy importing countries. Western countries traditionally were energy importers. With the notable exception of Norway and partially the UK, European countries are energy importers. The same was true for the US until the shale gas revolution. New cost saving methods in shale gas extraction applications have paved the way for the US to become a natural gas exporter. The energy Information Agency predicts that beginning from 2018 the US will have reached the status of energy exporter compared to its previous status of importer. The US will have to export its natural gas in liquefied form, which will increase its costs and logistical challenges, but this still means

[22] International Energy Agency, (04.06.2018)
[23] United Nations. (04.06.2018)
[24] Tippee B., (2012). Definition of energy security. Oil & Gas. (04.06.2018) https://www.ogj.com/articles/print/vol-110/issue-1c/regular-features/journally-speaking/defining-energy-security.html

that the US will not have to worry about energy supply security in the long term. This is a major shift for US energy policy which was heavily influenced by sensitivity to the threat of supply disruption since the energy crisis of 1973. [25]

The EU on the other hand has not benefitted from new energy sources and therefore maintains it importer status. As a multinational body the EU strives towards a common policy in energy matters as it does in almost all areas. This effort can be followed back to the days of the 1973 energy crisis and the subsequent search for a common energy policy. The EU approaches its supply security with a drive to diversify source countries and transport routes. Another way of long term energy security is to implement market dynamics in its approach to energy imports. The idea is that competitive markets will ensure security of supply, by establishing a market situation where gas to gas competition is encouraged. EU regulations regarding energy imports are actively aiming towards this goal.[26] We will look further into the EU regulations for the energy market later in this paper.

The third approach centers on environmental and social acceptability dimensions of energy and its security. Von Hippel states: "With increasingly global, diverse energy markets, however, and increasingly transnational problems resulting from energy transformation and use, old energy security rationales are less salient, and other issues, including climate change and other environmental, economic, and international considerations are becoming increasingly important."[27]

Baumann regards energy security as the prerequisite for legitimacy of a ruling political entity. Baumann states: "To put it simply, energy security – or in other words stability – is all about security. Any longer interruption of a steady and plenty flow of energy would massively harm a nation's economic output, political stability and the personal wellbeing of its citizens. Our societies are entirely addicted to energy services, such as gas stations

[25] EIF Annual Report 2018, pp61, (04.06.2018) https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf
[26] European Commission, Energy Strategy, Agency for the Cooperation of Energy Regulators, (04.06.2018) https://ec.europa.eu/energy/en/topics/imports-and-secure-supplies/supplier-countries
[27] Bleischwitz R., Fuhrmann K., (2006). Energy Policy, Volume 34, Issue 11, pp 721-722

or electricity. Not only private households, but also the business sector and even public authorities and governmental agencies are in the dire need of energy to function properly. Hence a satisfactory supply with energy is a precondition for economic growth and also for the legitimacy within a political entity."[28]

Benjamin Sovacool conceptualizes energy security including with three dimensions: "Physical accessibility, geological, technological and geopolitical factors; Economic availability, energy efficiency, affordability, price fluctuations; Environmental acceptability, environmental impacts and social acceptability. [29]

For the sake of this study we shall focus on political, economic, military and physical security dimensions of the concept of energy security, disregarding wider definitions that include environmental and social acceptability etc. dimensions.

1.1.2 Brief History of Energy Security

The concept of energy security was part of national policy making since the early days of industrialization. The more economic welfare and military capability depended on industrial output, the more energy became a key to maintaining or increasing those. Great Britain switched from a coal based navy to an oil based navy in before the First World War. The decision was made by Churchill who was then lord of the admiralty. While the aim was to achieve a faster navy than that of its rival Germany, at the same time this decision meat that Great Britain could not anymore use its own coal resources but had to secure a supply of oil which had to be imported from abroad. This meant that energy security would have to become a vital part of overall national policy of Great Britain.

[28] Baumann F. (2008) Energy Security as multidimensional concept, CAP Research Group on European Affairs, No.1. p4

[29] Sovacool B. (2011) Introduction: Defining measuring and exploring energy security. (04.06.2018). https://www.researchgate.net/publication/284665956_Introduction_Defining_measuring_and_exploring_energy_security

Churchill stated that energy security could only be achieved through wide source diversification. [30]

What was true for Great Britain was true for all industrialized nations. World war one saw an increase in the military use of machines, while during world war two participating armies relied almost entirely on motorized armed forces. With this change in warfare, energy became a crucial part of military capacity and therefore national security. Right before the Second World War, Germany had an oil consumption of around 44 million barrels, while Great Britain consumed 76 million barrels and Russia 183 million barrels. As the largest industrialized nation, the US consumed one billion barrels. With such vast amounts of industrial energy consumption, control of oil fields was a major reason for Germany's attack on the Soviet Union and the Japanese occupation of Indonesia during the Second World War. All participating nations had to secure an adequate supply of oil / energy to fuel their mechanized armies, navies and air forces. [31]

After the Second World War, the economic boom motivated by the reconstruction of Europe, combined with advancements in technology that allowed the widespread use of cars and electrical appliances led to a steep rise in energy consumption in developed countries. While coal was a widely available resource that industrialized countries were able to extract mostly from their own lands, oil on the other hand was largely imported from underdeveloped countries. The international trade in oil was controlled by western companies. Dissatisfaction with prices and business terms in that trade led in September 1960 to the formation of the Organization of Petroleum Exporting Countries (OPEC). Kuwait, Saudi Arabia Iraq Iran, and Venezuela were founders while the United Arab Emirates, Indonesia, Algeria, Qatar, and Libya joined in the 60's. Gabon and Nigeria joined in the 70's and Equatorial Guinea, Angola and Ecuador joined after the year 2000. [32]

[30] Yergin D., (1996) Ensuring Energy Security, Foreign Affairs, Volume 85. Nr.2 p69
[31] Yergin D., (1991) The Prize, The Epic Quest for Oil, Money and Power, pp.295-302, 317-322
[32] OPEC, (04.06.2018)

The formation of OPEC is an important milestone for the topic of energy security because it pawed the way for the oil crisis of the 1973 which brought energy security to the forefront of national security debates national security policy.

After the humiliating defeat of the Six-Day war, Arab leaders sought a way to reclaim their prestige and lost territory. The Jewish holy day Yom Kippur presented such an opportunity. On the 6th of October 1973, Egypt and Syria launched an attack on Israel. After initial success and a push into the Golan Heights and the Suez Channel, Israelis gained the upper hand (with substantial material support via airlift by the US) and pushed Arab forces back. The war that was started as a way of winning back territories and prestige had failed. Arab countries sought for a way to make the west pressure Israel to relinquish occupied Arab lands. The decided to use oil as an economic and political tool. Arab members of OPEC stopped sales to the US and the Netherlands as a protest to US support of Israel. The crisis that followed was the first major disruption of energy and left a permanent mark on how countries view the concept of energy security. As a result of the crisis oil prices rose sharply and the US implemented fuel rations and started to embark on a road towards increasing domestic production. Increasing energy efficiency also became a focus point of relevant authorities. The US considered a physical occupation of Arab oil fields in the gulf as a last resort but the crisis was ended through negotiations and the oil embargo was lifted in 1974. [33]

The crisis had a lasting impact on various levels. While domestic production and the search for increased efficiency had started, in 1974 the Organization of Economic Cooperation and Development (OECD) founded the International Energy Agency (IEA). During the energy crisis EU countries were not able to agree on a common stance towards the embargo. This became apparent during the European Community summit in Copenhagen on 14 - 15 December 1973. As a response to the poor performance of EU leadership during the crisis and as a way to implement lessons learned from the crisis, France initiated the quest for a common European energy policy. [34] The common EU

[33] Hellema D., Wiebes C., Witte T., (1998). The Netherlands and the oil crisis. Den Haag. pp 14
[34] Hellema D., Wiebes C., Witte T., pp 117

energy policy is of significance because it provides the base for EU internal gas market regulations which are an important part of EU energy policy and which we will look into later in this paper.

1.2 Energy Security Implications & Dimensions

Energy security was largely a concept approached only from its military dimension until the oil crisis in 1973. After that, it was realized that other important dimensions, such as energy infrastructure ownership, energy infrastructure protection, economic welfare & social stability and the environment are crucial parts of energy security. While energy security has many dimensions and implications, we will focus on these most prominent implications.

1.2.1 Military Dimension

"The battle is fought and decided by the Quartermasters before the shooting begins. The bravest men can do nothing without guns, the guns nothing without plenty of ammunition, and neither guns nor ammunition are of much use in mobile warfare unless there are vehicles with sufficient petrol to haul them around." [35]

Ever since Navies switched from coal to oil as their propulsion changed to combustion motors under Winston Churchill who was then first Lord of the Admiralty at the beginning of the 20th century, and later land combat and transport vehicles such a s tanks and trucks used fossil fuel, oil became a part of strategic planning during times of war and peace. [36] By its nature, the military application of energy defines the oldest security is the first aspect

[35] Field Marshal Erich von Rommel, 1942 North African Campaign
[36] Yergin D., (1996). Ensuring Energy Security, Foreign Affairs. Volume 85 No.2. pp 69

World War I and II saw entire military operations dedicated to capture oil fields and other strategic energy infrastructure. I will use two military campaigns, both from WW II, to point out the military dimension of energy security and its crucial role. Hitler's push on Stalingrad was to be the opening of a campaign (Operation 'Blau' and 'Edelweis') aiming to reach the oil rich Caucasus, Grozny in Chechnya, Maikop in Russia but in particular the Azerbaijani oil fields that supplied soviet troops with oil for fuel. The 22.2 million tons of oil that were extracted in Baku in 1940, made up 72% of all Soviet oil production of that year. Azerbaijani oil was the life line of the Soviet army. Operation 'Blau' and 'Edelweis' which started in the first months of 1942, was devised to capture these strategic fields and the related infrastructure.

The Allies on the other hand had equally grasped the importance of these fields and had drafted plans to bomb Soviet oil fields. The German – Soviet Pact which was signed by the Soviet Foreign Minister Molotov and his German counterpart Von Ribbentrop on August 23, 1939 gave rise to concerns on the Allied side that Soviet oil could be used to fuel Germany's war machine. The bombing raids would have been originated from the French Air Force stationed in Syria. In a report from General Gamelen to French Prime Minister Daladye on 22.02.1940, it was stated that: "Dependence on oil supplies from the Caucasus is the fundamental weakness of Russian economy. The Armed Forces were totally dependent on this source also for their motorized agriculture. More than 90% of oil extraction and 80% of refinement was located in the Caucasus. Therefore, interruption of oil supplies on any large scale would have far-reaching consequences and could even result in the collapse of all the military, industrial and agricultural systems of Russia." After Hitler actually attacked France and occupied it, the Allied were no longer regarding the destruction of Caucasus oil fields and energy infrastructure as a primary objective. They were to be destroyed only if the Soviets were defeated after operation 'Barbarossa' on the 22nd of June 1941 and the German army reached Baku. [37]

[37] Darabadi P., (2008) The Caucasus and the Caspian in the great geostrategic game on the eve of and during WW II, The Caucasus and Globalization. Vol. 2 Nr. 1. Pp.137-139 (04.06.2018)

With operation ‘Blau’, Germany wanted to seize the Caucasus oil fields and infrastructure. During a phone call between Field Marshal Erich von Manstein and Hitler, in which the field Marshall asked for troops from the Caucasus to come to aid the sixth army that was encircled in Stalingrad, Hitler said: “It's a question of the possession of Baku, Field Marshal. Unless we get the Baku oil, the war is lost." When his war strategy seemed at odds with the advice of his generals Hitler frequently used a phrase that was to become prominent: "My generals know nothing about the economic aspects of war." The economic aspect he was referring to was the importance of oil in the war effort. The same point of view is evident in the way Hitler described the Crimea. For him the Crimea was a “Soviet aircraft carrier for attacking the Rumanian oil fields”. At the beginning of operation ‘Blau’, German forces seemed to be poised to attain their strategic goals. Rostov had fallen in July 1942 and the Russian oil field of Maikop, which was the furthest western Soviet oil field was under German control. As expected Russian forces had demolished every last bit of the infrastructure there. Germany had assembled a task force called ‘Technical Oil Brigade’. It consisted of skilled workers and specialist and was 15.000 man strong. Its aim was to repair and get conquered oil fields and infrastructure back to production. These efforts proved futile as the Germans were only able to produce 70 barrels a day at best in Maikop. [38]

Operation ‘Blau’ came to halt because German troops had to wait frequently for fuel supplies to reach their advancing troops. Those delays combined with difficult mountainous terrain enabled the Soviets to prepare defenses and slow down the German advance until it halted. The failure to capture Stalingrad meant that the German sixth army would not be able to come to aid the war effort in the Caucasus, as it was originally planned. Ultimately the lack of fuel had caused Operation ‘Blau’ and ‘Edelweiss’ to end without any tangible results in Germany’s push for the Baku oil fields.

The second important battle demonstrating the military importance of energy availability and security, was the Africa campaign of the famous German General Rommel. Rommel was a brilliant commander who used daring tactics and an extreme version of mobile

[38] Yergin D., (1991)The Prize, The Epic Quest for Oil, Money and Power, pp336

armored warfare with his famous tank divisions called the 'Africa Corps'. He had already proven himself on the French theater of war with battle tactics that combined speed with daring maneuvers. In 1941 he was ordered to lead the war effort in North Africa where he once again used his hallmark tactics to drive the British back to Cairo. But while he was within 60 miles of Cairo his supply lines had also stretched from Tobruk to the border of Egypt. Long supply lines enabled allied air attacks from their bases in Malta on German logistic support convoys. Enemy harassment of his supplies combined with the time it took for supplies to reach the front even if they were not attacked, brought his advance to a halt and ended in the first battle of Alam Halfa on the 7th of September 1942. Montgomery's counter attack on the 23rd of October in 1942 forced Rommel's retreat.[39] Taking into consideration that Rommel's whole campaign had the final aim of meeting other German troops in Baku, the importance of oil (energy) field for the war effort is once again prominently demonstrated. [40]

As Hitler predicted the inability to take Baku enabled the Soviet Union to continue the war effort and cost Germany its victory. Without oil from Baku, the outcome of the battle of Stalingrad would have been different. In fact, given that the Azerbaijani oil made up a large share of all oil used to fuel the Soviet Army, the whole Russian counterattack that followed Stalingrad and led ultimately to the Red Army occupying Berlin would have been impossible.

1.2.2 Energy Infrastructure Ownership; Nationalization and OPEC

Energy infrastructure ownership rights became an issue of concern after the nationalization wave before the oil embargo in 1973. [41] The reasons for the trend towards nationalization lie in the first decades of oil exploration in underdeveloped countries and the agreements they had made.

[39] Kitchen M. (2009) Rommel's desert war. New York. Cambridge University Press. pp. 142,218,312
[40] Yergin D., pp 342
[41] Cockburn P., (2008) Oil giants return to Iraq. The Independent. pp.4. (06.05.2018) https://www.independent.co.uk/news/world/middle-east/oil-giants-return-to-iraq-851036.html

Oil and natural gas reserves were first discovered and utilized in developed countries who had the required know how, technical capacity and human resources to extract oil and gas reserves in their own territory, such as the US. Not long after, in the beginnings of the twentieth century first oil and a decade later natural gas was discovered in the Middle East.

Middle Eastern countries lacked the capacity to extract their resources and therefore had the choice of either neglecting a new source of income or to cooperate with energy companies of industrialized nations. The international energy market was largely dominated by seven companies who are also often referred to as the 'seven sisters'. Five of them, Mobil, Exxon, Gulf and Chevron are from the US. BP is British and Shell is Anglo-Dutch owned. [42] Underdeveloped resource rich countries struck deals that included concessions in return for extraction and marketing of their national resources. These deals differed from each other in various forms but had usually the common feature that the companies would have exclusive rights to explore for resources. They would be entitled to extract and market any resources they find. In return they would carry all commercial risks of the extraction and they would make payments in form of royalties and production taxes to the host countries. While these agreements resulted in an initial flow of money for the relatively poor host countries, later decades saw a growing resentment towards the agreements that were increasingly being regarded as unfair.

The main reason for resentment was that the contracts were spanning several decades. Contracts of 50 to 60 years were common. The area the contracts awarded to oil companies was also unrealistically large. For example in the instance of Iran, one contract covered the entire southern half of the country, while another contract covered the entire landmass of the United Arab Emirates. [43] The first major resistance came from Venezuela. With a new tax law in 1947 and an additional amendment on November 1948, Venezuela declared taxes that would practically amount to a 50 /50 sharing of profits. Other oil resource nations were at first not comfortable with following the example but around a

[42] Sampson A., (1974). The seven sisters: The great oil companies & the world they shaped. New York. Bantam Books. pp33
[43] Parra F. (2004), Oil Politics: A modern history of petroleum, New York IB Tauris, pp 8,9

decade later the Arabian American Oil Company, ARAMCO in Saudi Arabia offered the Saudis a deal similar to that made with Venezuela. It proved to be a wise move because by doing so ARAMCO evaded the domestic resentment that was evident in Iran and Iraq. While this agreement brought higher profits to the host countries, their gains didn't last long. Since major oil companies did not just control the upstream meaning the oilfields, they also controlled the market and therefore could manipulate prices and production capacity. [44]Additionally to the economic disputes, the founding of Israel in 1948 and following tensions also had a negative effect on the way Arab populations viewed the activities of foreign oil companies on their soil. With growing resentment due to the Arab-Israeli conflict and the pro-Israeli attitude of western nations in the conflict, the way for energy infrastructure nationalization was paved in the Middle East.

The most prominent attempt of nationalization took place in Iran between 1951 and 1953. The popular mood was in favor of nationalization and with the assassination of Prime Minister Ali Razmara who was the most prominent politician to oppose nationalization, the Iranian Parliament passed a bill in favor of nationalization. The main proponent of the bill was Mohamed Mossadegh who had become Prime Minister despite the Shah. In 1951 Mossadegh travelled to the US where he made a presentation at the United Nations, making the case for a nationalization of Iran's oil wealth. After that he met with US President Harry S. Truman where he asked for US mediation of the conflict with Britain and its oil giant the Anglo Iranian Oil Company (AIOC). Mossadegh also asked for financial support in form of a loan, that he most probably wanted to use to enable Iran to extract the oil by themselves and to mitigate the effects of the temporary fall in oil production that was to be expected should a successful nationalization take place. Despite the time and effort Mosaddegh invested in this trip, he wasn't able to get the support he desired nor the loan he had asked for. On his way back Mossadegh stopped in Egypt where he was greeted by thousands. This showed that the public mood in the Middle East was becoming more and more hostile to the Oil companies and the governments that backed them. In 1952 he travelled to The Hague and presented his case to the International Court. A few months later the International Court delivered its verdict which was in favor of Iran's case. In the meantime the UN Security Council rejected the British complaint

[44] Parra F. pp 15,16

against Iran's nationalization effort. Mossadegh also was in confrontation with the Shah. After mass protests the Shah backed down and allowed Mossadegh to realize some of his requests. [45] Negotiations with the UK and US governments rendered no result and Iran stopped its oil exports. National pride and popular will was satisfied but oil was the country's main source of income and the effects of it not being exported were felt. Within two years the popular mood changed and it was deemed the right time to oust Mossadegh. The US Central Intelligence Agency, CIA organized a coup codenamed 'Operation Ajax' together with the British in 1953. Mossadegh lost power and was sent to jail for three years and then was put under house arrest for the rest of his life. [46] This event served as a stark warning and reminder for other oil producing nations that would consider a similar path as that of Mossadegh's in the years to come.

The founding of OPEC is the most important event in the turbulent relationship of source countries and the big energy companies. In 1959 the Venezuelan Minister for Mines and Hydrocarbons, Pérez Alfonzo led an income tax raise which affected oil companies. The reason for this tax was a drop in oil prices which had hurt the Venezuelan income from oil. Alfonzo wanted resource countries to have a say in the pricing of the oil. The easiest way to influence prices was to limit production. For this to work all or most oil producing countries had to act in unison, otherwise a limitation of production by one country would only lead to loss in market share since another oil producing nation would fill the gap. Alfonzo invited other oil producing countries to form a multinational institution or a loosely tied group to act in accordance with common goals. Saudi Arabia, Iran, Iraq and Kuwait had all experienced several price drops in the past and in 1960 they were ready to listen to Alfonzo's offer. In 1960 OPEC was founded and held its first official meeting on the 10th of September.[47]

Their first decision was that no further price drops shall be executed without consent of supplier countries and that a system for price stabilization should be worked out. At that time Arab regimes and Iran were either not capable of working in cooperation or were

[45] The Mossadegh Project, (06.05.2018)
[46] Abrahamian E. (2013).The coup, New York. The New Press. pp. 154
[47] Parra F. (2004), Oil Politics: A modern history of petroleum, New York IB Tauris, pp 85

too afraid to upset the oil companies due to the example that had been made of Mosaddegh in 1953.

The first years of OPEC were rather inactive. But during the 60's with new members such as Indonesia, the United Arab Emirates, Qatar, Libya and Algeria, its numbers grew and so did its influence. 1966 marked the year in which OPEC took its first decision of substance. The 'Declaratory Statement of Petroleum Policy in Member Countries' gave countries the right to decrease production for conservation purposes. Additionally it gave the oil producing countries the right to become partners of oil companies to a certain percentage. [48]

While in the 60's OPEC member countries were not capable of grasping the power they could project, these terms would become important tools in future standoffs between oil producing OPEC countries and the oil companies. In 1970 Algeria and Libya requested a price rise for oil and were ready to challenge the oil companies on their request. With negotiations leading nowhere, Algeria nationalized some components of the energy infrastructure that was producing for domestic use. Libya on the other hand reduced production, using the terms of the 'Declaratory Statement of Petroleum Policy in Member Countries agreement, citing conservation concerns. Within a few months oil companies had agreed to the demands, plus an additional 5% profit rise for Libya, that saw Libya's share of profit growing to 55 % from a previous 50%. This event was a turning point in the relations of oil producing countries and oil companies. The myth of the unbendable oil companies and the paralyzing fear of the Mosaddegh affair had been shattered. In the fall of Mosaddegh, the US and UK governments had actively acted on behalf of the oil companies. But in the instance of Libya, governments of leading industrialized nations did not prioritize oil company interest over security of supply and preferred not to intervene aggressively. This showed a shift in the attitude of western governments towards oil companies, the issue of energy security and the way to maintain it. At the OPEC meeting of 1971 member countries asked for the terms that were given to Libya to

[48] Skeet I. (1991) OPEC Twenty five years of price and politics. New York. Cambridge University Press. pp. 42, 45

be applied to all member countries. This request was also met after a brief period of resistance by the oil companies. [49]

The next step in the relations between OPEC and the oil companies was the participation in ownership of the oil companies that operated on their soil. This step was important because it represented a way of compromise between the two sides. While hardliners may have preferred full nationalization, it was obvious that such a step would result in both political upheaval as well as technical difficulties and shortage of know-how for oil producing nations in maintaining oil production. Negotiations took off in 1971 and it was agreed that the countries would be allowed to buy a 25% share in 1973. With gradual increases in participation the countries would end up with a 51% ownership by 1976. With the new model, countries would be controlling production on their soil. They would sell the oil to the companies at market prices. [50]

1.2.3 Infrastructure Protection; A New Challenge

In the 20th century the threat to energy security, or to the availability of energy was largely emanating from political standoffs such as the Arab oil embargo and nationalization moves by governments. The conventional understanding of energy security is based on the experience of the 1973 oil embargo, therefore focusing on potential energy disruption stemming from national policy decision making of source countries.

The 21st century saw a new threat intensifying. Terrorist attacks against energy infrastructure are on the rise. In the light of such attacks, protection has to cover not just certain production facilities, but the entire value chain beginning from the upstream production units, including transmission and transportation infrastructure such as

[49] Bird A. & Brown M., (2005). The history and social consequences of a nationalized oil industry. pp 12
[50] Skeet I. (1991) OPEC Twenty five years of price and politics. New York. Cambridge University Press. pp. 102,104

pipelines, pumping stations, LNG terminals and vehicles such as tankers. The infrastructure in question was not built in regard to such threats and therefore all protection measures and related organizations must be developed and integrated in retrospect. Developing and putting new security measures into operation will also have an impact on the price of energy.

1.2.3.1 Types of energy infrastructure and transportation

Transportation and support facilities change according to the type of energy. Solid primary energy sources like coal are fairly easy to transport and store with conventional transportation methods. Liquid primary energy sources such as oil, are usually transported by a mix of conventional transport assets such as trucks, ships and supertankers, but more complex methods such as pipelines are also used. Logistically the most challenging form of energy is posed by natural gas due to its gas form. It requires more volume to be stored and also more technologically advanced storage facilities. One form of transportation is the liquefying of natural gas which is called LNG, Liquid Natural Gas.[51] This process is used for long distance and trans-oceanic shipment, but is more costly because the gas has to be liquefied for transport with tankers, and then once again gasified for consumption. The cost of liquefying and gasifying natural gas can reach up to 70 percent of the purchase price of the original gas.[52] Besides process related costs, relevant liquefaction and gasification terminals must be built at shipping ports and destination ports, which requires substantial investments before the gas can be shipped and received.

Pipelines most of the time traverse through countries that are not end users but transit countries. The most cost effective way of transportation for natural gas is the use of a pipeline. That way it will be extracted in its natural form and delivered to end use in the same way. But due to construction and cost limitations, pipelines are only optimal for

[51] Mokhatab S., Poe W., (2006) Natural gas transmission and processing. MA, USA Elsevier Inc. pp.28,29

[52] Hornby G., Wyeno R., (2016). Platt's energy special report: Natural gas. (06.05.2018). https://www.platts.com/IM.Platts.Content/InsightAnalysis/IndustrySolutionPapers/SR-us-lng-pipeline-gas-european-market-share-0916.pdf

short or medium distance gas transport. Oil and gas that is exported by sea does not involve any third party territory, but this does not mean that sea routes are safer than land routes. Oil and gas platforms and tankers are sea born assets that are open to threats.

1.2.3.2 Threats and protection

Terrorist attacks against energy infrastructure were not uncommon in the second half of the 20th century, but those were not large enough to cause major disruptions on the market. The PKK in Turkey is known for attacking the countries pipelines since the early 1980's. [53] In 2004 Chechen resistance fighters hit pipelines near Moscow, Stavropol and Volgograd. In Pakistan and India. The United Liberation Front of Asom and Baluchistan militias have carried out attacks against energy infrastructure in 2006. In Colombia the Revolutionary Armed Forces of Colombia (FARC) and the National Liberation Army (ELN) repeatedly attacked the Cano Limón-Covenas oil pipeline, which transports an average 35,000 barrels per day from Arauca province to the Caribbean coast. The EPR attacked several oil and gas pipelines in 2007 in Mexico. As the years passed, attacks on energy infrastructure begun to become more large scale and more sophisticated. [54]

Attacks on sea based energy infrastructure assets were traditionally carried out against transport ships, tankers. Those were in the past rather pirate attacks while terrorist attacks have increased in the last years. Oil platform attacks are not frequent with the exemption of the Niger delta where militants from the Niger Delta Avengers have specifically announced and carried out attacks on oil platforms. [55] Attacks on tankers are much more frequent. While the motivation behind the attacks varies from piracy to terrorism, the effect is the same. The coast of Somalia and neighboring waters such as the Gulf of Oman are especially dangerous for maritime shipping. The straits of Malacca are a narrow sea

[53] Pamuk O, Humeyra P., (2015). Turkey to boost security for energy infrastructure as PKK attacks rise. Reuters. (06.07.2018)
[54] Alic J., (2012). FARC Steps Up Attacks on Colombian Energy Infrastructure. Oil price. (06.07.2018)

[55] Owolabi T., (2016) Militants attack Chevron platform in Nigeria's oil-rich Niger Delta Reuters, pp.1,2 https://www.reuters.com/article/us-nigeria-oil-delta-idUSKCN0XW1PL

passage that accounts for a quarter of the world's oil transportation by sea. Countries that are especially dependent on these sea lines are Japan and Korea, which are industrialized countries that import a sizable part of their energy. Pirates in these waters usually use primitive but effective methods. Fast boats are used to approach tankers. The range of fast boats is increased by the use of 'mother ships' that supply the boats with fuel and ammunition. Pirates are usually armed with assault rifles and rocket propelled grenades. After boarding the tankers using climbing equipment they take the crew hostage and take the ship to the coast where they wait for their ransom demands to be met.

While the use of naval military power has decreased the rate of pirate attacks substantially, it is by itself not adequate to end the practice of piracy in the area fully. On 10 May 2012 the European Parliament concluded that "Maritime piracy off the coast of East Africa cannot be defeated solely through military means". The next step in securing maritime sea lanes must include poverty reduction and political engagement in the countries bordering the Gulf of Aden, namely Somalia. Addressing the grievances of Somalia's fishing rights must be part of the solution. The illegal international fishing activities off the coast of Somalia have cost the country the loss of an annual income of an estimated 100 million Euros. [56]

The most notable attack on any land based energy infrastructure asset was the attack on the In Amenas gas field in the south of Algeria on 16.01.2013.The size of the attack and the importance of the target, the In Amenas gas field made it stand out. While such attacks are usually hit and run operations of a small scale, the In Amenas attack involved 39 Militants and numerous hostages. The installation had 700 Algerians and 130 foreign workers of different nationalities on the site. The remoteness of the area (800 miles south of the capital and 35 miles to the Libyan border) and its strategic importance made it a prime target. The In Amenas gas field is providing 10 % of all Algerian natural gas production. Taking into consideration that the EU imports 30% of its gas from North Africa with Algeria as its largest provider, the In Amenas attacks were in the first place a

[56] Leymarie P., Rekacewicz P., Stienne A., (2013) UNOSAT Global Report on Maritime Piracy. pp. 5,15 (06.05.2018) https://unosat.web.cern.ch/unosat/unitar/publications/UNITAR_UNOSAT_Piracy_1995-2013.pdf

hit against the Algerian government that was supported and influenced by France but the attacks were also indirectly targeting western economies and welfare.[57]

1.2.3.3 Multinational Efforts

In 2011 NATO released its strategic concept regarding energy security. It defines NATO's role in energy security as follows. "All countries are increasingly reliant on the vital communication, transport and transit routes on which international trade, energy security and prosperity depend. They require greater international efforts to ensure their resilience against attack or disruption, for example by terrorist groups. Moreover, some NATO countries will become more dependent on foreign energy suppliers and in some cases, on foreign energy supply and distribution networks for their energy needs. As a larger share of world consumption is transported across the globe, energy supplies are increasingly exposed to disruption." [58]

In the context of the Ukraine crisis NATO General Secretary Fogh Rasmussen stated that: "We (NATO) must make energy diversification a strategic transatlantic priority and reduce Europe's dependency on Russian energy." [59]

1.2.3.3.1 Active Task Forces

Because the rate of maritime piracy has risen very fast in the Gulf of Aden, industrialized nations have launched three separate protection forces in the area. Operation 'Atlanta' is being carried out since 2008 by the EUNAVFOR (European Naval Force) with the participation of major EU countries. Task force 508 'Ocean Shield' is a NATO task force active since 2009 and compromising of 13 NATO countries including Turkey. The third

[57] Chrisafis A., Borger J., Mcalister T., (2013). Algeria hostage crisis. The Guardian. (06.05.2018) https://www.theguardian.com/world/2013/jan/25/in-amenas-timeline-siege-algeria

[58] NATO Energy Security Division. (2011). NATO's Role in Energy Security. (06.05.2018) https://www.nato.int/nato_static/assets/pdf/pdf_publications/20111026_Energy_Security_EN.pdf

[59] Riley C., (2015). NATO's energy security agenda. NATO Review Magazine. p.1 (06.05.2018) https://www.nato.int/docu/review/2014/NATO-Energy-security-running-on-empty/NATO-energy-security-agenda/EN/index.htm

is the combined task Force 150/151 that is a US force with the addition of 14 other countries including Turkey. Besides these forces, Japan, South Korea, China, India and Russia also have ships in the area. Most of these task forces are using Djibouti as a coordination base of operations. Besides these, private shipping companies have hired "Privately Contracted Armed Security Personnel" (mercenaries) to act as on board protection for their ships and cargo. It is estimated that 140 different companies who account for 2.700 armed personnel are active in the area. [60]

1.2.3.4 Economic Cost

The example of the Niger Delta is an instance in which such attacks had a devastating effect on the economy of the whole country. Besides the Nigeria Delta Avengers which is a more recently founded group, the Movement for the Emancipation of the Niger Delta (MEND) was capable of organizing frequent and effective attacks. Since 2006, 70 attacks against energy infrastructure assets have taken place. [61] The attacks of the MEND alone account for a 25% production loss of Nigeria's total capacity. In 2016, a new wave of attacks caused Nigeria's oil production to be decreased from 2.2 million barrels a day to 1 million per day. The drop was more than 50% and resulted in a recession for Nigeria. Its oil production was the lowest level in the last 30 years of the country's history. Since oil sales accounted for two thirds of the government revenue, Nigeria couldn't compensate for the loss and recession could not be avoided. [62]

While attacks on energy infrastructure effect source and transit countries because the relevant facilities are on or run through their territory, consumer countries are also effected due to price hikes after such attacks. The examples of successful attacks in Iraq

[60] Riley C., (2015). NATO's energy security agenda. NATO Review Magazine. p.3,4 (06.05.2018) https://www.nato.int/docu/review/2014/NATO-Energy-security-running-on-empty/NATO-energy-security-agenda/EN/index.htm

[61] Omale S., (2017). Nigeria Delta Avengers vow to resume attacks on oil, gas installations. EWN News. (06.7.2018)

[62] Tife A., Owolabi T. (2018) Nigerian militants threaten oil rig attacks within days. Reuters News Agency, (06.06.2018) https://www.reuters.com/article/us-nigeria-oil/nigerian-militants-threaten-oil-rig-attacks-within-days-idUSKBN1F6155

and Nigeria show how prices and therefore interests of consumer countries are vulnerable to attacks that are carried out far away from consumer countries. [63]

1.2.4 Economic Welfare & Social Stability

1.2.4.1 The Effect of Energy Security on Social Stability for Source Countries

1.2.4.1.1 Poverty Reduction & Economic Diversification

Most energy rich countries with the exception of the US, the UK (Scotland), Norway and Russia, were industrially underdeveloped countries. Their level of welfare was far behind that of western nations. Latin American and Middle Eastern countries come to mind. With the foundation of OPEC, poverty reduction was announced as a major goal for these countries. According to the United Nations, extreme poverty is a situation where an individual has to live by less than one USD per day. OPEC countries have achieved a substantial reduction of extreme poverty with the use oil and gas revenues. Nevertheless the challenge remains. While absolute poverty may have been reduced, significant levels of development that may act as pillars of a stable and long term economy have not been achieved. The oil and gas industry is not a very labor intensive one. Therefore Middle Eastern OPEC countries and other energy source countries such as Azerbaijan had to channel oil revenues towards building up new and differentiated economic sectors that may provide income for the population. The comments of the President of Azerbaijan, Ilham Aliyev show that leaders have already grasped the importance of diversification. He said addressing the 'Strategic Outlook: Eurasia' panel at the World Economic Forum in Davos on January 23: “Diversification of economy is Azerbaijan's main objective...” [64]

[63] Egan M., (2016) Hidden force behind oil's rise: sabotage by terrorists. CNN. (06.07.2018) http://money.cnn.com/2016/03/29/investing/oil-prices-terrorists-iraq-nigeria/index.html

[64] Azernews. (2018) President Ilham Aliyev: Diversification of economy is Azerbaijan's main objective (06.07.2018)
https://www.azernews.az/nation/125973.html

One of the best examples for a resource rich country that tries to diversify its economy is Saudi Arabia. New reforms aim to enable the kingdom's economy to a more diversified one that is not dependent on energy and has several different industries, with a business culture that encourages small and medium businesses and large scale entrepreneurship. [65] The Program is named the 'National Transformation Program 2020' and was made fully public with the 'Vision 2030' document. Increasing transparency, local business partnerships and the private sector are primary goals of the plan. [66] Among projects to reach that goal, Saudi Arabia is set to establish a $500bn mega-city called NEOM connecting Jordan and Egypt. The business zone which will span 26,500sq km. The main industries the project is aiming for are biotech, entertainment and advanced manufacturing industries. The most important financial asset Saudi Arabia possesses, SAUDI ARAMCO is also open to partial privatization. In 2018 the government plans to sell shares of ARAMCO which is worth approximately 2 trillion USD. [67]

1.2.4.1.2 The Social Contract

Unfortunately the diversification of an economy cannot be achieved through financial means alone. Most Middle Eastern countries are agricultural economies and therefore a diversification not only requires the hardware for other industries but also training for the population. Many oil rich Middle Eastern countries have grasped the problem and its solution, but are hostage to their own practice of a subsidized economy.

In western societies the notion of a social contract defines the adherence to state authority against the backdrop of legitimacy that is recognized by the individual. This legitimacy is rooted in rights and obligations that clearly define the role and authority of the state

[65] Kassem M., (2017). Saudi Arabia on track to diversify economy.
The National (06.07.2018). https://www.thenational.ae/business/saudi-arabia-on-track-to-diversify-economy-1.622017

[66] Vision 2030 (2016). National transformation program 2020. (06.07.2018) http://vision2030.gov.sa/sites/default/files/NTP_En.pdf

[67] Willcox R., (2017). Saudi Arabia's $500bn mega-city aims to boost economic diversification. World Finance. (06.07.2018) https://www.worldfinance.com/infrastructure-investment/saudi-arabias-500bn-mega-city-aims-to-boost-economic-diversification

and individuals. 'Social contract, in political philosophy, an actual or hypothetical compact, or agreement, between the ruled and their rulers, defining the rights and duties of each.'[68]

Different societies have different forms of social contracts. The case in underdeveloped resource rich countries is that the state provides a certain amount of unearned wealth to its citizens in return for loyalty. This wealth may take the shape of government's subsidiaries, government jobs, or other forms such as direct payouts. While subsidiary practices helped to maintain social stability, it also put a heavy burden on the countries' economies. Social spending in the country has reached 130 billon USD in 2015. The fact that the state is the country's largest employer is another indirect form of sublimation. The percentage of Saudi citizens employed in the private sector is only 24%.[69] An astonishing rate of 67 % of the workforce is state employed at rates that are higher than the private sector. [70]

Governmental substitution is everywhere because non democratic oil rich regimes regarded a hand out economy s way to safe guard stability and avert any social unrest. In 2009, Saudi Arabia subsidized fuel with 32.5 billion USD. In 2010, the subsidy increased to 43.6 billion USD. In 2011, the amount was 60.9 billion USD. Besides fuel which accounts for 76 % of all subsidies, electricity accounts for 24 %. [71]

Apart from the burden on the economy, the practice of governments subsidies and state employment throughout generations have made it very hard if not near to impossible to change the mindset of the population towards that of an economy based on productivity, competition and merit. Notably the current ruler of Saudi Arabia, King Salman has seen the unsustainable nature of a heavily subsided economy and therefore tries to speed up

[68] Britannica, (06.07.2018)
[69] General Authority for Statistics Saudi Arabia. (06.07.2018)
[70] Hodgson. C., (2017). The fragile balance between Saudi Arabia's ruling class and its people is 'unsustainable'. Business Insider. Pp.1-3 (06.07.2018) http://uk.businessinsider.com/saudi-arabian-social-contract-unsustainable-2017-11
[71] Barber L. (2018). Saudi Arabia Subsidies. Climate scorecard. pp.1-3 (06.07.2018) https://www.climatescorecard.org/2018/01/saudi-arabia-subsidies/,

economic reforms that begun under his predecessor.[72] The high population growth of Middle Eastern countries makes a subsidized economy even harder to maintain. The population growth of Middle Eastern countries is generally high. In the example of Saudi Arabia, population growth has been higher than even the Middle Easter average. It jumped from 3.12.00 to 4.041.000 in 1960 with a 29.5% increase. This growth rate then increased greatly during the next 10 years. In1980, the population rose to 9,801,000 with a 69.8% increase and to 16.139.000 in 1990 with a 64.7% increase. Despite government intervention to limit population growth in the 80's, the 90's witnessed a 24.2% rise totaling the population at 20,045,000 in the year 2000. In 2018 the estimates are around 33.550.000. The median age of the population is 27, which means than a high percentage of the population will enter the job market in the near future.[73]

The research paper by Jane Kinninmont at Chatham House, named 'Vision 2030 and Saudi Arabia's Social Contract Austerity and Transformation' states that a serious reduction of handouts and subsidiaries may result in damage to the social contract that could be summed up as 'loyalty for handouts'. Austerity measures have first targeted business giants such as the Bin Laden Group and Saudi Oger in 2015. Downscaling of government funded mega infrastructure projects had no real effect on the public. But shortly after, fuel prices were raised 80% which represented the first ever austerity measure to effect the whole population. Government employees also lost some of their allowance that were usually added on their basic income. Saudi Arabia saw no public protests because organized opposition does not exist in the country. But social media has become the stage for voicing of anger over the price raises and cuts in allowances. In 2017 a royal decree reinstated the allowances. It is important to remember that almost all resource rich countries also have ethnic or sectarian problems that are either active and therefore could worsen against the backdrop of a severe economic austerity. Conflicts that are dormant due to generous government handouts and security measures such as the long standing problems with Shiite minorities in Gulf States.[74]

[72] The Economist Intelligence Unit., (2015). Saudi Arabia studies fuel subsidy reform. The Economist. pp.1, 2 (06.08.2018)
http://www.eiu.com/industry/article/1633636747/saudi-arabia-studies-fuel-subsidy-reform/2015-11-04
[73] Worldpopulationreview. (06.08.2018)
[74] Kinninmont J. (2017). Vision 2030 and Saudi Arabia's Social Contract Austerity and Transformation. Chatham House. pp. 17,18,26,27 (06.08.2018).

Saudi Arabia is not alone in its delicate balance of 'handouts for loyalty'. With the exception of a few western European energy rich nations, almost all energy resource rich countries including Russia, depend on a similar system to keep social stability in their countries. Any disruption in these handouts that play a similar role to social security systems of developed western nations, could become a threat to stability in these nations. Such social instability and unrest would in turn, represent a dangerous disruption in the energy flow to consumer nations. It can be argued that failure to maintain the social contract in resource rich countries has the potential for global economic crisis and therefore represents a threat not only for resource rich countries but also for consumer countries and the global economy.

1.2.4.2 The Effect of Energy Security on Social Stability for Consumer Countries

1.2.4.2.1 Social Stability & Economic Welfare

"Social stability is also directly affected by energy security due to the fact that a disruption in energy would lead to a decline in production and therefore a rise in unemployment and social unrest. Energy insecurity is 'the loss of economic welfare that may occur as a result of a change in the price and availability of energy" [75]

'The political stability of a country is linked with the sustainability of its economic development, which is closely related to the reliability of access to energy resources. This implies that access to stable sources of energy is one prerequisite for state stability.'[76]

https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2017-07-20-vision-2030-saudi-kinninmont.pdf

[75] Bohi, D. R... & Toman M.A. (1996). The economics of energy security. Boston. Kluwer Academic Publishers.p.1

[76]OSCE (2010) Renewable energy for energy stability. pp. 1 (06.08.2018) https://www.osce.org/serbia/16332?download=true

Developed industrial countries enjoy a high level of quality of life which is only possible with an uninterrupted flow of energy at affordable prices. Besides daily necessities such as heating and transportation, the entire economy of an industrialized nation depends on its access to energy. Without access of with prices that are too high, produced goods will not be able to compete on the world market. A downturn in welfare might lead to social instability.

The best example to showcase the economies and therefore social effects of a lack of energy security, is the 1973 oil crisis and its effect on western economies and social stability.

In the October of 1973, Egypt and Syria attacked Israel during the Yom Kippur holy day of Jews, in order to take back land that was lost after the Israeli attack of the Six Day War in 1967. While the war delivered some initial territorial gains for Egypt and Syria, Israel was able to reorganize its defense and counterattack, which led to even more territorial loss for Egypt and Syria. The Sinai, the Golan Heights and some other territories came under Israeli occupation.[77] A heavy US airlifting of ammunition and equipment together with emergency aid of 2.2 billion US dollars made the successful Israeli counterattack possible. Oil producing Middle Eastern countries were already upset towards the US, due to Nixon's decision withdraw from the gold standard that was set by the Breton Woods Agreement in 1944, which measured the value of the US dollar against gold. The sudden implementation led to a rise in gold prices but simultaneously caused a devaluation to the US dollar. The US dollar was the designated currency for trading in oil. This arrangement had given the US dollar and the US itself an almost monopolistic power against all other currencies.

By devaluating its own currency for purposes of stimulating the economy, Nixon had also effected the purchase power of oil producing countries. Their revenues had fallen, while

[77] Rabinovich A., (2004). The Yom Kippur war. New York. Schocken Books. pp.132

any imports they made from any other country than the US became more expensive due to the value of other currencies that had not changed in the process.[78]

Coupled with the events of the Yom Kippur war, Middle Eastern oil producing nations decided to use oil as a foreign policy tool. Under the leadership of Saudi Arabia, OPEC announced an oil embargo against the US and European countries supportive of Israel, especially the Netherlands. The price of oil was raised to 11.65 USD a barrel which was an increase of 387% compared to pre-crisis years. As a country that made up one third of all global oil consumption, the US was highly vulnerable.

The American public felt the effects immediately. Lines formed at gas stations and gasoline was rationed. The average US citizen had grown accustomed to the availability of cheap fuel. Cars were used extensively, both to travel and for daily transportation. Measures such as the rationing of fuel, speed limitations to conserve fuel, fuel sales according to number plates with odd numbered plates being allowed to purchase on odd numbered days had a profound effect on the psyche of the public. With uncertainty and the Fed continuously changing interest rates, business leaders could not plan ahead and were not willing to hire. This in turn led to unemployment which further impacted the public morale. [79] Combined with an economic downturn that had already begun before the oil crisis, it was as if the public awoke from a dream to face reality. Although the oil crisis was resolved within a year, the price of oil remained 33% higher than pre-crisis prices. The economic downturn went on throughout the rest of the decade. An 11% increase in retail prices and another 18 % rise in wholesale prices had a profound impact on the budget of average people. Unemployment figures rose to 8.5% a year after the end of the oil crisis in 1975.The real gross national product of the US fell by more than 2% in 1974 and by 3% in 1975. Towards the end of the 70's the US faced an economic situation that can be described as a cross between stagnation and inflation. Both inflation and

[78] James Patterson, (1996) Grand Expectations. The United States 1945–1974 New York. Oxford University Press. p 530

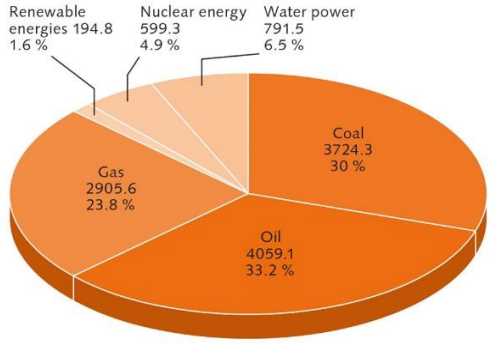
[79] Amadeo K. (2018) OPEC Oil Embargo, Its Causes, and the Effects of the Crisis. The Balance. p.3 (06.08.2018) https://www.thebalance.com/opec-oil-embargo-causes-and-effects-of-the-crisis-3305806

unemployment had reached around 10%. With the oil crisis the 'golden post world war years' of the US had ended.[80]

2. GLOBAL ENERGY RESERVES AND TRANSPORTATION

2.1 Types of Energy

There are several types of energy which are usually categorized according to the whether they are renewable or not. Renewable energy sources are hydro energy which is generated at dams that use the kinetic power of water to produce energy with the use of turbines, wind energy uses the kinetic power of wind to produce energy with the use of turbines and solar energy which uses solar panels that partially trap solar energy in different types of battery-like storage units.[81] Another form of non-renewable energy is nuclear power. In this study we will disregard renewable energy sources and nuclear energy. We will focus on non-renewable energy sources such as coal, oil and natural gas also called fossil fuels. Given that it took millions of years of geological processes for such fossil fuels to form under the earth surface, and because it would take another couple of millions of years for similar fuels to form, they are practically non-renewable.



[80] James Patterson, (1996) Grand Expectations. The United States 1945–1974 New York. Oxford University Press. p 531

[81] US Energy Information Administration. (2017). Nonrenewable and renewable energy sources. (06.08.2018). https://www.eia.gov/energyexplained/?page=nonrenewable_home

Figure 1: Energy Types in Global Energy Consumption in Percentage and million tons of oil equivalent (MTOE)

Source: World Ocean Review https://worldoceanreview.com/en/wor-3/oil-and-gas/sating-our-energy-hunger/

2.2 Definitions & Types of Reserves

"Reserves are generally defined as the portion of energy resources that can be recovered economically by using current technologies and for which a project has been defined. Estimates of reserves in each category can change as the underlying assumptions are modified or new information becomes available. For example, as the oil price rises, some resources that were previously classified as non-commercial may become profitable and could be moved into the possible, probable or proven (3P) reserves category upon definition of a suitable project." [82]

When talking about reserves we have to distinguish certain types of reserves. Those are usually grouped according to the probability of their existence and the probability of their extraction. There are five main types of reserve definitions: URR (ultimately recoverable resource), proved, probable / possible reserves and oil in place. The definitions that were formulated within above mentioned framework for oil, apply to all fossil fuels in general, including natural gas.

Ultimately recoverable resource (URR): "URR is an estimate of the total amount of oil that will ever be recovered and produced. It is a subjective estimate in the face of only partial information. Whilst some consider URR to be fixed by geology and the laws of physics, in practice estimates of URR continue to be increased as knowledge grows, technology advances and economics change. Economists often deny the validity of the

[82] Houssin D., (2013). Resources to Reserves. International Energy Agency. p.7 (06.08.2018) http://www.iea.org/media/presentations/Resourcestoreserves2013web.pdf

concept of ultimately recoverable reserves as they consider that the recoverability of resources depends upon changing and unpredictable economics and evolving technologies. The ultimately recoverable resource is typically broken down into three main categories: cumulative production, discovered reserves and undiscovered resource. Cumulative production is an estimate of all of the oil produced up to a given date. Discovered reserves are an estimate of future cumulative production from known fields and are typically defined in terms of a probability distribution. Discovered reserves are typically broken down into proved, probable and possible reserves." [83]

According to the BP Energy Economics Statistical Review 2016, the definition of proved reserves is: "The estimated quantities of oil which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under current economic and operating conditions". According to the United Nations proved reserves are defined as: "The quantity within the proved amount in place that can be recovered in the future under present and expected local economic conditions with existing available technology." [84] If the probability of a reserve in a field has a chance of being put to use that is above 90% that reserve is usually named a proved reserve. Within this framework proved reserves are also an estimate of potential production from a specific field. Proved, probable and possible reserves make only a fraction of oil in existence because it is not possible to extradite all the oil in a given field. The recovery factor is the proportion of oil that can be extracted in relation to the total oil volume. Naturally factor changes according to technological advances, geographical specifications, or additional investments that increase the amount of extracted oil. With technical innovations the factor usually increases every year.

Definition of Probable Reserves: "Probable reserves have been variously designated as 'indicated' or P50 reserves, the latter referring to reserves which are estimated to have a better than 50% chance of being technically and economically producible." [85]

[83] BP Energy Economics Statistical Review 2016. (06.08.2018)
[84] World Energy Organization 2013 Survey. (06.08.2018)
[85] BP Energy Economics Statistical Review 2016 (06.08.2018)

Definition of Possible Reserves: “Possible reserves have been designated as 'inferred' reserves, sometimes referred to as P10 or P20 reserves – i.e. including reserves which, at present, cannot be regarded as 'probable', but which are estimated to have a significant, but less than 50 per cent chance of being technically and economically producible. In general, a portion of a field's probable and possible reserves tend to get converted into proved reserves over time as operating history reduces the uncertainty around remaining recoverable reserves: an aspect of the phenomenon referred to as 'reserves growth'. Like reserves, undiscovered resource is also defined typically in terms of a probability distribution. Estimates of 'yet-to-find' resource are made based on a range of geological, technological and economic factors.” [86]

2.3 Unconventional Reserves

In the last two decades technological advances have made new methods of locating and extraction of fossil fuels possible. While conventionally only submerged pockets or basins of crude oil and natural gas were extractible, the new ability to extract both shale gas and oil from oil sands (and increased levels energy efficiency) has changed both estimations of reserves as well as the ranking of oil and gas producing countries. The process of extracting oil from oil sands is more labor intensive than conventional crude oil production. Sands that are containing Bitumen are dug up and the Bitumen is extracted to gain crude oil. Currently only 10% of all oil in oil sands is economically extractible. Should this percentage change with advancements in technology, global oil reserves would change dramatically. Only the Alberta province of Canada contains1.6 trillion barrels of oil in oil sands. This is more than the global reserves of crude oil.

The second important unconventional method of extractions is related to shale gas and shale oil. Hydraulic fracturing is used to break shales which then release gas and oil under

[86] BP Energy Economics Statistical Review 2016 (06.08.2018)

extreme pressure. As in the example of oil sands, the capacity of shale oil (1 trillion barrels) in the US alone is higher than the entire global crude oil reserve. [87]

The US Geological Survey indicates that northern polar regions contain 30% of the world's undiscovered gas and 13% of the world's undiscovered oil, usually concentrated in offshore basins around the polar regions:.[88]

Energy reserve are different in type, some are solid while others are liquid or gas. Their density changes accordingly. Therefore conventional measurements such as weight or volume are not sufficient for a definition of energy reserve capacity. Terms such as 'barrel' which are used for oil are resource specific and cannot be used across the broad spectrum of energy resources. Therefore one of the more precise ways to determine the capacity of an energy reserve is the amount it equals in energy, meaning Joule 'J' or kilo Joule 'kJ'. Another way to express the capacity of reserves is the reserves/production ratio or R/P. The R/P ratio is the number of years the reserves can last given that production goes on at the present rate. [89]

2.4 Major Fossil Fuels

Coal: Coal is the most abundant one of all fossil fuels. It is a rock formation that consists of carbon, hydrocarbon, hydrogen, oxygen, nitrogen and varying amounts of Sulphur. High temperature combined with pressures caused physical and chemical changes in previous vegetation that has been buried beneath the surface for millions of years transforming it into coal. Coal can be combusted and is being used widely around the world both for heating and generation of electricity. It is estimated that around 40% of global electricity production is obtained by the use of coal combustion. [90]

[87] Wolfson R. (2015). Energy, environment and climate. New York. Norton W. W. & Company, Inc.
[88]Gautier L., Bird J., Charpentier R., Grantz A., Houseknecht W., Klett R., (2009) Assessment of Undiscovered Oil and Gas in the Arctic. Science Journal. Vol. 324. pp. 1175-1179. (06.08.2018) https://pubs.er.usgs.gov/publication/70035000
[89] Boyle G., Everett B., Peake S., Ramage J. (2012). Energy systems and sustainability: Power for a sustainable future. Oxford UK. Oxford University Press
[90] Ritchie H., Roser M. (2018). Fossil Fuels. (06.09.2018) https://ourworldindata.org/fossil-fuels

Its large scale use has started with the industrial revolution in the 19th century. Since its combustion leads to heavy CO2 emissions and because during its mining and processing, the water that is used is polluted with heavy metals and other toxics it is classified as an environment unfriendly energy resource. [91]

Coal reserves which are confirmed globally totaled 1,032 Giga tons (Gt) by the year 2016. [92]

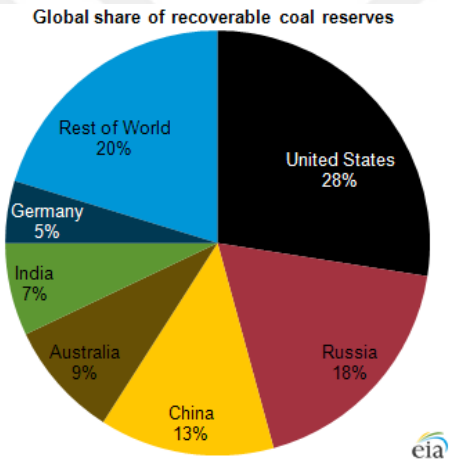


Figure 2: Global Share of Recoverable Coal Reserves

Source: US Energy Information Agency
https://www.eia.gov/todayinenergy/detail.php?id=2930)

[91] World Coal Association (06.09.2018)
[92] The Federal Institute for Geosciences and Natural Resources Database. (06.09.2018)

Table 1: Global ranking of coal consumption per nation in million tons oil equivalent per 2011 including Turkey

1	China	1839.4
2	US	502.1
3	Japan	117.6
4	South Africa	93.1
5	Russian Federation	91.0
6	South Korea	79.6
7	Germany	77.6
8	Poland	59.8
9	Australia	49.6
10	Indonesia	43.7
11	Ukraine	42.4
12	Taiwan	41.4
13	Turkey	32.2
14	United Kingdom	31.0
15	Kazakhstan	30.5
16	Canada	21.7
17	Czech Republic	19.5
18	Italy	15.7
19	Vietnam	14.9

20	Malaysia	14.9

(Source: Europe's Energy Portal, https://www.energy.eu/stats/energy-coal-consumption.html)

South Africa with 93.7% leads the world in the percentage of coal it uses for electricity generation. Poland with 83%, China with 75, 4%, India with 72.8% and Australia with 6.3% are nations that are heavily dependent on coal for electricity generation. [93]

Oil: Crude oil is a liquid fossil fuel containing hydrocarbons that formed through a million years lasting process beneath the surface of the earth. Beside its use as fuel oil and gasoline it is also an important ingredient in plastics and pharmaceuticals. Crude oil needs to be processed in different ways according to its use.

Oil has a share of around 30.6 % in energy consumption globally, making it the most important energy source in the world.

Estimated total crude oil reserves and resources are around 689 billion t. [94]

[93] Sawe E., (2017) 15 Countries Most Dependent On Coal For Energy. World atlas. (06.09.2018) https://www.worldatlas.com/articles/15-countries-most-dependent-on-coal-for-energy.html
[94] The Federal Institute for Geosciences and Natural Resources Database. (06.09.2018)

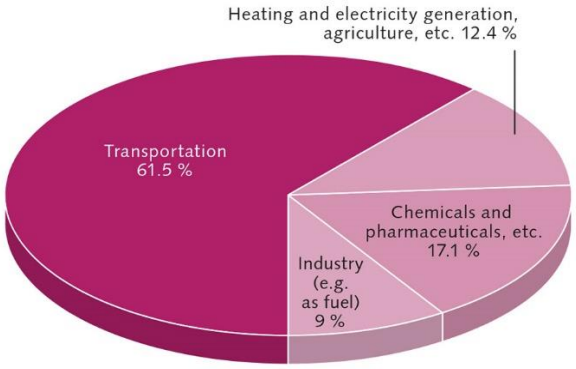


Figure 3: Global Share of Oil use per Sector

Source: World Ocean Review https://worldoceanreview.com/en/wor-3/oil-and-gas/sating-our-energy-hunger/

Through new and innovative extraction methods combined with advanced technologies the estimate for global oil reserves has increase in comparison to the last two decades. Unconventional oil resources, such as shale oil, oil sand, extra heavy oil and natural bitumen have resulted in a fourfold increase in oil reserve estimates. 447.874 billion tons of the 689 billion tons total reserves, is made up of non-conventional crude oil. Conventional oil reserves are distributed fairly uneven around the world. The densest reserves are in the Persian Gulf, the Venezuelan Caribbean Gulf, North America and North East Asia.

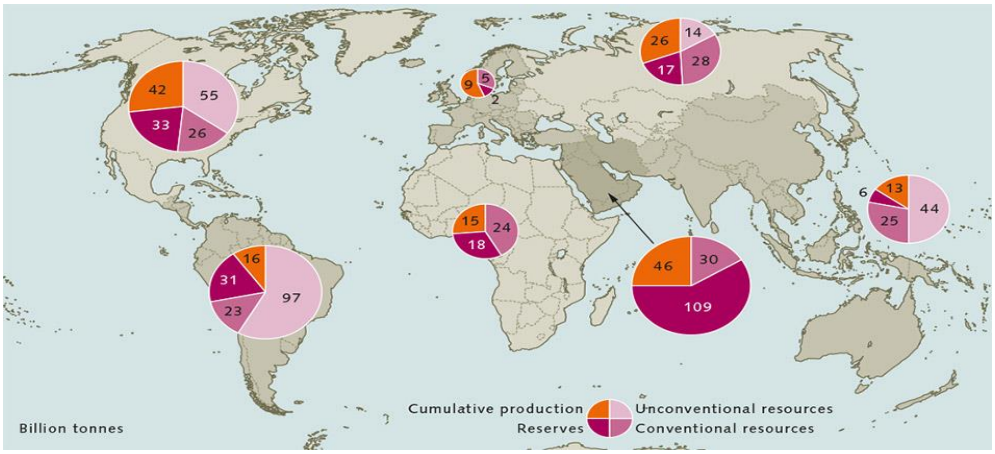


Figure 4: Conventional and Unconventional Oil Reserves

Source: World Ocean Review https://worldoceanreview.com/en/wor-3/oil-and-gas/sating-our-energy-hunger/2/

Table 2: Countries Ranked by Proved Reserves Including Turkey

Rank	Country	(BBL)	Date of Information
1	Venezuela	300,900,000,000	1 January 2017 est.
2	Saudi Arabia	266,500,000,000	1 January 2017 est.
3	Canada	169,700,000,000	1 January 2017 est.
4	Iran	158,400,000,000	1 January 2017 est.
5	Iraq	142,500,000,000	1 January 2017 est.
6	Kuwait	101,500,000,000	1 January 2017 est.
7	United Arab Emirates	97,800,000,000	1 January 2017 est.
8	Russia	80,000,000,000	1 January 2017 est.
9	Libya	48,360,000,000	1 January 2017 est.

10	Nigeria	37,060,000,000	1 January 2017 est.
11	United States	36,520,000,000	1 January 2017 est.
12	Kazakhstan	30,000,000,000	1 January 2017 est.
13	China	25,620,000,000	1 January 2017 est.
14	Qatar	25,240,000,000	1 January 2017 est.
15	Brazil	13,000,000,000	1 January 2017 est.
16	Algeria	12,200,000,000	1 January 2017 est.
17	Angola	8,273,000,000	1 January 2017 est.
18	Ecuador	8,273,000,000	1 January 2017 est.
19	Mexico	7,640,000,000	1 January 2017 est.
20	Azerbaijan	7,000,000,000	1 January 2017 est.
...	...	...	...
54	Turkey	388,500,000	1 January 2017 est.

Source: World Fact Book CIA, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2244rank.html

The world's top oil consumers are the most industrialized nations who have a developed industrial production that depends partially on oil and a high standard of living that also is dependent on energy which means oil especially for means of transportation.

Table 3: Countries Ranked According to Oil Consumption Including Turkey

1	US	18,961.00
2	China	10,480.00
3	Japan	4,557.00
4	India	3,660.00
5	Russia	3,493.00
6	Brazil	3,003.00
7	S. Arabia	2,961.00
8	Germany	2,435.00
9	Canada	2,374.00
10	S. Korea,	2,328.00
11	Mexico	2,090.00
12	Iran,	1,885.00
13	Indonesia	1,718.00
14	France	1,713.00
15	UK	1,502.00
16	Italy	1,260.00

17	Singapore	1,240.00
18	Spain	1,208.00
19	Thailand	1,171.00
20	Australia	1,080.00
...	.....	
27	Turkey	731.00

Source: Index Mundi, https://www.indexmundi.com/energy/?product=oil&graph=consumption&display=rank

It is important to note that the countries with the highest reserves are not necessarily those with the highest production of oil. Historically S. Arabia was the highest ranking producer, but recent developments in unconventional extracting methods which have been mentioned earlier in this study, have made the US one of three top ranking oil producer. The US has been historically a net oil importer whereas now it has become an exporter.

Table 4: Countries Ranked According to Oil Production Capacity Including Turkey

1	Russia	10,550,000	2016 est.
2	Saudi Arabia	10,460,000	2016 est.
3	United States	8,853,000	2016 est.

4	Iraq	4,452,000	2016 est.
5	Iran	4,068,000	2016 est.
6	China	3,981,000	2016 est.
7	Canada	3,679,000	2016 est.
8	United Arab Emirates	3,106,000	2016 est.
9	Kuwait	2,924,000	2016 est.
10	Brazil	2,515,000	2016 est.
11	Venezuela	2,277,000	2016 est.
12	Mexico	2,187,000	2016 est.
13	Nigeria	1,871,000	2016 est.
14	Angola	1,770,000	2016 est.
15	Norway	1,648,000	2016 est.
16	Kazakhstan	1,595,000	2016 est.
17	Qatar	1,523,000	2016 est.
18	European Union	1,507,000	2016 est.
19	Algeria	1,348,000	2016 est.
20	Oman	1,007,000	2016 est.
...	...	...	
55	Turkey	49,500	2016 est.

Source: The World Fact Book, CIA, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2241rank.html

Natural Gas: Natural gas is the medium of the topic of this study, the Trans Anatolian Natural Gas Pipeline Project and therefore we will take a detailed look into the details of Natural gas, global reserves distribution, reserve types, extraction and use.

Natural gas consists to a large portion of methane that has been released by fossil fuels. Therefore natural gas findings are located in the vicinity of fossil fuels such as petroleum and coal. The processing of natural gas removes non methane components after which it can used as a combustion agent. Natural gas is the cleanest of all fossil fuels. Due to its low emissions when combusted, it is categorized as a more environment friendly fuel compared to coal or oil. [95]

The more carbon a certain type of fuel has, the higher the CO2 emission when combusted. Since natural gas consists mainly of methane CH4, its CO2 emission is much lower than other fossil fuels. Natural gas emits 55% less CO2 than coal when combusted in an energy plant. The emission of a transport vehicle running on natural gas is between 15 to 20 % less than that of gasoline. [96]

Table 5: CO2 Emissions in pounds per million British Thermal Units (Btu) of Energy for Fossil Fuels

Coal	214.3
Diesel fuel and heating oil	161.3
Gasoline	157.2
Propane	139.0
Natural gas	117.0

Source: US Energy Information. https://www.eia.gov/tools/faqs/faq.php?id=73&t=11

[95] US Energy Information Administration. (06.09.2018)
[96] US Department of Energy (06.09.2018)

Globally natural gas is mainly used for heating and electricity generation beside its use for chemicals, the petrochemical industry, pharmaceuticals and transportation. While the percentage of use as fuel for transportation is still low, the potential is high for the future. Especially in South East Asia the numbers of vehicles using compressed natural gas (CNG) are rising.

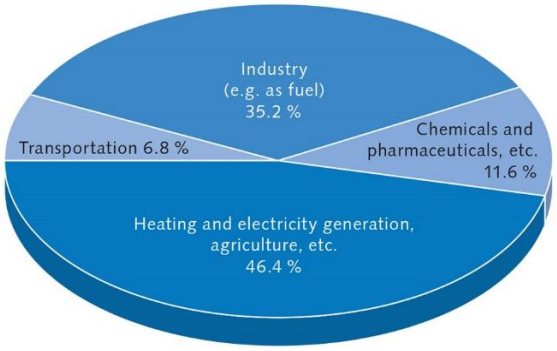


Figure 5: Global Share of Natural Gas Use per Sector

Source: World Ocean Review https://worldoceanreview.com/en/wor-3/oil-and-gas/sating-our-energy-hunger/

40% of conventional natural gas reserves (excluding shale gas) are located in the Middle East and 30 % are located in Russia and the Central Asian Republics. [97]

[97] Boyle G., Everett B., Peake S., Ramage J. (2012). Energy systems and sustainability: Power for a sustainable future. Oxford UK. Oxford University Press

Table 6: Natural Gas Reserves Ranking by Country in cubic meters including Turkey

1	Russia	47,800,000,000,000	1 January 2017 est.
2	Iran	33,500,000,000,000	1 January 2017 est.
3	Qatar	24,300,000,000,000	1 January 2017 est.
4	United States	8,714,000,000,000	1 January 2016 est.
5	Saudi Arabia	8,602,000,000,000	1 January 2017 est.
6	Turkmenistan	7,504,000,000,000	1 January 2017 est.
7	United Arab Emirates	6,091,000,000,000	1 January 2017 est.
8	Venezuela	5,701,000,000,000	1 January 2017 est.
9	Nigeria	5,284,000,000,000	1 January 2017 est.
10	China	5,194,000,000,000	1 January 2017 est.
11	Algeria	4,504,000,000,000	1 January 2017 est.
12	Iraq	3,158,000,000,000	1 January 2017 est.
13	Mozambique	2,832,000,000,000	1 January 2017 est.
14	Indonesia	2,775,000,000,000	1 January 2017 est.
15	Kazakhstan	2,407,000,000,000	1 January 2017 est.
16	Egypt	2,186,000,000,000	1 January 2017 est.
17	Canada	2,182,000,000,000	1 January 2017 est.
18	Australia	1,989,000,000,000	1 January 2017 est.
19	Norway	1,856,000,000,000	1 January 2017 est.

20	Uzbekistan	1,841,000,000,000	1 January 2017 est.
...	...	...	
77	Turkey	18,490,000,000	1 January 2017 est.

Source: World Fact Book, CIA, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2253rank.html

As it is the case with oil, natural gas reserves rankings do not reflect the capacity of production due to lack of know-how, unfavorable political climate, security risks and geological challenges in some resource rich countries. Especially in the case of Middle Eastern countries, local consumption of natural gas limits the capacity for exports.

It is notable that the US has risen to be the top natural gas producer due to the so called shale gas revolution which enabled the US to tap into reserves previously not extractable.

Table 7: Natural Gas Production by Country in cubic meters including Turkey

1	United States	766,200,000,000	2015 est.
2	Russia	598,600,000,000	2015 est.
3	Iran	184,800,000,000	2015 est.
4	Qatar	164,000,000,000	2015 est.
5	Canada	149,900,000,000	2015 est.
6	China	138,400,000,000	2016 est.

7	European Union	120,000,000,000	2016 est.
8	Norway	117,200,000,000	2015 est.
9	Saudi Arabia	102,300,000,000	2015 est.
10	Turkmenistan	83,700,000,000	2015 est.
11	Algeria	83,040,000,000	2015 est.
12	Indonesia	72,800,000,000	2015 est.
13	Australia	67,200,000,000	2015 est.
14	Malaysia	63,430,000,000	2015 est.
15	United Arab Emirates	60,180,000,000	2015 est.
16	Uzbekistan	55,700,000,000	2015 est.
17	Netherlands	47,460,000,000	2016 est.
18	Nigeria	45,150,000,000	2015 est.
19	United Kingdom	41,340,000,000	2015 est.
20	Trinidad and Tobago	40,870,000,000	2015 est.
...	...	...	
73	Turkey	381,000,000	2015 est.

Source: World Fact Book, CIA, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2249rank.html

Consumption natural gas is highest in developed countries because of its use in industry and daily life such as heating and transportation.

Table 8: Natural Gas Consumption Ranking by Country in cubic meters including Turkey

1	United States	773,200,000,000	2015 est.
2	Germany	773,200,000,000	2015 est.
3	Russia	418,900,000,000	2015 est.
4	Mexico	418,900,000,000	2015 est.
5	European Union	402,100,000,000	2016 est.
6	China	210,300,000,000	2015 est.
7	United Kingdom	186,200,000,000	2015 est.
8	United Arab Emirates	186,000,000,000	2015 est.
9	Iran	186,000,000,000	2015 est.
10	Japan	123,600,000,000	2015 est.
11	Thailand	114,800,000,000	2015 est.
12	Canada	114,800,000,000	2015 est.
13	Saudi Arabia	102,300,000,000	2015 est.
14	India	102,300,000,000	2016 est.
15	Turkey	81,350,000,000	2015 est.
16	Egypt	77,930,000,000	2015 est.
17	Argentina	72,030,000,000	2015 est.
18	Italy	70,910,000,000	2015 est.
19	Korea, South	69,630,000,000	2015 est.

20	Turkmenistan	67,520,000,000	2015 est.

Source: World Fact Book, CIA, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2250rank.html

Figure 6: Global Natural Gas Supply and Demand by Region

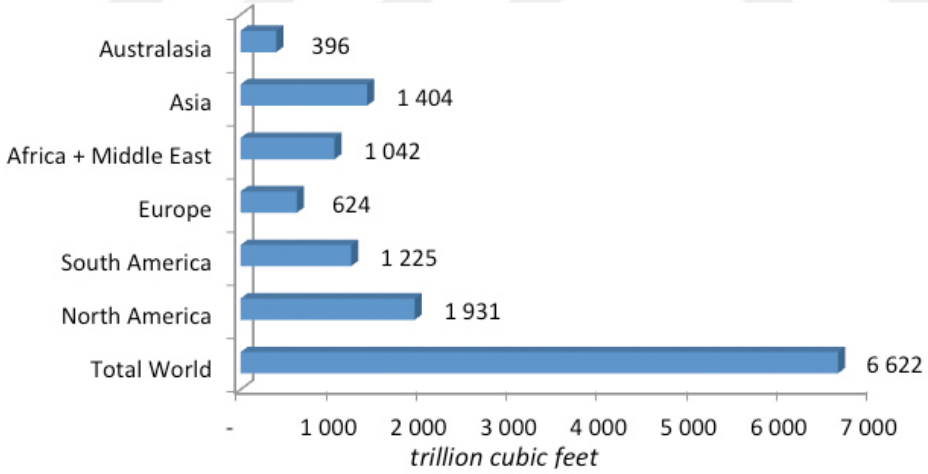
Source: IGU International Gas Union https://www.igu.org/resources-data

Unconventional Natural Gas: Technical advancements in extraction methods in the last two decades have led to new reserves being accessible. These newly acquire reserves are called ‘unconventional’ due to their extraction technique. Ten years ago in the US the percentage of unconventional gases was only 1%, while it has reached 23% in recent

years. With the addition of unconventional resources the global volume of reserves has been updated by 40%. [98]

Shale Gas is found in shale rock where it is trapped in clay particles or in micro-fractures in the rock, whereas another form of unconventional gas is Tight Sands Gas, which is found in sandstone and carbonate. These materials limit the gases ability to flow to the surface due to its low permeability. Methane Hydrates are usually found in porous ice with methane molecules. Particular sublayers of Arctic permafrost and layers beneath the ocean floor contain Methane Hydrates. Coalbed Methane is methane trapped in coal beds.[99]

Figure 7: Recoverable Shale Gas reserves by Region (2011)



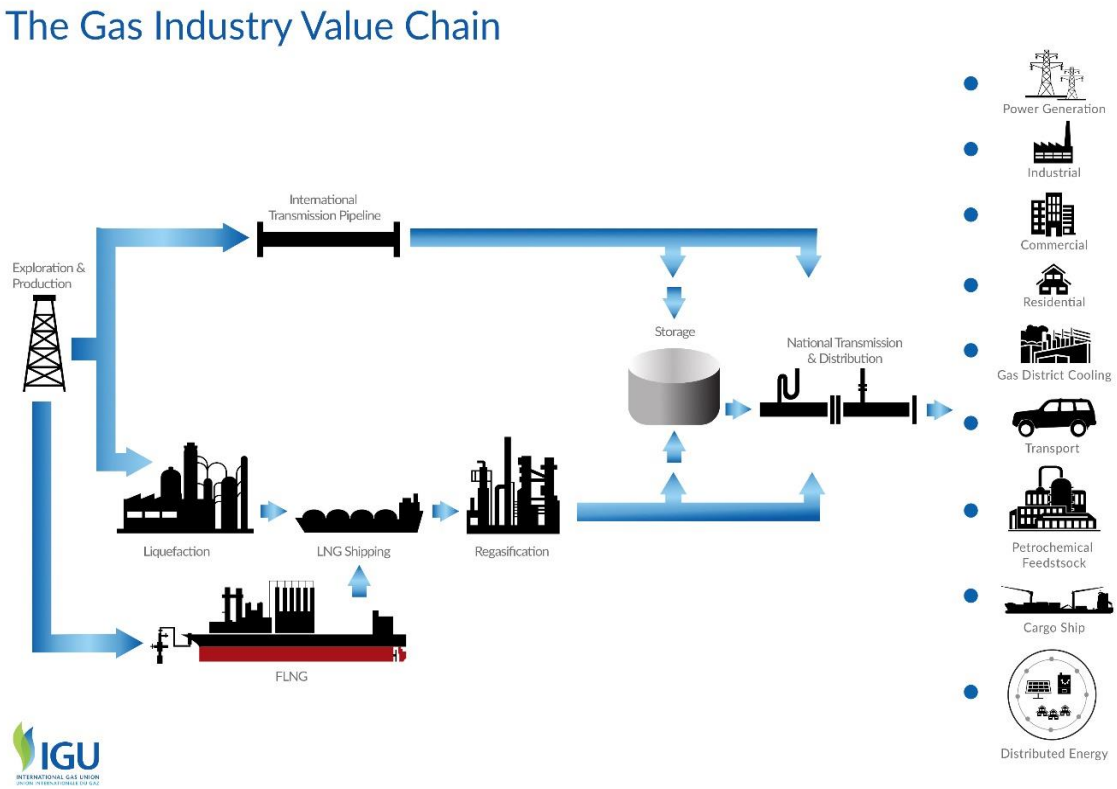
Source: 2011World Energy Council Shale Gas Report

[98]Energy Information Agency, (2018) Unconventional gas resources. (06.09.2018) https://www.eia.gov/analysis/studies/worldshalegas/
[99] International Gas Union. (06.09.2018)

2.5 Currently Existing Energy Transportation & Trade Routes

Due to the fact that main energy resources and main consumer countries are located in different parts of the world, the transportation of energy and the required infrastructure plays a crucial role for energy security. Natural gas transportation is basically divided into pipelines and LNG (liquefied natural gas) shipments.

Figure 8: The Gas Value Chain



International Gas Union, https://www.igu.org/dialog-sidebar/gas-industry-value-chain

2.5.1 Shipping of LNG (Liquefied Natural Gas)

Natural gas needs to be liquefied form is gas state so that it can be transported via tankers. To this end, natural gas is cooled down through compression, condensation, expansion, evaporation, which is a refraction cycle that transforms gas into liquid. To enable the transformation the gas needs to be cooled down to -160°C. The volume of gas decreases by 600 % when liquefied, which makes transport of large quantities possible. Specially made tanker ships with thermally insulated tanks, transport the gas to its destination. Once it arrives at the LNG terminal, LNG is stored in cryogenic tanks where it maintains its liquid form. LNG needs to be degasified so that it can be pumped into the national gas transmission network. The LNG is degasified and pressurized through heat exchangers. LNG shipments cover only 22% of the international gas trade which corresponds to only 5.6% of the global natural gas demand.[100]

Malaysia, Indonesia, Brunei and Australia produce 33% of the global LNG production. Australia has a rising potential and is poised to rival Qatar in its exports to the Asia Pacific region and beyond.[101]

It is notable that the entire European Union combined has a lower import volumes of LNG than only two East Asian nations, Japan and South Korea. The reason for this seemingly contradiction is that Europe receives a substantial portion of its gas through a wide network of pipelines that originate in, or pass through Russia.

[100] Energy Information Agency. (06.09.2018)
[101] World Energy Resources 2013 Survey. (06.09.2018)

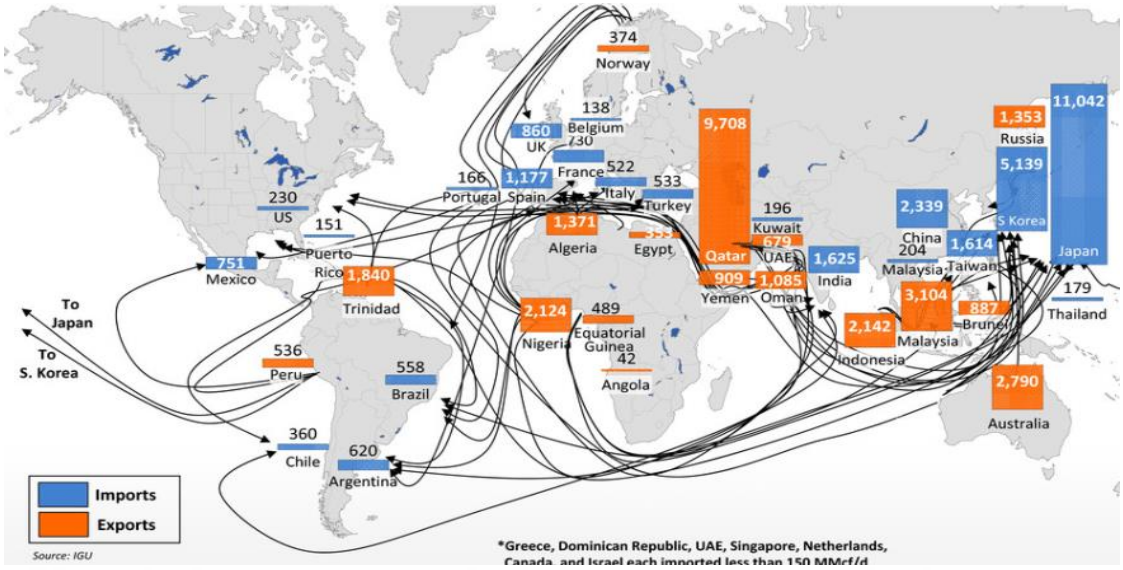


Figure 9: Major LNG Terminals, LNG Export & Import Volumes and Global LNG Trade Routes

Source: International Gas Union

2.5.2 Pipelines

Pipelines are the main means of transportation of natural gas. They account for 78% of the international gas trade.[102]

Pipelines are usually used in interregional gas trade when the distance between source and consumer is not too long. LNG shipments are used for long distance transportation such as trans-oceanic shipments. The duration and quantity of the energy need on the buyers side is also a factor. Pipelines are preferred for long term & large quantity energy needs while LNG is a better solution for short term & low quantity shipments. Both types of transportation have certain advantaged and disadvantages. Pipelines require major

[102] Energy Information Agency. (2018) Pipelines explained. (06.09.2018) https://www.eia.gov/energyexplained/index.php?page=natural_gas_pipelines

investment costs during its construction phase, but once built they are relatively easy to maintain and supply a steady flow of energy over decades. Pipelines also require a lot of planning, trade agreements etc. before the construction even starts. LNG shipments can be arranged relatively quickly but their costs are higher due to liquefaction and regasification. This requires additional procedures as well as infrastructure investments which make LNG a costly choice compared to pipelines. LNG shipments are small in volume compared to pipeline transmission.

The EU depends heavily on natural gas transported via the Russian pipeline network. The pipeline network running from Russia to EU countries is one of the most extensive networks in the world. The total transmission capacity of natural gas pipelines from Russia to The EU are over 120 billion cm. This equals more than a third of the EU's entire natural gas imports.

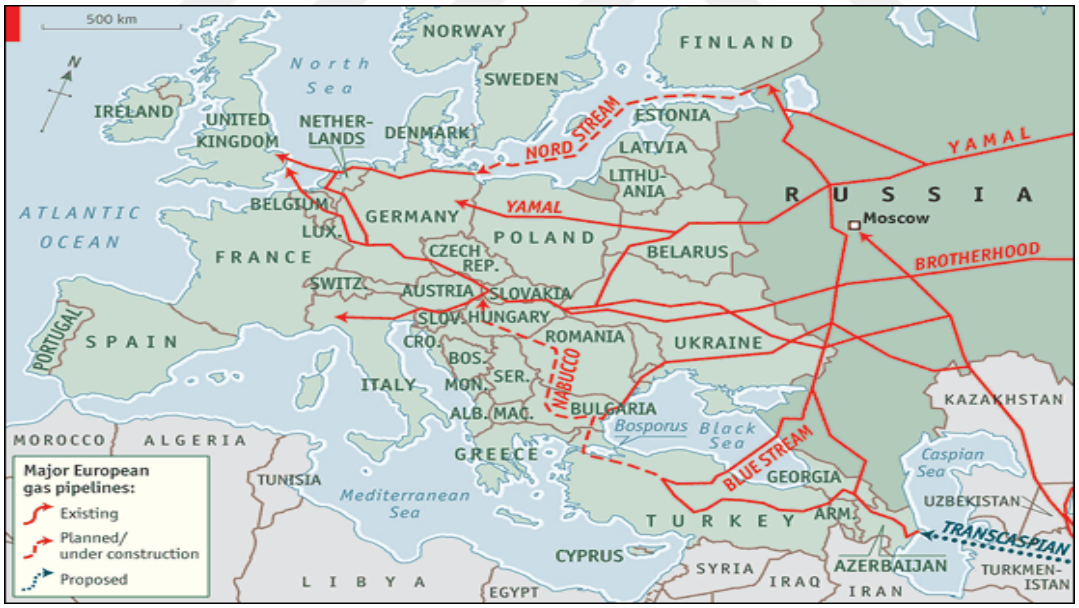


Figure 10: Major European Natural Gas Pipelines

Source: The Economist, https://www.economist.com/node/9009041

There is sizeable network of currently operational major east-west natural gas pipelines between Russia, Azerbaijan, Turkey and the EU.

Russia's major natural gas pipelines supplying the EU and Turkey:

Name: Yamal-Europe

Capacity: 1.2 tcf/a (trillion cubic feet per year)

Length: over 1,000 miles

Source: West Siberian fields Urengoy area

Destination: Poland, Germany and northern Europe via Belarus

Name: Blue Stream

Capacity: 0.6 tcf/a (trillion cubic feet per year)

Length: 750 miles

Source: West Siberian fields

Destination: Turkey via the Black Sea

Name: Nord Stream

Capacity: 1.9 tcf/a (trillion cubic feet per year)

Length: 760 miles

Source: West Siberian fields

Destination: Germany and northern Europe via the Baltic Sea

Name: Urengoy-Ukhta, Bovanenkovo-Ukhta, and Ukhta-Torzhok

Capacity: 6.0 tcf/a (trillion cubic feet per year)

Length: over 1.500 miles

Source: Bovanenkovo field on the Yamal peninsula and Urengoy area fields

Destination: Western Russia and Europe

Name: Soyuz and Brotherhood

Capacity: over 3.5 tcf/a (trillion cubic feet per year)

Length: over 2,800 miles

Source: West Siberian fields including Urengoy area, Russian Urals fields, and Central Asia

Destination: Western Russia and Europe via Ukraine

Name: Southern Corridor

Capacity: 2.2 tcf/a (trillion cubic feet per year)

Length: Western route 550 miles, Eastern route 1,010 miles

Source: West Siberian fields including Urengoy area

Destination: Turkey and Europe via Turkish stream pipeline

Name: Turkish Stream

Capacity: line 1, 0.6 tcf/a (trillion cubic feet per year), lines 2-4, 1.7 tcf/a (trillion cubic feet per year)

Length: line 1 over 500 miles, lines 2-4 over 500 miles

Source: line 1 and 2-4, West Siberian fields including Urengoy area

Destination: line 1 Turkey, Line 2-4 Southeast Europe via Turkey[103]

[103]Gazprom. (2018). Natural gas pipelines in operation. (06.09.2018). http://www.gazprom.com/about/production/projects/pipelines/

Azerbaijan's major natural gas pipelines supplying the EU and Turkey:

Name: Baku - Tbilisi – Erzurum Natural Gas Pipeline (BTE)

The pipeline transports natural gas from the Caspian Shahdeniz fields to Turkey via Georgia. Planning started with the related agreement for the purchase of gas on the 12th of March 2001. The agreement between BOTAŞ and SOCAR covers a 15 year duration. Construction works kicked off on the 16th of October 2004. The annually transmitted volume is 6.6 billion cm and the length is 980 km with a 42” pipe diameter. The pipeline is operational since the 4th of July 2007. [104]

[104] SOCAR State Oil Company of Azerbaijan. (06.09.2018)

3. TRANS ANATOLIAN NATURAL GAS PIPELINE PROJECT (TANAP)

Note: As the Corporate Communications Director of the Trans Anatolian Natural Gas Project, I had access to specific project related data and the ability to make interviews with leading officials from the Ministry of Energy and Natural Resources of the Republic of Turkey and several high ranking project officials. Information from above mentioned primary sources has been used to enhance the quality and authenticity of this study.

The TANAP pipeline will carry Azerbaijani natural gas to Turkey and the EU. It is by far the largest energy project realized in the history of both Azerbaijan and Turkey. The pipeline stands out in terms of size, financial volume and strategic importance.

3.1 TANAP Vision Statement

“Our vision is to open up a new gas supply corridor from Azerbaijan to Europe in order to enhance supply security and diversity to the Turkish and European natural gas markets and strengthen the economic cooperation among countries in the supply chain by stimulating investments and fostering the gas to gas competition.”

The TANAP Project is set to bring natural gas produced in Azerbaijan’s Shah Deniz-2 gas field, and in the other areas of the Caspian Sea, to Turkey and on to Europe. That way it will contribute to Turkey's natural gas supply security and diversify the countries sources of supply. Azerbaijan will gain by entering new markets with its natural gas while contributing to energy supply security and stability in the region. The "Intergovernmental Agreement between the Government of the Republic of Turkey and the Government of the Republic of Azerbaijan on the Trans-Anatolian Natural Gas Pipeline System" and its attachment, the "Host Government Agreement" have been signed on June 26, 2012 in

Istanbul. [105]

These agreements are the legal basis of the project. The Host Government Agreement was amended and re-signed on May 26, 2014 and subsequently approved by the Turkish Parliament on September 10, 2014. On the 14th of October 2014 the agreement for the purchasing of the main line pipes was signed. This stage in the project is important because it is a point of no return, meaning that after the main line pipes for a pipeline project are purchased the project cannot be shelved anymore as it happened with the TANAP's predecessor, the Nabucco project.

3.2 Ownership Structure

The State Oil Company of Azerbaijan, SOCAR has formed a separate company named SGC for its shares in TANAP. It holds 51% of the shares.

Apart from SGC, SOCAR holds another 7% in its own name. BP holds 12% while the Turkish national gas transmission company holds 30%. It is notable that the Republic of Turkey holds also 19% of shares in the Shahdeniz Consortium SDH2 which is the 'upstream', meaning the source area of the natural gas in the Caspian Sea as well as another 19% in the Georgian part of the pipeline.

[105] TANAP Trans Anatolian Natural Gas Pipeline. Management Project Documents (06.09.2018)

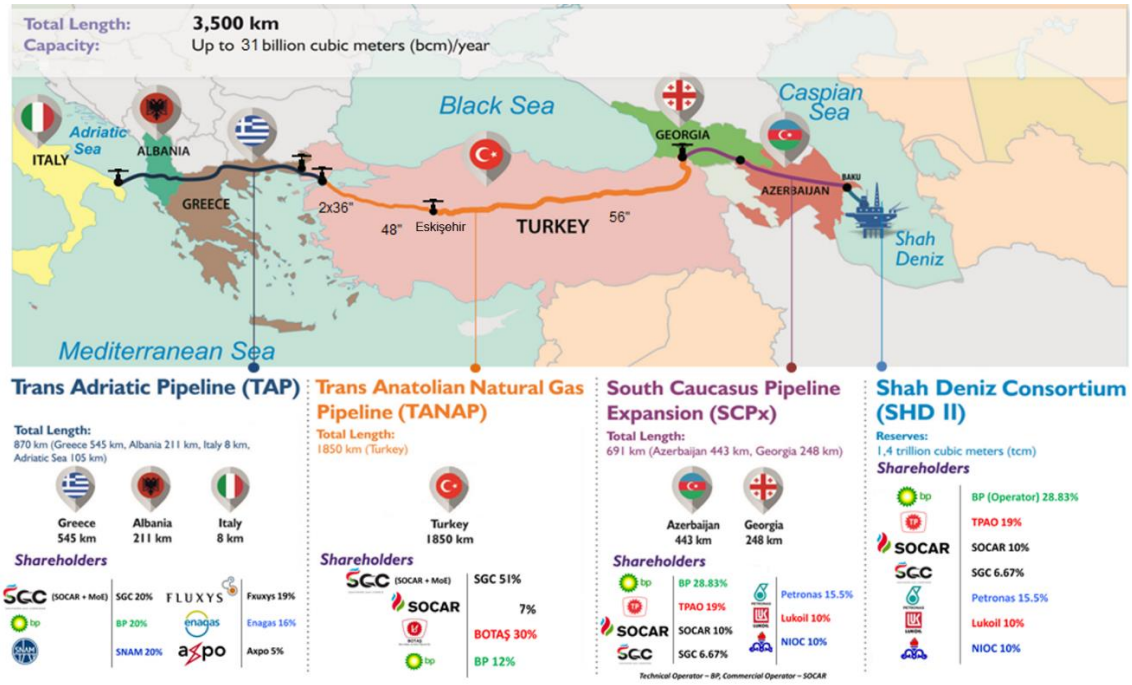


Figure 11: TANAP Shareholders Infographic

Source: TANAP

3.3 Project Cost and Financing

TANAP's shareholders have decided to pursue shareholder finance instead of project finance to reduce time requirements, complexity and the cost of financing. Each shareholder is responsible for its share of the project cost: SGC (58 percent7), BOTAŞ (30 percent) and BP (12 percent).[106]

The current cost estimate is about US$8.6 billion (breakdown in Table 1). These costs are well below original estimates prepared by international firms, in part due to competitive

[106] Energy Ministry Republic of Turkey. (2017) TANAP shareholders signing ceremony. (06.09.2018). http://www.enerji.gov.tr/tr-TR/Bakanlik-Haberleri/TANAP-Ortaklar-Anlasmasi-Imza-Toreni

bidding. As all major contracts have been awarded, there is relative certainty on the costs moving forward and the risk of cost overruns is low, especially since the estimate includes a conservative US$1.4 billion as a contingency provision.

International Bank for Reconstruction and Development (IBRD), Multilateral Investment Guarantee Agency (MIGA), Asian Infrastructure Investment Bank (AIIB), European Bank for Reconstruction and Development (EBRD) and European Investment Bank (EIB) have approved the loans for TANAP's shareholders for their TANAP project related cash requirements. TANAP shareholders have secured $3.75 billion under the loan agreements with international finance institutions including IBRD, MIGA, AIIB, EBRD and EIB.

TANAP was granted European Union wide 'Project of Common Interest' status by European Commission, as it has material cross border impacts at the level of European Union by contributing to the safe and reliable gas supply to the European Union. Accordingly, TANAP was found eligible for grants for studies under the Connecting Europe Facility (CEF) Program which amounted €10.2 million.[107]

3.4 Route and Technical Specifications

TANAP, starting from the Turkish village of Türkgözü in the Posof district of Ardahan located on the border with Georgia, runs through 20 provinces including Kars, Erzurum, Erzincan, Bayburt, Gümüşhane, Giresun, Sivas, Yozgat, Kırşehir, Kırıkkale, Ankara, Eskişehir, Bilecik, Kütahya, Bursa, Balıkesir, Çanakkale, Tekirdağ and Edirne. At the Greek border in the İpsala district of Edirne, it will connect to the TAP Pipeline which will convey the natural gas to European nations.

[107] TANAP Trans Anatolian Natural Gas Pipeline. Financial Department Project Documents (06.10.2018)

Two off-take stations are located within Turkey for natural gas transmission through the national grid, one in Eskişehir and the other in Trakya. The Trans Anatolian Natural Gas Pipeline System, with a 17, 5 km submerged passage at the Dardanelles strait, consists of a total of 1850 km. The numbers and specifications of the above ground facilities to be used in operating the connection lines to the off-take stations in Turkey are given below:

- 7 compressor stations (when the bearing capacity reaches 31 billion cm),
- 12 pigging stations,
- 2 off-take stations to supply the national natural gas network of Turkey,
- 4 measuring stations,
- 49 block valve stations.

With its route through 20 provinces, 67 districts and nearly 600 villages with different social and demographic characteristics, almost 60% of the pipeline has been laid in a hilly to mountainous terrain.

The pipe diameter is 56 inches (1.422 mm) from the Georgian border to Eskişehir, and 48 inches (1.219 mm) from Eskişehir to the Greek border. The offshore section is 36 inches. The first 600 km from East to West is at 2,000 m altitude on average. The Çanakkale Sea Crossing of the line consists of a twin pipeline system with a diameter of 36 inches (914 mm). 56 inch diameter pipes used in construction are approximately 12-13 meters in length and 8.5-9 tons in weight, which resulted in additional logistic and constructability challenges. Due to climate, in certain sections of the pipeline route the construction season is limited to 110 days only which posed another challenge to construction activity. As part of the 1.850 km long pipeline, 4,400 crossings that consist of watercourses, roads, railways, pipelines, power lines, buried cables, water and sewage systems and similar infrastructures have been made only for the 56 inch section of the

pipeline.[108]

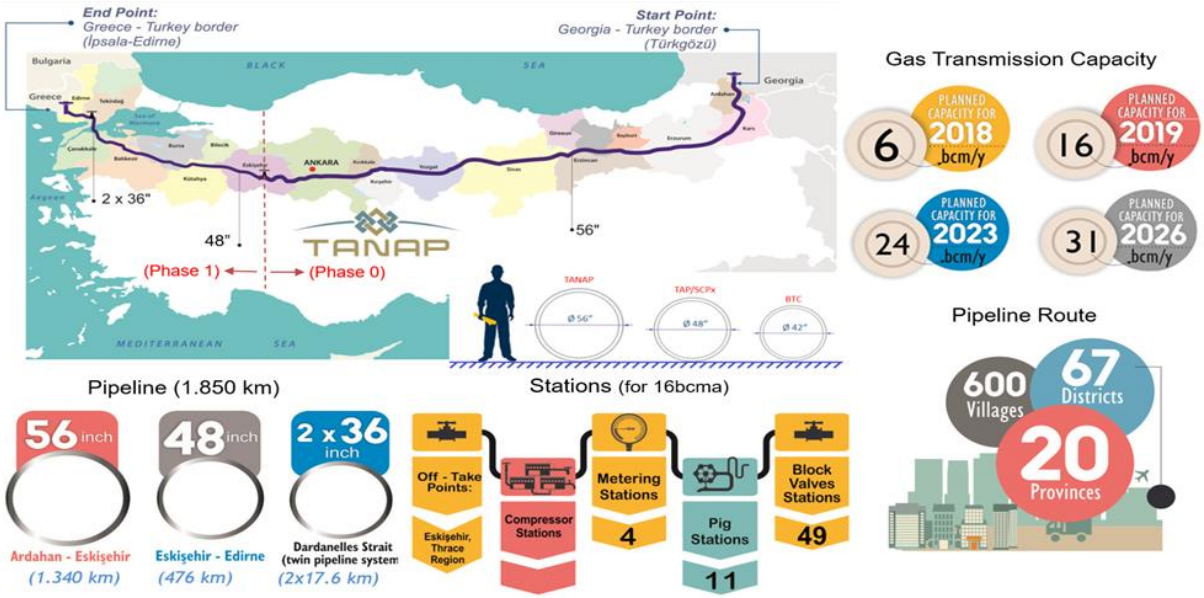


Figure 12: TANAP Pipeline Data Infographic

(Source: TANAP)

In addition to main pipeline facilities, temporary camps, storage areas and access roads have been built. The entire system and pipelines except the temporary facilities used in the construction phase and all above ground facilities were designed as embedded.

Within the scope of the Project, above ground facilities of 4 measuring stations, 2 main line compressor stations and 1 off take station are under construction. With the capacity of the pipeline increased to 31 billion m3, the number of main line compressor stations will total seven. The compressor stations, which are part of the above ground facilities,

[108] Interview with Dr. Saltuk Düzyol CEO of TANAP (20.05.2018)

ensure that gas is pressurized along the pipeline by compressing it at certain intervals. The measuring stations provide volume measurements and inventory during the flow of natural gas through the pipeline. An annual amount of 16 billion cubic meters of natural gas is predicted to be transported initially of which 6 billion cubic meters are to be utilized in Turkey. The transport capacity of the line is planned to be raised to 24 billion cubic meters and then to 31 billion cubic meters with additional investments.[109]

3.5 Offshore

The offshore of the project is maintained by a 36-inch twin pipeline system, each pipe line having a length of 17, 5 km. The pipeline submerges on the Anatolian side 5 km west of Biga district, Çanakkale province and resurfaces on the European side 13 km southwest of Şarköy district, Tekirdağ province. For the sea crossing, 3100 pipes of 12 m each, covered with 100 mm, 80 mm and 60 mm concrete are used, at a maximum water depth of 65 m. [110]

TANAP Natural Gas Pipeline offshore construction activities were subject to environmental and social standards.

Relevant studies have been carried out in regard to health and safety measures for communities and to eliminate the potential of loss of income in all settlement areas that were open to impact during offshore construction activities. One such initiative is the "Offshore Fisheries Livelihood Restoration Plan" which was initiated by TANAP with the aim to compensate for any potential negative impact on commercial fishery activities during sea crossing construction activities. Within the scope of above mentioned plan, a fuel assistance program has been implemented for local fishing boats that are engaged in small-scale coastal fishing activities.

[109] TANAP Trans Anatolian Natural Gas Pipeline. Contracts Department Project Documents (06.11.2018)
[110] TANAP Trans Anatolian Natural Gas Pipeline. Engineering Department Project Documents (06.11.2018)

An ‘Integrated Management System’ which is in accordance with ISO 9001, ISO 14001 and OHSAS 18001 standards is used for the project. Due to financing by international institutions such as the World Bank and the European Bank for Reinstatement and Development EBRD, the TANAP project is subject to implementation of internationally recognized work safety performance criteria alongside related national legal requirements.

3.6 Environmental and Socio-Economic Initiatives

The project has allocated a budget of 70 Million USD with the aim of contributing to the socio-economic development of the regions on its route and to the overall economy with new business and employment opportunities. The pipeline provides direct or indirect employment to about 15,000 people in the 20 provinces it passes through. The budget is also used to provide The ‘Social and Environmental Investment Programs’ which consists of direct contributions and benefits provides new business opportunities to a large number of small and medium-sized industrial and commercial enterprises for the local community along the route. Before the construction phase an ‘Environmental and Social Impact Assessment’ process including numerous sub-studies have been carried out for the participation of all the stakeholders in the project, aiming to inform the public about the project, to obtain opinions, questions and suggestions related to the project. Prior to the start of construction activities, affected residential areas and local governments have been visited and stakeholders have been informed about the construction schedule. These studies have continued throughout the construction period.

During construction activities, adults are educated in settlements and children in elementary schools in order to raise the awareness of local people about traffic and construction safety issues. In addition, consultation meetings are held at all stages of the project to address various issues. The Environment and Social Impact Assessment process began with the application file submitted to the Ministry of Environment and

Urbanization on January 7, 2013 and was executed by taking into account the national and international standards. The report was submitted to the Ministry of Environment and Urbanization on May 16, 2014, and the project received the "EIA Positive Certificate" for the Environment and Social Impact Assessment (ESIA) Report on July 24, 2014. During the ecological researches conducted within the scope of the ESIA studies, land and aquatic animals as well as plants were determined along the pipeline route and were classified according to international criteria.[111]

3.6.1 Social and Environmental Investment Program (SEIP)

As part of TANAP's international obligations, the project also contributes to the socio-economic development of the country through projects implemented in the provinces, districts and villages on its route in line with the Social and Environmental Investment Program. The declared aim of these is to preserve natural resources together with maintaining economic and social development by establishing a union coherent with the ecosystem throughout the TANAP Pipeline. The programs aims can be summarized as follows:

Social Priorities:

- To support schools, libraries, sports fields and common social spaces by meeting their equipment needs
- To support the improvement of the quality and effectiveness of health services rendered in rural areas
- To expand the capacity of vocational training centers
- To enhance the agricultural production variety, added value and productivity
- To support the production of local and traditional products

[111] TANAP Trans Anatolian Natural Gas Pipeline. Social Department Project Documents (06.12.2018)

Environmental Priorities:

- Sustainable management of water, soil and natural resources
- Development and efficient use of renewable energy resources
- Management of the environmental infrastructure and reinforcement of environmental awareness
- Promotion of cultivation and economic use of aromatic and medicinal plants
- Conservation and development of biodiversity and ecosystems[112]

3.7 Land Acquisition

The expropriation procedures carried out within the scope of the TANAP Project have been conducted by the General Directorate of BOTAŞ, which is assigned as the Land Rights Entity with the decision of the Council of Ministers, in accordance with the Host Government Agreement, the Law Concerning the Transit Passage of Oil with Pipelines and the Expropriation Law numbered 2942 as amended with Law No. 4650. Since it is the national gas carrier company, land expropriation was delegated to BOTAŞ.[113] For this purpose, local land acquisition bureaus were established within the body of the TANAP Expropriation Directorate which was instituted by BOTAŞ and named "Expropriation Branch Offices" Within the scope of the project, land has been expropriated for fixed plant sites and access roads. On land located in the 16-meter pipeline corridor, permanent and exclusive surface right is established which is valid throughout the construction and operation of the pipeline. During the expropriation of the pipeline corridor, lands were not subdivided. Besides this, in addition to the pipeline corridor, a provisional easement right has been established for a separate area of 20 meters wide in order to carry out necessary activities throughout the construction period. The pipeline route was planned

[112] TANAP Trans Anatolian Natural Gas Pipeline. Social and Environmental Investment Programs Department Project Documents (06.12.2018)

[113] BOTAŞ. (2018). Kamulaştırma ve arazi edinimi. Land acquisition. (06.13.2018). http://botas-ahk.gov.tr/tr/ahk/kamulastirma-ve-arazi-edinimi.aspx

taking into consideration residential areas which could be damaged during the construction of the pipeline.[114]

3.8 Route Selection and Construction

Numerous Turkish and foreign companies took part in the processes of engineering, procurement, construction and production of the project. The project is built on a geography extending from a height of 2,760 meters to a depth of 65 meters in the sea crossing.

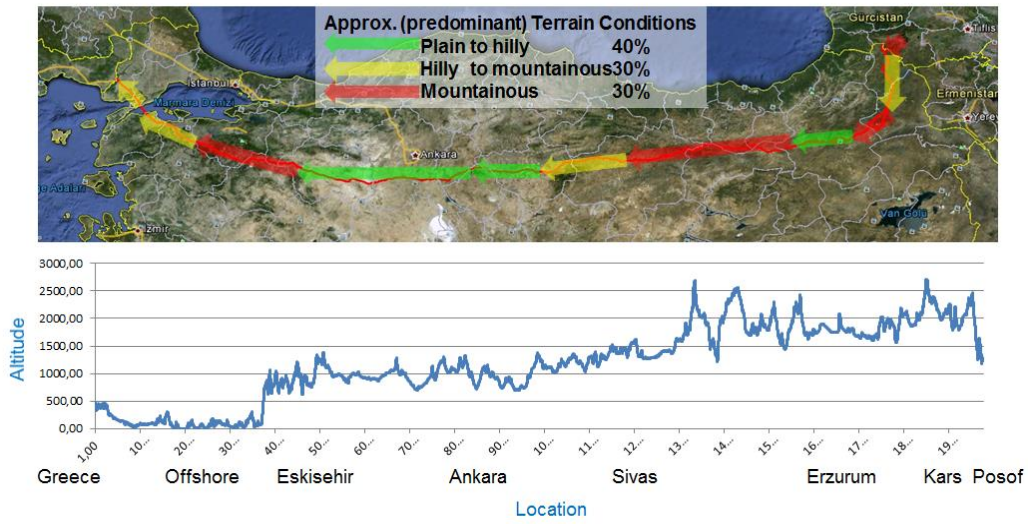


Figure 13: TANAP Route Specifications Elevation Graphic

(Source: TANAP)

The route corridor was determined by taking the following criteria into consideration:

[114] TANAP – BOTAŞ Land Acquisition Department (06.13.2018)

- Constructability
- Minimization of the length of the pipeline for land and sea passage
- Proximity to transport infrastructure to reduce the impact of construction
- Avoidance of areas where geological risks are identified
- Minimization of environmental and social impact
- Minimization of impact on cultural / archaeological sites
- Minimization of impact on major agricultural areas
- Minimization of transits through existing and / or planned infrastructure

Custom manufactured high strength steel pipes and consoles (hot bends) have been used to withstand high operation pressure. 7.000 specific crossings (river, highway, railroad, telecom and electricity substructure etc.) have been conducted. Approximately 150,000 pieces of steel pipes with a weight of 10 tons and a length of 13 meters (approximately 1,200,000 tons) are used in the project. 80% of the main line pipes have been purchased from domestic producers, which was a precondition of the Republic of Turkey before the signing of the host government agreement.[115]

3.9 Groundbreaking and Inauguration

The ceremony for the start of construction of the pipeline was held in the Selim district of Kars on March 17, 2015 with the participations of the President of the Republic of Turkey Mr. Recep Tayyip Erdoğan, the President of Azarbaijan Mr. Ilham Aliyev and the President of Georgia Mr. Giorgi Margvelashvili. The section from the Turkish - Georgian border to Eskişehir is planned to be completed in June 2018, while the final section to the Turkish – Greek border is scheduled to be completed in June 2019.

[115] TANAP Trans Anatolian Natural Gas Pipeline. Construction Department Project Documents (06.13.2018)

The first phase which is named ‘Phase 0’ and runs from Kars to Eskişehir delivers gas to the Turkish natural gas grid has been completed on June 30th, 2018. The inauguration ceremony of TANAP was held on the 12th of June 2018 in the Eskişehir Compressor Station CS-5, which is also the off-take point for the gas that will be delivered to the Turkish national grid of BOTAŞ. Phase 1 which will deliver Caspian gas to Europe is scheduled for completion in June 2019. The TANAP project is set to be fully completed in June 2019 when it is scheduled to connect at the Greek – Turkish border to the TAP pipeline that runs through Greece and Albania, crosses the Adriatic Sea and ends in Italy. From that point the natural gas will be distributed to the EU through the Southern European Natural gas distribution network.[116]

Figure 14: TANAP Timeline

(Source: TANAP)

[116] TANAP Trans Anatolian Natural Gas Pipeline. Corporate Communication Department Project Documents (06.15.2018)

4. TANAP'S CONTRIBUTION TO ENERGY SECURITY

The Trans Anatolian Natural Gas Pipeline is a first for Azerbaijan and Turkey in many ways and holds strategic importance for both countries and the EU. Perhaps the most important aspect of the pipeline is that it is the first of its kind due to its route selection. TANAP spearheads a new and politically stable route for energy transportation from east to west.

4.1 Current Energy Outlook & Policies of Azerbaijan, Turkey and EU

4.1.1 Azerbaijan

Azerbaijan is a country of 9.8 million with a GDP of 40.7 billion USD and an annual GDP growth of -3.1%. The percentage of export goods and services is 46 % of its GDP. [117]

With an annual natural gas production of 28.597,9 million m3 from in and around the Caspian Sea, Azerbaijan is an oil and gas exporting country.[118] Because the recent history of Azerbaijan heavily effects its energy policy today, we shall look briefly into the events that guide present Azerbaijani policy.

As a former Soviet republic it underwent a change towards a market economy after the fall of the Soviet Union. The country managed to become a stable energy exporter even if it was off for a rocky start in its early years of independence. The government of Elchibey between 1991 and 1992 was radically opposed to Russian influence and payed dearly for it. The following Aliyev government was rather diversified in its approach to relations with global and regional powers. But despite its inclusive tone, the Aliyev government deepened

[117] World Bank Country Profile, Azerbaijan. (2018). The World Bank in Azerbaijan. (06.15.2018). http://www.worldbank.org/en/country/azerbaijan/overview
[118] State Oil Company of Azerbaijan Republic SOCAR. (06.15.2018)

ties with Turkey and the West while keeping Russia and Iran at arm's length. While Azerbaijan is committed to cooperation with Russia on economic, political, social and cultural matters and is a member of the Commonwealth of Independent States (CIS), it hasn't tried to fully use the potential of the CIS but rather seems to be satisfied of being 'present'. Azerbaijan also showed little enthusiasm regarding the Russian prompted customs union and the Eurasian Union, not least due to Russia's ongoing support to the Armenian position regarding the Naghorno – Karabagh conflict.[119]

The political elite of the country had a unanimous if silent understanding that the future direction of the country had to be towards the west. Historical ties with Turkey which is part of the western alliance and the technical capacities of western energy companies also added to this understanding. [120]Another important factor that drives Azerbaijan's energy policy is the need to build alliances and gather support in order to secure its survival in regard to powerful neighbors to the south and north. The motivation to regain control over the Naghorno – Karabagh region which was lost to Armenia immediately after independence is also a driving force in Azerbaijani foreign policy. In this regard energy policy becomes a tool to reach foreign policy goals. Azerbaijan hopes to gain support in the west for a favorable solution to the Naghorno – Karabagh problem.

This expectation is not limited to countries Azerbaijan has direct energy deals with. The countries leadership also aims at using energy projects as a platform to gain political support towards a solution of the conflict. The influx of millions of refugees from the lost territories to Baku has put the government under pressure which it wouldn't have been able to deal with if it hadn't been for western support. The inclusion of Turkey in the energy export lines of Azerbaijan with the Baku –Tbilisi – Ceyhan oil pipeline and the TANAP natural gas pipeline was also an effort to increase Turkey's involvement in the region both economically and politically. An increased presence of a friendly NATO country is a welcomed support for Azerbaijan.[121] At the forefront of Azerbaijan's energy

[119] Makili-Aliyev K., (2013) Azerbaijan's foreign policy: Between east and west. p. 7,8 (06.15.2018) http://www.iai.it/sites/default/files/iaiwp1305.pdf
[120] Soltanov E., (2012). The emerging patterns of Azerbaijan's international energy policy: Continuities and changes. Caucasus International. Vol.2 pp. 80, 81
[121] Rzayeva G., (2012) A complicated corridor: Gas to Europe – it's not just economics. Caucasus International,

policy as well as its use in foreign policy is the State Oil Company of Azerbaijan Republic SOCAR, which has substantial investments in all countries that are part of its energy export route, namely Georgia, Turkey, Greece, Albania and Italy.

Since Azerbaijan's only strategically valuable export is energy, the country's main energy policy goals can be summed up as to secure a steady route of export that is not under threat of political instability or hostility, while using its energy exports to further its national security interest, particularly in the Karabagh dispute.

4.1.2 Turkey

Turkey is a country of 79.51 million with a GDP of 863.71 billion USD and an annual GDP growth of 3.2%. The percentage of export goods and services is 22 % of its GDP.[122]

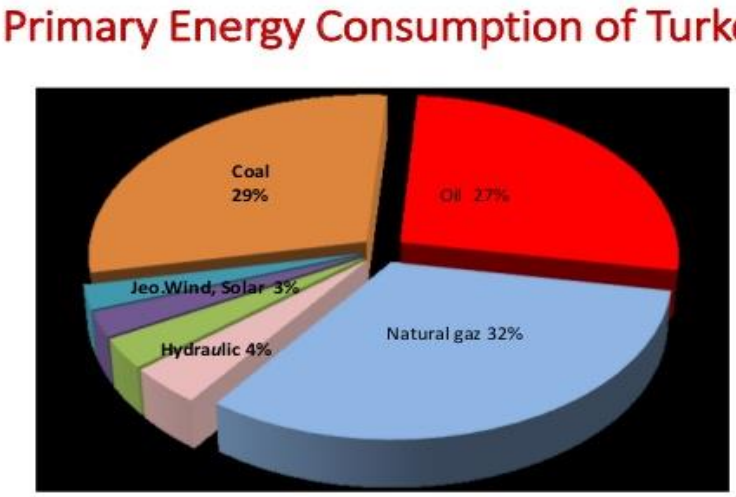


Figure 15: Primary Energy Consumption of Turkey per Source

Source: TEİAŞ

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[122] World Bank Country Profile, Turkey. (2018). World Bank Turkey country profile. (06.15.2018) https://data.worldbank.org/country/turkey

As a country with no substantial oil or natural gas reserves, Turkey is importing almost all of its energy. Only 24.8% of the country's energy needs are met with domestic resources.[123] The need for energy is increased by a fast growing economy. Between 2010 and 2018 the Turkish economy had a growth rate of 5% annually on average.[124] The need for natural gas increased from 22 billion cubic meters (bcm) in 2005 to 49 billion cm in 2015. Turkey's increased gas demand is the result of its domestic gas network being extended to more homes, especially in rural areas. Another important reason for the increase in Turkey's demand is its growing economy and the rise of industrial activity related to the countries impressive growth rate.

Infrastructural disadvantages are important. The domestic gas network is still not able to handle total demand. The networks capacity of 196.5 million cubic meters per day (mcm/d), is below the maximum demand which reaches 230 mcm/d in cold seasons. Two LNG terminals respectively in Aliağa, Izmir and in Marmara Ereglisi, Tekirdağ are operational but the storage capacity is limited.

On the level of regulations Turkey aims to synchronize its regulations and market with that of the EU. The Natural Gas Law of 2001 aims to unbundle BOTAŞ which is the national carrier and network system operator. It also aims to liberalize imports which is required for the countries aim to become a gas hub. After 2009 there has been no progress in these reforms.[125]

[123] Energy Ministry Republic of Turkey. (2016). Energy balance sheet. Energy denge tablosu. (06.15.2018) http://www.eigm.gov.tr/tr-TR/Denge-Tablolari/Denge-Tablolari

[124] Ministry of Development. (2018). Milli gelirler büyüme hızları. National income development pace. (06.15.2018) http://www.kalkinma.gov.tr/Pages/TemelEkonomikGostergeler.aspx

[125] Tordjman F., Schultz M., Rose J., Soares I., (2016)
Energy Policies of IEA Countries 2016 , Turkey, pp. 20,24 (06.17.2018) https://www.iea.org/publications/freepublications/publication/EnergyPoliciesofIEACountriesTurkey.pdf

4.1.3 The European Union

Table 11: European Union Country Profile Data

The European Union is a union of European nations that acts as a supra national body in areas such as foreign policy, defense and energy security among others. Its combined population is 511.360.932 with a GDP of 16.491.323 billion USD. The union's annual growth is 2%. Export goods and services are 43 % of its GDP. [126]

The EU is a main consumer of energy due to its developed industrial capacity and high standards of living. Its energy consumption in 2015 was 1.627 million toe (tons of oil equivalent). More than half of the energy and slightly more than 70 % of the natural gas used by the EU is being imported. Norway supplies 31% of EU's natural gas imports and 11% of EU crude oil imports. Russia supplies 39% of the EU's natural gas imports and 22% come from North Africa namely Algeria and Libya. The remaining 4% are LNG shipments from countries such as Qatar and Nigeria with another 4% from various sources. [127] The EU spent on average 385 billion Euros annually for energy imports. The percentage is highest for oil with 88.8 %. Natural gas is second with 69.1 %. Transport (33.15), households (25.4%), and industry (25.3%) and are the main areas of energy usage in the EU.[128]

[126] World Bank. (2018). World Development Indicators Europe. (06.17.2018). https://data.worldbank.org/region/european-union

[127] European Commission, (06.17.2018)
[128] Eurostat Statistics. (06.20.2018)

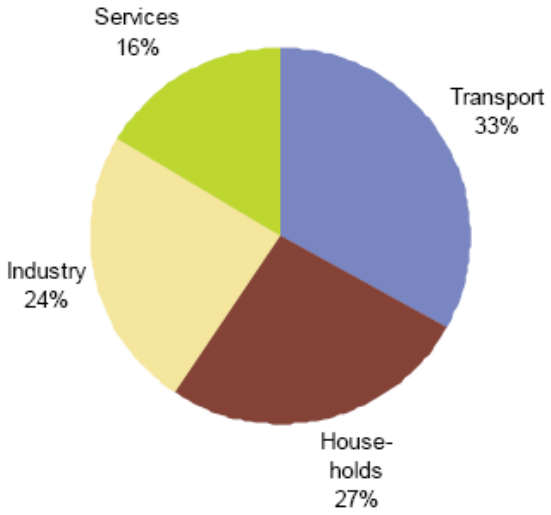

Figure 16: Usage of Natural Gas per Sector in the European Union

Source: Eurostat

The trend is towards deceasing fossil fuels in favor of renewable energy. Coal and oil make up combined 51% of the EU's energy consumption. Due to high emissions of coal and oil, the decrease which is aimed to reach 32% by 2040, is balanced with natural gas. Therefore natural gas demand has risen from 24 % to 27% in the last decade.[129]

The main goal of EU energy policies is to reach energy supply security and prepare for potential shortages. The set goal for supplies is the ability to supply critical units such as hospitals and major centers with gas for at least 30 days in case of disruptions. Gas storage capacity plays a crucial role. The existing storage capacity is reasonable in nations such as German, Italy and France but too low in eastern European countries and the UK. [130]

[129] BP Energy Outlook 2018 EU. (06.20.2018) https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018-region-insight-eu.pdf
[130] Vermeeren R. (2017). The role of gas storage in internal market and in ensuring security of supply. European Commission. (06.20.2018). pp. 19 https://ec.europa.eu/energy/sites/ener/files/documents/REPORT-Gas%20Storage-20150728.pdf

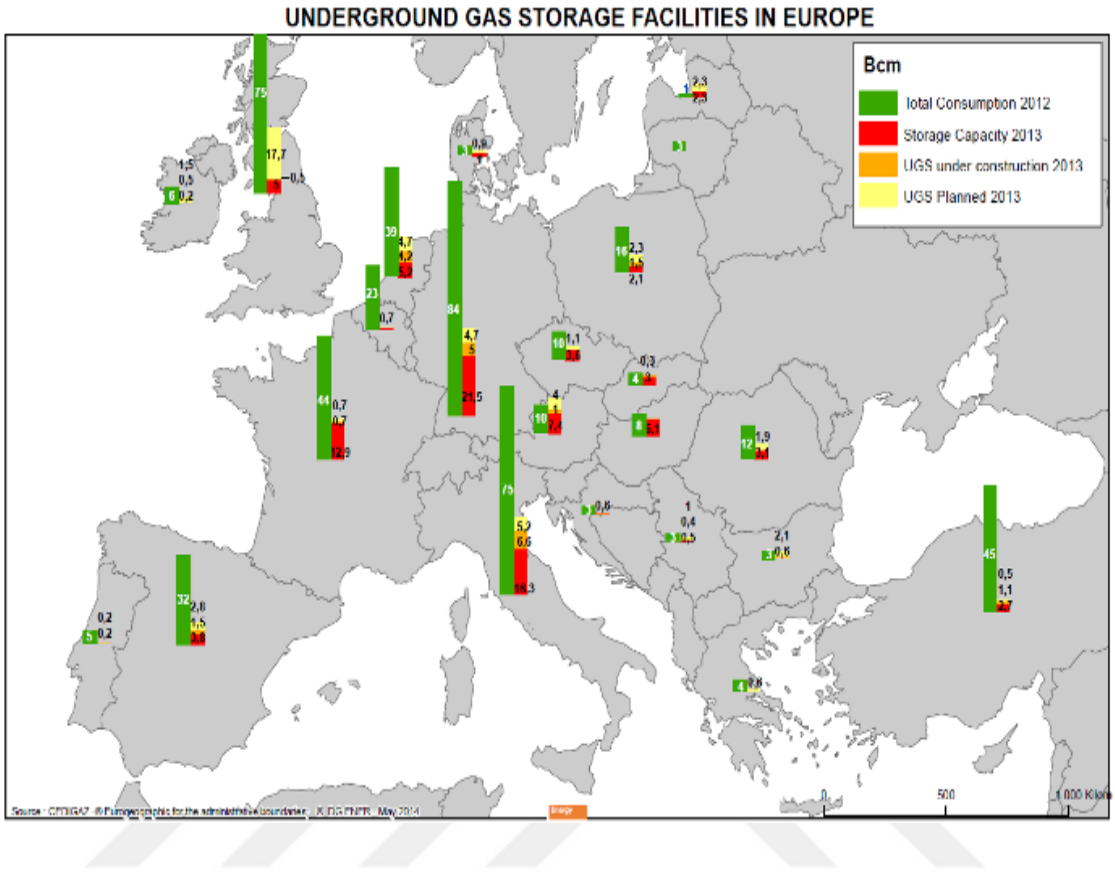

Figure 17: Underground Gas Storage Capacity of EU and Turkey

Source: CEDIGAZ/ Comission Staff Working Document 2014

4.2 Energy Regulations of EU

The Communication of the European Commission to the European Parliament and the European Council of 2014 sets out cornerstones of EU energy policy which aims to achieve energy security through following means:

1. The Strengthening of already existing emergency mechanisms with an emphasize on measures of solidarity should the need arise, coordination of risk assessments and contingency plans; and protection of strategic infrastructure.
2. Moderation of energy demand by decreasing waste.
3. Establishing a fully integrated internal energy market.
4. Increasing EU energy production.
5. Further improving energy technologies.
6. Diversificartion of external supplies and related infrastructure.
7. Improved coordination of national energy policies. [131]

It is important to note the 6th decision in the document that refers to 'Diversification of external supplies and related infrastructure' since this is the goal that directly stands in connection with the TANAP project and European support for it.

Another important goal in the document is the aim to 'establish a fully intergared internal energy market'. This means that energy will flow freely across national borders within the EU. Infratsructure, technical arrangements and regulations are supposed to be streamlined to this end. The overall aim of such that an integrated energy market is that energy providers can compete and therefore provide the best energy prices to the EU market. This goal is of importance because it is the primary factor that shapes the commercial status of TANAP and its gas in the EU, which we will look into later in this study.

Besides the 'European Energy Security Strategy' document EU energy policy is based on the '2030 Energy and Climate Framework' published in January 2014 and adopted by the European Council on 24 October 2014, setting out goals to be attained by 2030. This

[131] European Commission. (2014). Communication of the European Commission to the European Parliament and the European Council. (06.20.2018) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0330&from=EN

document is in line with the targets of the 'European Energy Security Strategy' document but emphasizes integration of environmental goals such as 'decarbonization' into energy policies. The drive to reduce greenhouse gas emissions in the EU aims at replacing most carbonand fossil based fuels with renewable energy. But on the medium term coal and oil use will be replaced with natural gas, which leads to a rise in natural gas demand in Europe. Other measures include goals to increase efficiency in energy use and new technologies to limit greenhouse emissions of existing fossil fuel use. [132]

4.3 TANAP's Status in the EU

The natural gas transported by TANAP originates in the Azerbaijani Shah Deniz 2 Field in the Caspian Sea and is therefore a non EU source. Therefore its entrance into the EU energy market is bound to certain technical regulations and trade agreements. Since the EU aims for a fully intergared internal energy market acording to goals set out in the 'European Energy Security Strategy' document adopted in 2014, gas from external sources must physically and commercially enter the integrated market after having been adjusetd to the integrated markets technical and physical standarts.

4.3.1 The EU Free Market

TANAP will have to conform to the norms of the Integrated Market which the EU regards as a basic tenet of cost effective energy security. Markets that are open to competition are seen as the best mechanism to guard against financial or political abuses of the energy by suppliers and traders. This means that unlike in most other regions, the buyer of gas is not the government or a governmental company but the market is open to all types of buyers. (Another advantage of a transparent market that favours competition is that it enables rapid reaction to shortages in form of short term spot shipments of LNG or rerouting national pipeline grid transmissions.)

[132] European Commission 2020 Climate and Energy Package, (06.21.2018)

The free nature of the EU energy market means that the type of purchase agreement for gas enetering the market will also define whether it is going to be a temporary source that is used to fill supply gaps wherever they occur, or whether TANAP'S gas is going to have long term fixed customers which would make it a strategic long term energy supply for the EU and a crucial part of EU energy security policy.

The principle of a free energy market is basically the competition between gas shippers and traders. Every trader has the right to obtain and trade gas from any source/shipper. This diversifies both the gas sources and the offers for Europe and has also a downward effect on the prices.[133] The trend has intensified especially with the rise in the number of LNG terminals in Europe. This enables also US shale gas to enter the European market which in turn is again benefiting Europe.

In Europe rules that TOS' have to abide by are very clear and well established. There are even mechanisms that simplify complex issues such as capacity booking. There is a platform called 'Prisma' including ten European countries, where capacity booking for all ten countries is possible. To give an example, in the past when Russia (Gazprom) wanted to sell and transport gas to a country in Western Europe, Russia (Gazprom) had to make separate agreements with all East European states its gas would traverse. Whereas now the trend is towards making the whole EU one single market in terms of gas sales. For example Italy and the UK are members of this platform. While there is no possibility of Azerbaijani gas to be transported and therefore marketed to Britain because there is no pipeline to the UK, through this platform Azerbaijani gas is marketed to the UK. If as a shipper delivered the gas to Italy, it can be marketed to the UK, because both are part of the same platform. By enabling such mechanisms the EU also practically turns itself into a single market for energy and motivates the 'gas to gas competition'.[134]

[133] European Commission. (2017). Market and consumers. (06.21.2018) https://ec.europa.eu/energy/en/topics/markets-and-consumers
[134] Interview with Erdinç Özen, TANAP Commercial Operations Manager

4.3.2 Commercial Status

The main commercial players in the purchase of TANAP's gas in Europe are shippers and TSO's (Transmission System Operators). TANAP (Trans Anatolian Natural Gas Pipeline), TAP (Trans Adriatic Pipeline) and SCPC (Southern Caucasus Pipeline Company) are all TSO's, while BOTAŞ has a simultaneous TSO function because it operates a network, besides being a shipper. TANAP's interconnection agreement is with BOTAŞ in its TSO function. The shippers are AGSC and BOTAŞ, with whom TANAP has a gas transportation agreement since 2013. Consultations on the operational agreement were still going on at the time of the drafting of this study. [135]

The TANAP project is an exception in certain ways. Usually a TSO is fully independent from any gas traders according to EU practice. Gas traders are not supposed to have a say in the management of TSO's. Even if there is a trader owns shares in a TSO, the management of it has to be separate. In TANAP's case, shippers (BOTAŞ and AGSC) who are TANAP's customers, also have shares at TANAP. This is a result of the transnational nature of the TANAP project and the fact that some of these companies had already been actors in the upstream operations in the Caspian Sea even before the TANAP project.

At the time of this study, TANAP had finalized Gas Transit/Transportation Agreements and Operation Agreements with relevant shippers, and Interconnection Agreements, Operational Balancing Agreements and Interoperability Agreements with TSO's.

In the EU the network, gas that comes from external sources or cross border networks, is subject to network codes that are binding for all TSO's, beyond bilateral agreements and country specific network codes. Thee codes are published by the European Network

[135] ENTSOG. (2018) Security of gas supply. European Network of Transmission Operators, (06.21.2018) https://www.entsog.eu/publications/security-of-gas-supply

of Transmission Operators, ENTSO-G.[136] The codes are bundle of rules that incorporate all cross border networks, including TAP (Trans Adriatic Pipeline) which TANAP connects to inside EU territory. This bundle of rules consists of sub codes such as the balancing network code, the capacity allocation network code, etc. TAP which is going to carry the gas transmitted by TANAP and its stages is operating in a regulatory environment. It is bound by both national codes as well as by the EU's ENTSO-G codes.

All legal engagements and agreements of TAP (and therefore TANAP) are subject to not just the ENTSO-G but also to the regulatory authorities of Greece, Albania and Italy, the three countries TANAP's gas traverses after it has entered the EU.

The common practice in the EU after the 3rd European Gas Directive was proclaimed, is that there are two models for the structuring of TSO's. In the first model the TSO's are fully independent through a term we call 'ownership unbundling', and in the second they are independently managed, meaning that gas traders may own shares in the TSO, but cannot be represented in its management which has to be fully independent from gas traders. It is noteworthy that the only exception that was granted so far was for the TANAP project. TAP has been given the right to reserve a percentage of its transmission capacity to gas traders it had pre-existing trade relations with. At a transmission capacity of 20 billion cm we are talking about 50 % which equals 10 billion cm. The exemption which was granted to TANAP functions as follows: The AGSC Azerbaijan Gas Supply Company delivers the gas up until the EU border. There the gas is marketed to Europe. Of that gas, 10 billion cm are reserved to buyers that AGSC sees fit. The contracts are usually long or medium term contracts. TAP which represents the EU in this matter, requires that there is a transparent process, where the announcement is made publicly. This transparent process is called 'open season'. The open season process is common in all capacity auctioning procedures of such green field projects like TANAP. After TAP has declared its price for transmission and the operational rules that will apply, bidders

[136] European Commission. (2018) Gas network codes. (06.21.2018) https://ec.europa.eu/energy/en/topics/markets-and-consumers/wholesale-market/gas-network-codes

send in their bids. Even if there are more bids than capacity, the ASGC still has the right to reserve 50% of its capacity to buyers it sees fit.[137]

To achieve an effective intergrated market, (besides regulatory framework synchronisation) an infrastructure in form of interconnected pipeline grids that enable two way flow and therefore can make emergency transmissions between gas grids is required. TANAP will be conected to the integrated EU grid as a main external entry point with. The EU has budgeted 200 billion Euros for the neccessary infrastructure works.

4.3.3 Legal Status

There are three different legal frameworks along the TANAP pipeline. In the Caucasus region where the upstream and the first part of TANAP pipeline run through, the host government agreement between the Azerbaijani government and the project companies is the legal basis. In Turkey the network operates according to law no. 4646 which is basically a version of the relevant EU law, but still has some differences. On top of these TANAP's gas is subject to the Turkish Gas Transit Law which was designed for the Baku Tiflis Ceyhan Oil Pipeline and was later modified to fit gas transmissions as well. This law is differs from the Turkish domestic gas transit law. TANAP is subject to the transit law, but since it is also delivering to the national network of Turkey, it is simultaneously subject to Turkish domestic gas transit law. TANAP runs through three different geographical and political areas and therefore three different legislations. The three networks need to be harmonized in regard to their gas programs and timelines. The rules at TAP are set by the EU so they are not open to renegotiation. TANAP has asked for an exemption by suggesting a hybrid system that would incorporate all three regions systems, but this suggestion has not been accepted by the EU. Therefore TANAP accepted the timelines of the EU.

[137] Interview with Erdinç Özen, TANAP Commercial Operations Manager

4.3.4 Technical Status

TANAP is part of a gas value chain stretching from Azerbaijan to the EU. TANAP delivers the gas to TAP which is then responsible to transport it to the EU market. To facilitate this TANAP and TAP have an interconnection agreement. The capacity of the metering station, the parameters that are going to be covered in the metering reports, the question of who is going to operate the metering station are important matters that will have to be clarified before start of operation. Apart from issues that are part of the relationship between the two TSO's, the handling of the nomination process is crucial. The nomination process decides how the daily programs (TANAP uses a daily program, some gas networks operate on an hourly basis) are being settled the day before and how they are being revised both in terms of timelines as well as rules. Most of these are covered by the EU's ENTSO-G codes.

The interconnection agreement between TANAP and TAP shows that TANAP has accepted most of the EU norms and will comply by them. The challenge is that EU nomination timelines are not compatible with the Turkish nomination timelines. Since TANAP's request for a hybrid system that would incorporate the features of all three geographical regions (Caucasus, Turkey, Europe) was rejected, TANAP accepted the EU energy legislation norms. That means that shippers and traders will send the gas transmission program of the following day to their counterparts according to EU time schedules. E.g.; at winter time the reference is 13.00 UTC. The shipper sends all nominations to the TSO's on 13.00, who in turn have to validate the data for potential capacity constraints etc. independently from each other. Following the matching process between the TSO's starts. They have to make sure that they are in synchronization and if they do not, they have to synchronize them through modifications. This process has to be harmonized through the entire gas value chain, up until the upstream where the gas is first extracted. After having accepted EU norms on the matter we had to convince BOTAŞ (the Turkish national gas transmission company) to follow suit.

In August 2017 TANAP reached an agreement with BOTAŞ that the timelines used in

Eskişehir (TANAP delivers to the national gas grid at the Eskişehir off take point) and the Greek border where we connect to TAP, will be revised. By doing so, TANAP incorporated EU energy legislation norms that apply to all TSO's that do business in the EU, into all its current and future agreements. These agreements are the transmission agreements TANAP made with BOTAŞ and ASGC and the interconnection agreements with the operators TAP, BOTAŞ and SGC (Southern Gas Corridor, responsible for the Azerbaijani and Georgian pipeline segments).[138] Apart from these, the operation agreement that had not been finalized at the time of this study. Metering and nomination issues will be the bulk of these future agreements. It is a challenging task because the whole process of working out these agreements has to be done simultaneously with all TSO's and shippers otherwise a harmonization will be impossible.[139]

4.4 Reasons for the need of Source and Route Diversification

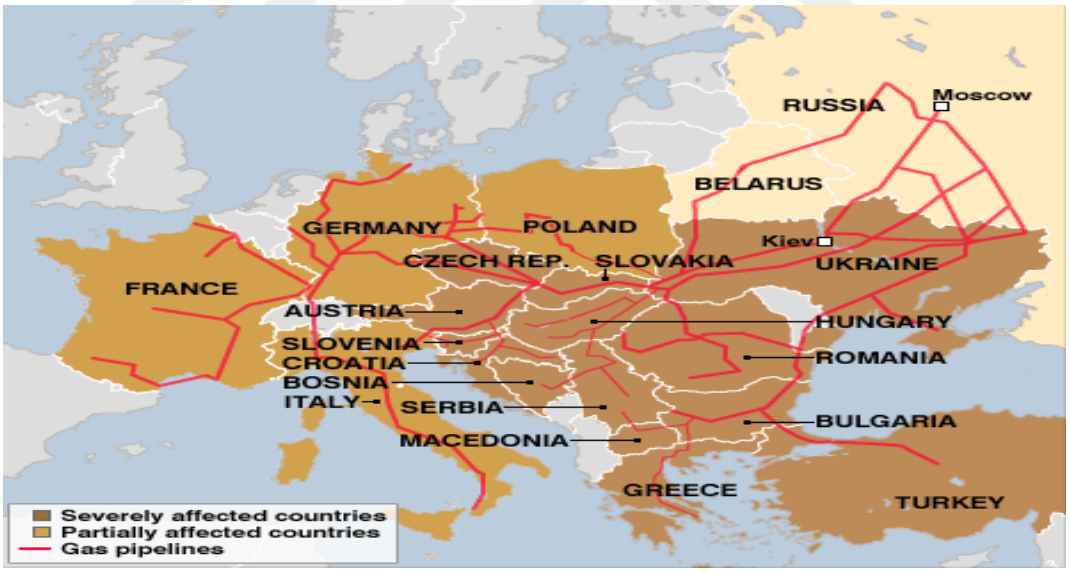

Figure 18: Effected Countries during the 2008 Gas Russo – Ukrainian Gas Crisis

Source: CNN News

[138] BOTAŞ. (2018) TANAP Project. (06.25.2018) http://botas-ahk.gov.tr/tr/proje/tanap-projesi.aspx
[139] Interview with Erdinç Özen, TANAP Commercial Operations Manager

During the 90's (after the dissolution of the Soviet Union) relations between the West and Russia were warm with western assurance of credits and trade deals and the expectation of a rapid democratization under Boris Yeltsin. Staring with the admission of the Czech Republic, Hungary and Poland in 1999 into NATO and the incorporation of former Warsaw Pact nations into the EU, the climate changed. In 2000 a new ruling elite under Putin came into power that regarded the 'restoration' of Russian influence on the international political arena as imperative for Russia's interests. That marked the beginning of troubled relations which had and still have an effect on the energy security of all countries supplied by Russia. Those troubled relations and their implications are also the reason for the search for alternative sources and routes to Russian energy on part of the EU and other nations bordering Russia. Three events in recent history stand out in defining the relations between the West and Russia, and energy security concerns. Those are the multiple Ukraine gas crises of 2005, 2008 and the Ukraine – Russia crisis staring in 2013 and culminating in the war of 2014.[140]

Ukraine Gas Crisis of 2005: In 2004 a popular movement of political change in the Ukraine brought Viktor Yushchenko into the office of president. He favored a more pro-western political line. Russia reacted with a price hike of 230 USD for natural gas exports to the Ukraine which paid 50 USD per 1,000 m3. On January 1 2006, Gazprom reacted with a one day supply cut. While the EU customers complained, Gazprom accused the Ukraine with theft from export pipelines. After mediation of the EU a price of 95 USD per thousand cm was agreed upon. [141]

Ukraine Gas Crisis of 2008: With the Ukraine moving further towards he West under the new President Tymoshenko, Gazprom asked the Ukraine to pay 1.5 USD billion of debt for supplies of the year 2007. In March Russia enacted a 50% drop in supplies. In

[140] Kovacevic A., (2009). The Impact of the Russia–Ukraine Gas Crisis in South Eastern Europe, Oxford Institute for Energy Studies. (06.21.2018) https://www.oxfordenergy.org/wpcms/wp-content/uploads/2010/11/NG29-TheImpactoftheRussiaUkrainianCrisisinSouthEasternEurope-AleksandarKovacevic-2009.pdf

[141] Reuters. (2009) Gas crises between Russia and Ukraine. (06.25.2018) https://www.reuters.com/article/us-russia-ukraine-gas-timeline-sb-idUSTRE50A1A720090111

October, the Ukraine and Russia agreed to gradual rise to market prices within three years. On January 1 Gazprom fully halted gas delivery due to disagreements over the debts. On January 7 Russia also stopped delivery to Europe via the Ukraine claiming the gas was stolen by the Ukraine. EU countries have been effected by the cuts. A deal that foresaw EU, Ukrainian and Russian observers monitoring gas flows through the Ukraine was signed but while the EU started receiving gas the Ukraine itself is still not supplied by Russia.[142]

4.4.1 Ukraine Gas Crisis of 2013 and War of 2014

In February 2013, the arbitration court of the Stockholm Chamber of Commerce decided that Russian Gazprom had to pay 2.56 billion USD in compensation to Ukrainian Naftogaz, due to Gazprom transmitting less gas to Naftogaz than it was obliged to. The Ukrainian authorities seized Gazprom assets in the country. Gazprom announced the termination of all contracts with the Ukraine.[143] In November 2013 the pro-Russian president of the Ukraine, Viktor Yanukovich, under Russian pressure, distanced himself from a trade deal with the EU. Shortly after Russia announced a 15 billion USD credit for the Ukraine. Street protests turned violent and ended on the 22nd February 2014 with the overthrow of Yanukovich. Russia refused to deal with the new government calling it illegitimate upon which Russian troops stationed in bases in the Crimea moved out and took control of the peninsula. Russia has equipped and supported ethnic Russian Ukrainian citizens of the Donetsk region who revolted against the Ukrainian government. The war between Russian backed separatists and the Ukrainian government which claimed thousands of lives so far has not been resolved as to date.[144]

[142] Reuters. (2009) Gas crises between Russia and Ukraine. (07.01.2018) https://www.reuters.com/article/us-russia-ukraine-gas-timeline-sb-idUSTRE50A1A720090111

[143] NATO Review. (2015). Russian-Ukrainian-EU gas conflict: who stands to lose most? (07.01.2018) https://www.nato.int/docu/review/2014/nato-energy-security-running-on-empty/Ukrainian-conflict-Russia-annexation-of-Crimea/EN/index.htm

144 Ukraine Crisis Center, (2018). The Ukraine Crisis Timeline. (07.03.2018) http://ukraine.csis.org/

4.5 Significance of TANAP

Due to being the cradle of scientific breakthroughs and the industrial production, the accumulation of know-how and a high population density, Europe is a region that historically required energy. The insufficiency of energy sources apart from coal make it a net energy importer, which is a position it shares with Turkey. The geographical proximity of Russia to Europe and Turkey and its rich energy sources, make it a natural choice of source for energy imports. The relative early industrialization of Soviet Russia in comparison to other resource rich countries, such as in the Middle East, has resulted in an early exploration of oil fields in Soviet Russia. The related infrastructure such as refineries and pipelines has also been built much earlier than in other resource countries. Therefore it is only natural that Russia emerged as a primary energy supplier for Europe and Turkey.

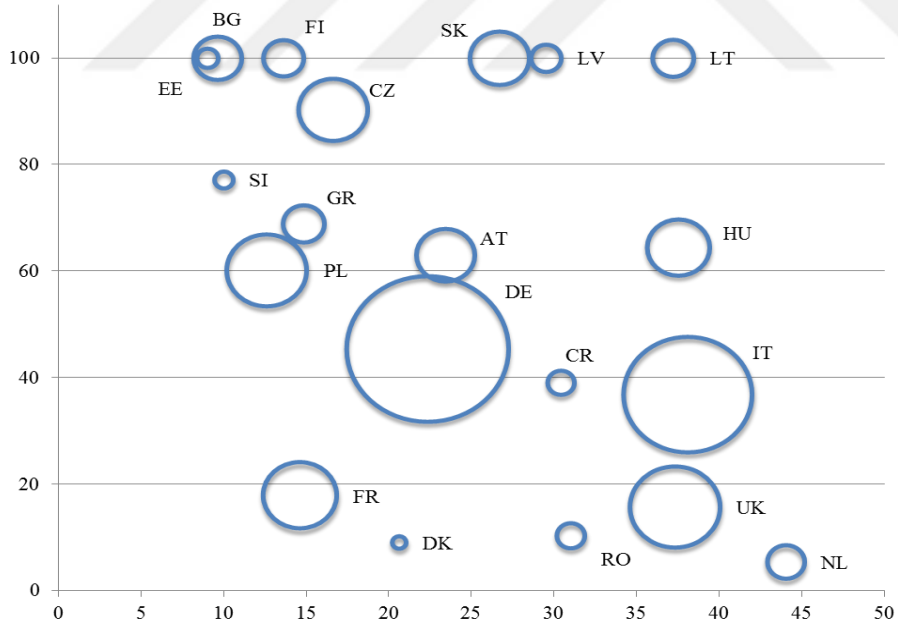

Figure 19: Natural Gas Imports from Russia by Country

Table X:

Horizontal axis: % of natural gas in the EU energy use

Vertical axis: % of Russian natural gas in total national natural gas consumption

Size of the circles: volume of imported Russian natural gas.

Estimates based on preliminary industry data for 2013 and including natural gas volumes traded by Russian companies not necessarily produced in Russia.

Source: European Comission, Energy Security Strategy Document, Annex 1

As we have seen in the previous chapter, the problems in Russia's relations with the west in general and with its neighbors and former Soviet Republics who are frequently transit countries for pipelines, have a negative impact on the supply security of consumer countries. It is obvious that customers of Russian energy have a two folded problem.

First, Russia has embarked on an increasingly aggressive foreign policy course in the last decade as is seen in three crises we have mentioned in previous chapter. Russia seems to be willing to confront and alienate the west, its neighbors and the international community over its foreign policy goals. A dependency of almost 40% on a single source in the supply of natural gas poses a serious risk for any consumer even without political risks associated. Given the political conduct of Russia and its aggressive stance, such a dependency becomes an issue of energy security and therefore also national security.

Second, the lack of political and social stability in countries that act as transit territories for energy pipelines poses another challenge for consumer countries that use Russian gas or oil. Frequently this instability is also due to friction between the West and Russia, as seen in the example of Georgia and the Ukraine. [145]

TANAP represents a first in energy transmission lines that historically flow from east to west and through because it is sourced from a non-Russian county, namely Azerbaijan

[145] NATO Review. (2015). Russian-Ukrainian-EU gas conflict: who stands to lose most? (07.04.2018) https://www.nato.int/docu/review/2014/nato-energy-security-running-on-empty/Ukrainian-conflict-Russia-annexation-of-Crimea/EN/index.htm

and does not use post-Soviet or current Russian territory. While the Baku-Tbilisi-Ceyhan BTC oil pipeline was a significant step in that direction, BTC ends in a port terminal in Turkey and the oil is shipped from there to international customers. TANAP on the other hand is the first pipeline that directly connects former Soviet (Azerbaijani) resources with Europe.

The project circumvents Russia, which therefore has lost its monopoly on gas exports from the region to the EU. TANAP represents different advantages for its source, transit and consumer countries.

4.5.1 Significance for Turkey

Turkey is situated on the crossroads of east and west. In the past this geographical position reflected itself in trade from east to west through the Silk Road. Today energy flows in the same direction. Resource rich countries are in the east while consumers are in the west. It makes sense that Turkey would use this geographical position to become an energy bridge between the two regions. But Turkey's aim is not limited by to becoming a transit country for energy, it also aims to become a hub for energy trade. Becoming a hub requires more than being merely a transit country. The required infrastructure, an open and liberal market, regulations that support the market and of course internationally recognized political stability and rule of law are all prerequisites for a country that aims to become an international energy hub.[146]

Turkey has the highest rate of growing energy demand among OECD countries over the last 15 years, which led the country to follow a dynamic energy policy with large investments. To this end Turkey has made efforts to realize large scale pipeline projects and is undertaking steps to invest in new storage facilities for natural gas.[147]

[146] Interview with Öztürk Selvitop, 18.05.2018, Manager External Relations Department, Ministry of Energy and Natural Resources
[147] Tordjman F., Schultz M., Rose J., Soares I., (2016)

Besides becoming an energy hub, Turkey wants to diversify its energy import sources and routes as any other energy importing country does. Apart from pipelines from Russia and Iran, Turkey has long term LNG contracts with Nigeria and Algeria that last until 2024, which mean a certain if not adequate degree of source diversification.

For Turkey diversification is not just an issue of decreasing dependency. Financially the amount of money that Turkey has to spent each year on energy imports 25 billion USD. While Turkey invests in renewable energy and nuclear energy to lessen its imports, the percentage of these is still not high enough to bring about a change in Turkeys' annual energy bill. Due to favorable agreements between Turkey and Azerbaijan, Azerbaijani gas is substantially cheaper than Russian of Iranian gas. Therefore cheaper energy imports such that from Azerbaijan are a short to mid-term solution to the financial strain on the countries energy budget. [148]

According to its 'Vision 2023' document, Turkey's energy policy is centered on securing long term reliable and affordable energy for its growing economy with diversified energy supply routes and source countries, and to become an energy corridor and energy hub for energy flowing from the Caspian region, the Mediterranean and the Middle East to Europe. [149]

Another important aspect of TANAP is its political significance. With TANAP Turkey will not merely be a transit country but through its stakes in the upstream operation in the Shahdeniz field, Turkey is also a key player in the whole value chain. Turkey's share in upstream operations provides it with valuable know how on how to conduct energy partnerships and agreements beyond the role of a transit country. Experience and know

Energy Policies of IEA Countries 2016 , Turkey, pp. 20,24 (07.04.2018) https://www.iea.org/publications/freepublications/publication/EnergyPoliciesofIEACountriesTurkey.pdf

[148] Interview with Öztürk Selvitop, 18.05.2018, Manager External Relations Department, Ministry of Energy and Natural Resources

[149] Vision 2023, 10th National Development Plan 2014-18, published in the Turkish Official Gazette No. 28699

how gathered in the TANAP projects up stream partnership structure, will prove to be an asset for Turkey's future investments in other gas or oil fields.[150]

Turkey which is both a transit and consumer country of TANAP, benefits in multiple ways. Turkish energy policy clearly defines one of its main goals as to lessen the countries energy dependence on expensive external sources (Russia, Iran) in favor of more reliable cheaper sources, meaning more reliable provider countries. [151]

Azerbaijan and Turkey have very good relations and do not regard each other as competitors in any way, which makes Azerbaijan a long term reliable country for Turkey. TANAP's existence paves the way for more pipelines on the east west corridor, which would support the countries bid to become an energy hub. The future holds a possibility for a connection that may see Turkmen gas flow to Europe through TANAP and even the potential for Northern Iraqi Kurdish and Israeli gas. It is important to note that TANAP's dual pipe diameters of 56 inches (1.422 mm) in the section of the pipeline from the Georgian border to Eskişehir, and 48 inches (1.219 mm) in the section from Eskişehir to the Greek border are specifically designed to transport more gas than its initial capacity suggests.

TANAP will enhance the supply security and diversity of the Turkish (and European) markets. It is a pipeline with two off-take points through TANAP system in Eskisehir and Thrace. Those points are very close to major consumption centers. That means Turkey will reduce its capital expenditure requirements to upgrade its local transmission network and gain a great operational flexibility. TANAP will be a solution to the problems of Turkey and South East European countries facing significant gas shortages from time to time from Russia due to the problems which often have to do with transit countries.[152]

[150] Interview with Öztürk Selvitop, 18.05.2018, Manager External Relations Department, Ministry of Energy and Natural Resources
[151] Turkish Republic Ministry of Energy and Natural Resources, Strategic Plan 2015-2019. (07.05.2018) pp. 23
[152] Interview with Dr. Saltuk Düzyol CEO of TANAP, 25.05.2018

4.5.2 Significance for Azerbaijan

Azerbaijan is a country of limited experience in self-governance due to the historical hegemony of Iran and later Russia. Yet it managed to become a stable energy exporter even if it was off for a rocky start in its early years of independence. The government of Elchibey between 1991 and 1992 was radically opposed to Russian influence and payed dearly for it. The following Aliyev government was rather diversified in its approach to relations with global and regional powers. But despite its inclusive tone, the Aliyev government deepened ties with Turkey and the West while keeping Russia and Iran at arm's length. While Azerbaijan is committed to cooperation with Russia on economic, political, social and cultural matters and is a member of the Commonwealth of Independent States (CIS), it hasn't tried to fully use the potential of the CIS but rather seems to be satisfied of being 'present'. Azerbaijan also showed little enthusiasm regarding the Russian prompted customs union and the Eurasian Union, not least due to Russia's ongoing support to the Armenian position regarding the Naghorno – Karabagh conflict.[153]

The political elite of the country had a unanimous if silent understanding that the future direction of the country had to be towards the west. Historical ties with Turkey which is part of the western alliance and the technical capacities of western energy companies also added to this understanding. [154]

Another important factor that drives Azerbaijan's energy policy is the need to build alliances and gather support in order to secure its survival in regard to powerful neighbors to the south and north. Under these geopolitical circumstances an effective foreign policy combined with energy policies is the only viable approach for the survival of an independent Azerbaijan. While its geopolitical status presents challenges, it also inherits

[153] Makili-Aliyev K., (2013) Azerbaijan's foreign policy: Between east and west. (07.05.2018)
[154] Soltanov E., (2012). The emerging patterns of Azerbaijan's international energy policy: continuities and changes, Caucasus International. Vol.2 pp.81

opportunities. Major modern energy routes and ancient trade routes between East and West run through the south Caucasus. Azerbaijan has built its entire energy policy around utilization of its Caspian energy reserves in connection to its strategic location. Azerbaijan's has proven natural gas reserves of around 35 trillion cubic feet (Tcf) which are mainly located in the Caspian Sea Shahdeniz field, one of the largest natural gas fields in the world. Azerbaijan is also the largest economy of its region which makes it a potential partner for any international power that seeks a share in the south Caucasus. [155]

The motivation to regain control over the Naghorno – Karabagh region which was lost to Armenia immediately after independence is also a driving force in Azerbaijani foreign policy. In this regard energy policy becomes a tool to reach foreign policy goals. Azerbaijan hopes to gain support in the west for a favorable solution to the Naghorno – Karabagh problem. This expectation is not limited to countries Azerbaijan has direct energy deals with. The countries leadership also aims at using energy projects as a platform to gain political support towards a solution of the conflict. The influx of millions of refugees from the lost territories to Baku has put the government under pressure which it wouldn't have been able to deal with if it hadn't been for western support. The inclusion of Turkey in the energy export lines of Azerbaijan was also an effort to increase Turkey's involvement in the region both economically and politically. Such an increased presence of a friendly NATO country would be a welcomed support for Azerbaijan. [156]

At the forefront of Azerbaijan's energy policy as well as its use in foreign policy is the State Oil Company of Azerbaijan Republic SOCAR, which has substantial investments in all countries that are part of its energy export route, namely Georgia, Turkey, Greece, Albania and Italy. Since Azerbaijan's only strategically valuable export is energy, the country's main energy policy goal can be summed up as to secure a steady route of export that is not under threat of political instability or hostility.

[155] Makili-Aliyev K., (2013) Azerbaijan's foreign policy: Between east and west. (07.05.2018)
[156] Rzayeva G., (2012) A complicated corridor: Gas to Europe – it's not just economics. Caucasus International, Vol.2, pp. 144

4.5.3 Significance for the European Union

The EU looks to diversify its natural gas sources as a means of achieving energy security. 39% of its natural gas is imported from Russia which is a dangerous over dependency. [157] While source diversification is a primary target, route diversification is also of importance to the EU and its policy of energy security. Alternative routes and projects have therefore always been on the policy agenda of the EU. The Nabucco pipeline which was supposed to transport natural gas from the Caspian Sea to Europe was the first project that would bypass Russia's pipeline network. [158]

TANAP is not just an energy infrastructure project, but it will have an important role in the energy policies of the EU. It will enhance the economic and political stability and integrity of the region. While the main Beneficial's of the TANAP project and the new gas supply corridor it represents, will be the South East European countries, TANAP will also enhance the supply security and diversity of the whole united European energy market. [159]

While most pipelines run through Russian of former Soviet territories, TANAP runs through Turkey which is a NATO country with aspirations to become an EU member country. Turkey's traditionally western political orientation and its membership in western political mechanisms means that the EU gains a supply route that will not be effected by potential political problems between Russia and the West. Besides providing a more stable route and supplier for Europe, TANAP and the southern gas corridor also puts some pressure on the Russians in the sense that it shows that other routes are possible. Therefore Russia will have to shape its relations with the EU more careful and may at the same time have to rethink its policy of using natural gas shipments as a foreign policy tool. TANAP may also further support Europe's aim of diversification by carrying natural

[157] European Commission. (2013) Supplier countries. (07.08.2018). https://ec.europa.eu/energy/en/topics/imports-and-secure-supplies/supplier-countries

[158] Jhonson T., (2011) Why natural gas matters, (07.09.2018) https://www.cfr.org/backgrounder/global-natural-gas-potential

[159] Interview with Dr. Saltuk Düzyol CEO of TANAP, 25.05.2018

gas from additional suppliers such as Northern Iraq and Turkmenistan to Europe. Its spare capacity of 15 b cm out of the total capacity means that there is potential for further gas shipment. Despite some political problems in Northern Iraq, Turkish companies have contracts and licenses to build a pipeline in the territory of the autonomous Northern Iraqi Kurdish Region. Regarding Turkmen gas, Turkmenistan and Azerbaijan have reached an agreement which settled long standing disputes and means that Turkmen gas may finally reach Europe. To do that the most feasible option is Turkish territory and TANAP. In the Caspian Sea a recent agreement between the five Caspian shore states to divide the sea and the resources opens up additional possibilities for exploration of gas in the Caspian Sea. With the construction of a pipeline from Turkmenistan to Azerbaijan, TANAP would be the ideal route to carry Turkmen gas to the European market. [160]

By activating a new energy supply route from the Caspian region to the EU, the EU does not only diversify its own sources and routes, but it also becomes a player in the Caspian energy fields, which in turn enables it to counterbalance Russian influence in this energy rich region. Therefore it is safe to say that the EU is shaping its energy policy regarding the Caspian region not only according to economic aspects but also has strategic aims in counterbalancing Russia. [161]

The 'European Energy Security Strategy' document refers to 'Diversification of external supplies and related infrastructure'. [162]

It states that EU energy policy has a clear aim of opening connections to new sources. The document refers to TANAP as one such new source that holds the potential to become an important alternative source of natural gas to Europe and therefore lessen the extent of

[160] Interview with David O'Byrne 20.05.2018, Freelance Journalist for the Financial Times, Economist Intelligence Unit, Platts Energy, Oxford Analytica, France 24 and Business News Europe

[161] Rzayeva G., (2012) A complicated corridor: Gas to Europe – it's not just economics. Caucasus International, Vol.2, pp. 145

[162]European Commission. (2014). Communication of the European Commission to the European Parliament and the European Council. (06.20.2018) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0330&from=EN

dependency on large single sources (Russia).

The strategy document also foresees an active involvement of the EU in the planning and construction of required infrastructure and trade relations in the Caspian region. TANAP is named as a potential carrier line for additional natural gas from sources such as Turkmenistan,the Middle East (Northrn Iraq, Iran) given that political obstacles are sorted out. The EU comission lays out targeted foreign policy innitiatives towards these potential supplier countries.

5. CONCLUSION

Every nation state or union that consists of states has to take care of its energy needs due to the fact that it is vital to economic development, social welfare and national security. Therefore every nation prioritizes its energy policy with the aim to achieve and maintain energy security.

In this study we laid out different approaches to energy security. The concept itself is still evolving. Energy security is frequently understood as energy supply security. This is the view that prevails when the question is answered from the standpoint of consumer countries. It has its roots in the oil crisis of 1973 which defined the debate substantially.

Nevertheless the definition changes according to the nation or region in question. While energy security for consumer countries means supply security, it means demand security for exporting countries.

Energy sources are concentrated in some geographical regions more dense than in others. In the case of Eurasia, the flow of energy is basically from East to West. Europe is the industrial powerhouse that needs ever growing amounts of energy while the Middle East, Russia, the Caucasus and Central Asia are source regions.

We laid out that the Soviet Union had a crude but functioning oil output at the beginning of the 20th century which was centered in Baku, Azerbaijan and was almost single handedly supplying the whole oil consumption of the Soviet Union before and during WW2. With production capacity and relevant infrastructure in place, and given the relative geographical proximity, it was only natural that Russia developed into a primary supplier of natural gas for Europe and the region.

Nevertheless the EU and other countries in the region such as Turkey arrived at a point where their supply structure reached a point of over dependency on a single supplier, namely Russia.

In 2015 was 1.627 million toe (tons of oil equivalent). More than half of the energy and slightly more than 70 % of the natural gas used by the EU is being imported. Norway supplies 31% of EU's natural gas imports and 11% of EU crude oil imports. Russia supplies 39% of the EU's natural gas imports and 22% come from North Africa namely Algeria and Libya.

As we have seen in this paper the EU imports around 50% of its energy and almost 70% of its natural gas. Domestic resources such as those of Norway which make up about 31% of the EU's natural gas consumption are not adequate to cover the Unions entire natural gas consumption. It is mainly supplied by Russia and North African countries.

Over dependency on single supplier is a risk in itself for the energy security of a nation. To this we must add that problems in relations with Russia and between Russia and its neighbors namely the Ukraine, have significantly raised energy insecurity on behalf of customer nations. With this in mind the European Commission has been looking to diversify its energy sources and routes. North African natural gas and LNG shipments from Qatar are some of these. But the most significant route and source diversification is that of TANAP. As part of the Southern Gas Corridor it is the first natural gas pipeline that circumvents Russian territory.

As we have previously explored, over dependency on a single supplier is not the only challenge to energy security. The threat of physical attack against energy transmission lines and infrastructure has risen.

Due to the risk of terrorist attacks, protection for the entire energy value chain, including refineries as well as transportation networks and facilities have to be protected. The terrorist threat has political, social and economic implications. Politically a government that is not able to protect its energy infrastructure or that which runs through its territory, risks its legitimacy in the eyes of the public. Socially energy shortages and their effects can be devastating on public morale and national cohesion. The economic cost of energy shortages will result in economic decline which in turn will trigger social unrest and the questioning of political leadership. The ongoing attacks in the Niger Delta are good examples of how profound the impact of such attacks can be on the economy and all

related factors. In 2016 the entire countries economy went into recession due to a decrease of oil production in the Delta. Multinational efforts to protect energy transmission routes and sea lanes have increased especially after the wave of pirate attacks against oil tankers in the Gulf of Aden which were usually carried out by Somalian pirates.

We also explored the importance of energy security on social stability of countries. In source countries social stability stands in relation to energy security through the social benefits that governments of such countries are able to hand out to the public. The social contract of such countries rely heavily on government subsidiaries and handouts as we laid out in the case of Saudi Arabia. Social stability for consumer countries is mainly tied to energy security in terms of quality of life and economic. Here we saw that social stability in consumer countries mostly is affected by supply shortages and the effect on the economy.

Pipelines are still the main means of transport for natural gas due to their cost effectiveness. Gas that is going to be transported via sea first needs to be transformed into liquid stage for transportation. Upon arrival at port it needs to be degasified before being pumped into the national grid. These processes are increasing the cost of LNG, therefore pipelines remain to be the preferred method for transportation of natural gas.

Except for TANAP, currently the flow of natural gas from the Caucasus to Turkey and Europe is via a massive network of pipelines from Russia to Europe and Turkey. Two gas pipelines from Azerbaijan supply Turkey; the Baku Tbilisi Erzurum pipeline and TANAP.

TANAP is one of the longest pipelines in the world with its length of 1.850 km through Turkey plus its Caucasian and European sections of the Southern Gas Corridor. The pipeline is one of the most sophisticated in terms of construction and transmission technology. It is going to carry 16 billion cm gas of which 6 billion cm will remain in Turkey and 10 billion cm will be transmitted to Europe. The capacity is scheduled to be increased to 24 billion cm in 2013 and 31 billion cm in 2026. It runs through 600 villages,

67 districts and 20 provinces. The section from Ardahan to Eskişehir with a length of 1.340 km was constructed with 56" diameter pipes which is a first for Turkey. During its construction 15.000 people were employed directly or through vendors.

The pipeline network supplying Europe and Turkey via Russian and Ukrainian territories has been increasingly unreliable due to problems between Russia and the Ukraine and between Russia and the West in general as we have seen in previous chapters. Russia's willingness to use natural gas as a tool in its quarrels with the West has led the European Commission to look for alternative routes and sources. Nabucco was the first attempt to bypass Russia. While Nabucco failed, shortly after TANAP was realized. It is the first of its kind in the sense that it bypasses Russian territory while transmitting Caucasian gas to Europe.

The full commercial and technical integration of gas carried by TANAP into the EU's single market and gas grid is another advantage for TANAP in comparison to gas from the Russian network. The Russian networks gas is plagued by ongoing commercial disputes between Russia and its neighbors as we have seen in previous chapters in the case of the Ukrainian national gas authority and Gazprom. These commercial disputes also effect the EU's supply security. TANAP on the other hand is both commercially and technically integrated to the European single market and network.

Compared to the huge pipeline network that has been built over the years to supply Europe by Russia, TANAP may look small, but it has opened the way for similar projects. TANAP's capacity was designed in a way to allow other sources of natural gas such as Turkmen or Norther Iraqi Kurdish gas to be transmitted through it. That in turn means that there will be an increased readiness to use Turkish territory for natural gas pipelines to supply Europe. Through TANAP, Europe's energy supply security will increase, Turkey's standing as an energy corridor will be strengthened and it will have moved forward towards its goal to become an energy hub. Azerbaijan will gain export security and the ability to market its gas to Europe, thereby strengthening its position on the global energy market.

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