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Thesis

"European Energy Security and the role of LNG"

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Sofia Pesini

EXECUTIVE SUMMARY

The aim of this dissertation was to analyze the case of energy security in Europe and the role that Liquefied Natural Gas (LNG) can play in enhancing and maintaining this security, taking into account the important role of LNG as an alternative fuel in shipping, as well as the role of the shipping industry in transporting LNG and how this can benefit the European economy and environmental protection. There is no doubt that energy is the most important commodity and energy sectors are the most important industrial sectors for national economies and the global economy as a whole, thereby driving countries and regions to take measures to enhance adequate energy reserves and their overall energy security. EU's emphasis on policy-making for enhancing energy security in the region shall be traced back to the 1950s and the development of communities for enhancing political, economic and energy cooperation among member-states. The EU, traditionally as an area of industrial states and developed economies, is among those actors of international economic relations for whom energy security is an issue of existential importance. Overall, efforts towards the development of a common energy market in Europe has not flourished at a policy level so far, mainly because it has always been in the minds of national governments to be free to succeed the best energy-supply agreements to promote their national interests. The recent war in Ukraine, though, has once again put pressures on member-states of the EU to commonly succeed in enhancing energy security for the region, mainly through being less dependent on imports from Russia.

A global response to the need for enhancing higher energy security in a global context has been the tremendous development of the global LNG sector, which has been the fastest growing energy sector across the globe since 1995. The share of LNG in natural gas production is expected to reach 17% by 2030, up from 12% in 2020. At the same time, as the Russian-Ukrainian war puts the focus on secure energy supply, the prospects for LNG trade appear even more positive. Now that Russia threatens to further cut down on natural gas supply towards the West, Europe's dependence on external sources and mainly the U.S. is expected to further increase, also taking into account the steadily declining gas production volumes in the EU. Even in this case, though, LNG terminals are not enough in number in the

EU to be able to store the necessary capacities for the region to cover its energy needs through LNG.

Russia is the biggest exporter of LNG in the world and the second biggest producer after the U.S.A., at least until the beginning of 2022, when the U.S. dominated LNG exports as well. The U.S.A. is expected to continue to play an important role in determining Russian LNG exports, while at the same time also shaping geopolitical relations across the globe and mainly between the West and Asia. The LNG market is the only market at the time being that shall be able to offer the EU some energy security potential, especially since its growth potential is highly supported by growth in the global shipping industry. The efforts of the EU towards enhancing a higher energy security and independence are highly associated with the development of a more robust EU maritime policy, as a means of boosting through maritime policy the potential for LNG to truly become the solution to the need for the EU to cover its energy needs, which grow higher and higher, as years pass by.

Keywords: Energy, energy security, LNG, natural gas, shipping industry, maritime policy

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER 1: INTRODUCTION

1.1. AIMS AND OBJECTIVES

The aim of this dissertation is to analyse the case of energy security in Europe and the role that Liquefied Natural Gas (LNG) can play in enhancing and maintaining this security, taking into account the important role of LNG as an alternative fuel in shipping, as well as the role of the shipping industry in transporting LNG and how this can benefit the European economy and environmental protection. More specifically, this dissertation has the following objectives:

- To examine the actions of member-states of the European Union (EU) to ensure energy supply on the inside
- To describe the importance of the development of a robust LNG market in Europe and its impact on the global natural gas market
- To analyze the impact of US LNG on Russian Natural Gas export policy
- To critically examine the European policies for the maritime sector and the use of LNG as an alternative shipping fuel and how helpful could be on carbon footprint reduction
- To provide implications regarding how energy security, economic security and environmental protection in Europe could be enhanced through the development of a European LNG market and the development of a robust LNG shipping market in the area

1.2. BRIEF STUDY BACKGROUND

Energy is a fundamental element for the evolution and progress of human society. From ancient times to the present, it has been a source of conflicts and negotiations between countries and nations, which proves its importance, while the development and emergence of a state into a superpower capable of controlling the destinies of the planet has often being associated with the possession of wealth-producing sources. In recent years, several events have demonstrated the need for energy security and its emergence as the first issue

on the agenda of European governments (Chevalier, 2009). The Russian-Ukrainian crisis of 2007 sent a strong message to Europeans about how energy-dependent they are and how much the development of a single European energy policy had been neglected. It is known across the globe that Europe is one of the biggest consumers of energy internationally, without having significant own energy resources, which makes it vulnerable to dependencies and pressures, especially when the main volume of its fuel imports comes from one country, Russia (Belyi, 2015). The above vulnerability has been well-proved during the current (2022) Russian-Ukraine crisis, which has become actually a crisis between Russia and the West, with the EU being at the forefront. Since 2007, there had been no question of Russia's reliability as an energy-supplier country, but especially after the events of 2007 and the change in Russia's policy during Putin's presidency, the voices in Europe for the diversification of energy routes began to increase (Pronczuk, 2022). Voices demonstrating this need existed in the past as well, but they were weak and very limited. In 2000, the European Commission published a green map towards a European strategy for the security of energy supply, which, however, failed to give rise to any political progress. In 2003, a proposal was added to the European security policy that highlighted the ever-increasing energy dependence, but without linking it to any specific strategy. Until 2004, the decision-making centers of national governments and Brussels had not been convinced that there is a direct link between energy security and a common foreign energy policy. Gradually, the vision of the Common Energy Policy, which began with the Treaty of Rome, EEC and EURATOM Treaties and the Treaty establishing the European Coal and Steel Community, started taking shape (Herranz-Surrallés & Natorski, 2012). Nowadays, the Russian threat of cutting down on natural-gas supply towards the EU, as a response to the sanctions imposed to the country, due to its invasion in Ukraine, the need for energy security in the EU is a front-burner one.

As a response to the energy crisis and the need for higher energy security, both in general and against the specific threat from Russia, the development of a robust EU LNG market could offer some important solutions to the abovementioned challenges. The need to wean the EU off Russian natural gas as quickly as possible is driving EU member-states to new agreements and suppliers, in addition to extending plans to phase out coal and nuclear power or speeding up their plans for the utilization of renewable energy sources. One of the

ways the EU is responding to the problem is by drawing up agreements that increase imports of LNG. By bypassing the use of pipelines from the east, LNG terminals offer a wider range of potential suppliers (IEA, 2022). The development of a robust LNG market in the EU, as well as the globe, is highly associated with the use of LNG as an alternative shipping fuel. This trend has been driven for about a decade now, mainly because of the imposition of the 2020 Sulphur Cap and the need for the shipping industry to reduce its environmental footprint (Herdzik, 2011). At the same time, of course, it is important to note that LNG is mainly carried by LNG sea carriers, thereby constituting the shipping industry as the industry to play the most crucial role in the development of a robust LNG market in the EU and the world (Singh, 2016).

1.3. RATIONALE OF CONDUCTING THE STUDY

Taking the brief theoretical framework developed above into consideration, it was considered as very interesting and important to conduct a study to analyze the current level of energy security in Europe, as well as the future prospects of this security, especially now that the member-states of the EU are in need of enhancing and maintaining their energy security without relying on Russian natural gas reserves and trade. At the same time, it was also considered as very interesting and important to examine the role that the development of a LNG market in the EU can play, also involving the shipping industry, which on the one hand has already started using LNG as an alternative, less expensive and more environmental-friendly fuel for the industry, while on the other hand the shipping industry shall play a leading and almost exclusive role in the transportation of LNG from other regions – mainly the US - to the countries of the EU, so that the latter start using LNG as a primary source of energy. The findings of this study shall provide important conclusions regarding what EU member-states shall do at a policy level, in order to ensure that a robust LNG market is developed in the region, which shall enhance energy security and at the same time contribute to the further reinforcement of the shipping industry and the European economy, while at the same time reducing the environmental footprint of both shipping and other industrial and household activities.

1.4. STRUCTURE OF DISSERTATION

The main part of this dissertation starts with Chapter 2, which provides an analysis of the politics of the EU External Energy Governance, namely the policies that the member-states of the region have developed and the actions that they have taken, as far as the EU energy security is concerned. Chapter 3 is occupied with analysing the global LNG market, as well as the EU LNG market, as a means of understanding the current trends and challenges, as well as the future prospects of the sector. In light of the dependence of the EU on Russian natural gas, which was highly profound after the start of the War in Ukraine and the need for the EU to find alternative natural-gas sources, Chapter 4 is occupied with analysing the Russian natural gas market and the impact of the US LNG on Russian natural gas export policy. Chapter 5 is solely occupied with LNG in the context of the global shipping industry, focusing on the policies that the EU has developed for the maritime sector, how the industry enhances its energy efficiency, using LNG as an alternative fuel, while also commenting on the role that the shipping industry shall play, as far as constituting LNG as a dominant energy source in the EU. Finally, Chapter 6 summarizes the main points of the analysis held in the main part of the dissertation, draws key conclusions on them, refers to the limitations of the study and provides implications for future research. Overall, the findings of this study shall provide important conclusions regarding what EU member-states shall do at a policy level, in order to ensure that a robust LNG market is developed in the region, which shall enhance energy security and at the same time contribute to the further reinforcement of the shipping industry and the European economy, while at the same time reducing the environmental footprint of both shipping and other industrial and household activities.

CHAPTER 2: THE POLITICS OF EU EXTERNAL ENERGY GOVERNANCE

2.1. INTRODUCTION

This chapter is the chapter analysing EU external energy governance from a politics' perspective. In the following section, an analysis takes place regarding EU external action and energy security, how this security is dealt with and enhanced beyond EU borders, as well as how EU external policy could be analysed in the context of the global political economy. The last section summarizes the key points of the analysis in this chapter.

2.2. EU EXTERNAL ACTION AND ENERGY SECURITY

The development of external actions and policies to enhance energy security in the EU has been mainly driven by the fact that the European project itself owes its existence to the building of forms of cooperation in the energy sector. The establishment of the European Coal and Steel Community (ECSC) in 1951 from France, West Germany, Italy and the Benelux countries, that is, from states that had engage in countless, relentless, bloody conflicts in the past, has been a sine qua non condition for the establishment of peace in the European continent, after two devastating world wars (Oberthür & Gehring, 2006). The need to secure the two main energy resources of that time, steel and coal, threatened to lead the economically devastated states of Europe in a new bloody conflict before the last one is well over (Lavenex, 2004).

The inexorable needs of access to energy sources forced the European states not only to cooperate in the peaceful use of these resources, but also accept the context of the ECSC for the first time in modern European history transfer of national sovereignty to a supreme authority, which promoted both the supply of the markets of all participant states with steel and coal on equal terms and production modernization and improvement of their quality,

while also equalizing and improving the working conditions of the employees in the industries of the above products (Youngs, 2009). For the sake of the success of the venture, again for the first time in modern history, capitalist economies accepted the so-called negative economic integration mechanism, which involved the removal of internal and external tariffs on specific energy products. This was later to be imitated in the so-called Single Market, as well the World Trade Organization (Lavenex, 2008).

The venture of free movement of coal and steel was crowned with success, prompting the countries that participated in the ECSC to undertake another ground-breaking for the era project, which involved the then "highly promising" atomic energy as a means for ensuring energy security in Western Europe. Indeed, with the signature of the Treaties of Rome for the European Economic Community (EEC) and the European Community of Atomic Energy (Euratom) on March 25, 1957, a gradually unified product market and a common framework for the development and marketing of nuclear energy to peaceful use were developed. Despite the enthusiastic start, though, the energy sector was to remain one of the most neglected fields of community interest and cooperation of the member states (Grin, 2003). The reason for this was that the main aim of member-states was just to ensure cheap and uninterrupted flow of energy from third countries, as well as – and above all - the reluctance of member states to cede national sovereignty to a supreme authority on the issue of their international energy relations, as they preferred to form them separately from each other. In between, the interest was also displaced from the trade of atomic energy and coal, as envisaged in the texts of the founding Treaties of EURATOM and of the ECSC, to the imports of hydrocarbons, oil and mainly natural gas, which are now their main energy sources of EU member-states (European Commission, 2014).

The European member states decided to carry out the biggest unifying steps in the energy sector again after an acute political crisis. Indeed, the Russian-Ukrainian conflicts of 2006-2009, a prelude to the war that followed, caused a shock of 30% reduction in the supply of the European economy with natural gas, making it clear that the EU was not only energy-wise, but also politically vulnerable to powers outside the continent. During the drafting of the Lisbon Treaty in 2007, EU member states decided to incorporate into the treaty the so-called title XXI on energy (Article 194), whose provisions referred to the establishment of an

internal energy market, whose main objectives would be to ensure the functioning of the energy market, the non-stop energy supply of the EU, energy efficiency and energy saving, and the development of new and renewable energy sources, while also promoting the interconnection of energy networks (Huang, 2014). At the same time, though, it is expressly stated in Article 194 that these measures do not affect the right of member-states to determine the terms of exploitation of their energy resources, their choice between various energy sources and the general structure of their energy supply (Padgett, 2011).

As it follows from the above, despite the upgrade in the quality of the EU's energy policy and the setting of targets and priorities, as well as the inclusion of the report on community solidarity, member-states proved to be bold enough to proceed with a "communitarianisation" of the energy sector, as the European Commission has been seeking for decades, as well as assign full sovereign rights to the EU in the field of external energy security. The domain energy in the union was thus included in the so-called concurrent competences of the EU, concerning sectors where the union and its member-states can legislate and adopt mandatory rules in common (Padgett, 2011). This decision, combined with the non-prediction of any specific mechanism of alignment of national energy interests with general European policies, has led to divergent national choices in the international energy choices of member-states, as well as in fragmented terms of supply and demand that disadvantage the financially and negotiating-power-wise weakest states (Lavenex & Schimmelfennig, 2009).

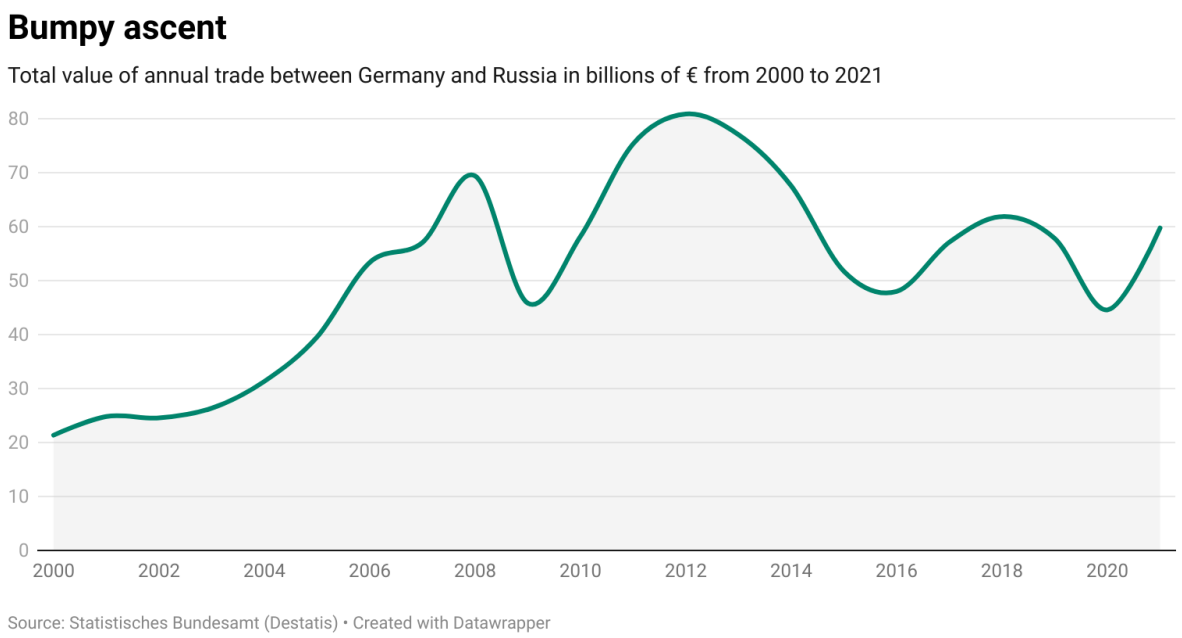
In the years following the Treaty of Lisbon, the European Commission proceeded to some important initiatives for the implementation of what is foreseen in its title XXI Treaty of Lisbon. Such initiatives include the development of the European Energy Union, the adoption of Europe's Energy Strategy and the passing of the Third Energy Package against monopolistic practices of energy companies, setting as basic pillars of its policies the promotion of environmental sustainability, competitiveness of the EU energy market and security of energy supply (Siddi, 2015). The long-term strategic goal set was to create a fully integrated energy market, involving the creation of the necessary technical infrastructure (pipelines, gas liquefaction stations, etc.) and the remove of restrictions, so that the EU can

trade energy as a single entity, achieving optimal supply and price conditions for each member-state (Dickel, Hassanzadeh, Henderson et al., 2014).

The results of such policies, however, have so far been not the expected ones. Today, the EU imports 90% of the quantities corresponding to its crude oil needs and 66% of the quantities corresponding to its natural gas needs, while the outlook is expected to further worsen, as domestic gas and oil producing countries are expected to be exhausted and the needs of the states to increase. Six member states are based on one and only foreign supplier for all-natural gas imports, Russia (Buchan, 2014). Member-states of the EU continue to typically engage in bilateral agreements with large multinational energy companies, allowing the latter to impose their own terms in the negotiations and undermine any attempt to formulate terms of European energy solidarity. Energy dependence of Europe also has enormous political ramifications, forcing it into politics dependence or cachexia towards non-European powers (Goldthau & Sitter, 2015).

The cases of Nord Stream and Nord Stream II are the most representative examples of the above situation, further reinforced by the development and operation of the Southern Corridor. In the first case, the two conductors connect Germany and Russia via an undersea pipeline in the Baltic Sea region, bypassing transit countries such as Ukraine, Poland and the Baltic states, reserving such preferential terms to Gazprom that circumvent the terms of the third energy package. As shown in Figure 1, the energy trade between the two countries has well developed since 2000. In the second case, Greece and Italy preferred to advance their own geo-economic interests against the politics of the European Commission, which was at that time promoting the questionable for its sustainability alternative business plan of exploiting Caspian deposits through the Nabuco pipeline (Letzing, 2022).

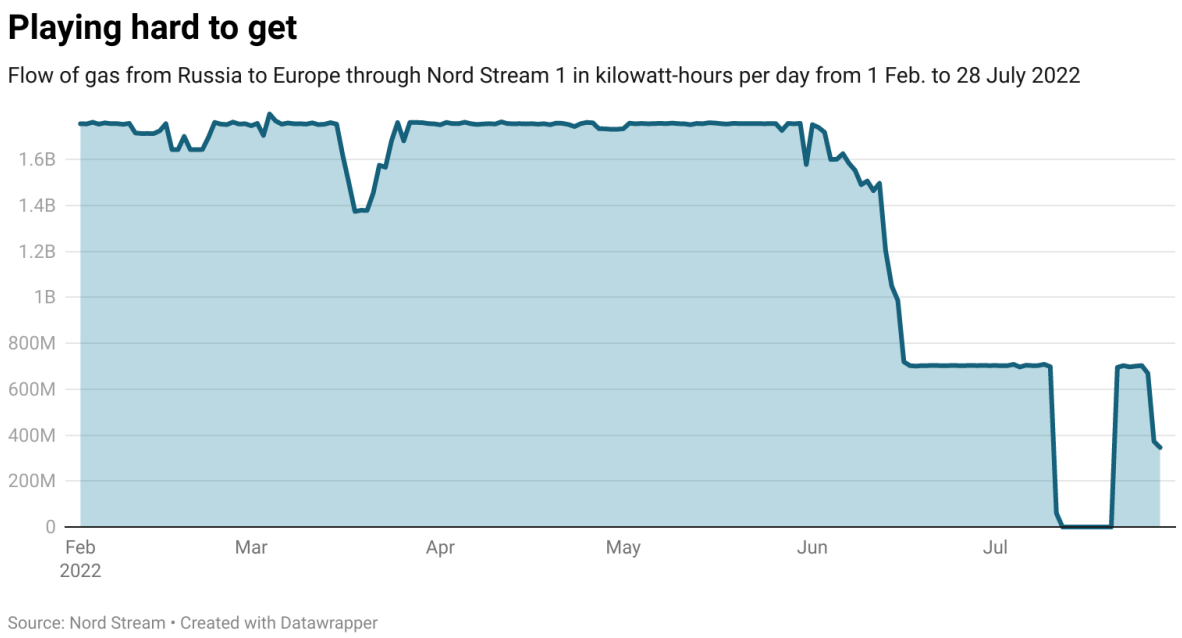
Figure 1: Annual Natural Gas Trade between Germany and Russia since 2000



(Letzing, 2022)

The need for actions towards enhancing and maintaining energy security is today more profound than ever, as a consequence of the Russian threat of cutting down on natural-gas supply towards the EU, as a response to the sanctions imposed to the country, due to its invasion in Ukraine. According to European Commission estimates, the European Union would experience a shortfall of 45 billion cubic meters (bcm), if natural gas flows from Russia were to stop completely. Figure 2 shows how Russia has responded so far, as far as cutting down on natural-gas supply towards the EU is concerned.

Figure 2: Russia's Supply of Natural Gas to the EU since February 2022



(Letzing, 2022)

One of the latest actions taken by the member-states of the EU is the agreement reached by the EU energy ministers to reduce natural gas demand ahead of the coming winter. The plan envisages a voluntary 15% reduction in gas consumption by EU member states in the period from August 1, 2022 to March 31, 2023. In addition, it foresees the creation of a mechanism that will signal an alarm throughout the European Union in the event of widespread gas shortages and the implementation of binding targets in terms of savings and the creation of strategic reserves (European Council, 2022). Achieving such an agreement required softening several of the stricter terms of the original plan and introducing several opt-out clauses, while the ceiling on binding savings limits was raised. Under the terms of the amended agreement, binding targets for gas savings will be imposed by the European Council, rather than the European Commission. (Reuters, 2022). The exemptions agreed mean that countries such as Cyprus, Malta and Ireland will not need to store gas, as their distribution systems are not directly connected to those of other member states. Mandatory gas savings will also be able to be reduced under specific conditions, for example when storage facilities are full, in cases of power outages or for the use of gas as a raw material for industrial purposes. During the negotiations of the EU member-states, four of them expressed major reservations and objections to the content of the agreement.

Germany, one of the countries heavily dependent on Russian gas, strongly supports the plan (Taylor, 2022).

Overall, the energy security policies adopted by the EU and its member-states over the last 60 years have also occupied academic literature. For example, Poiana (2017) conducted a thorough literature review, in order to provide an overview of the European energy policy evolution. Based on her analysis, the energy security policy of the EU has been more reactive and less proactive, as mainly driven by its dependence on imported natural gas. Such dependence has led the EU in taking action only when crisis with its imports take place. At least, at such periods of crisis, higher solidarity among the EU member-states has been observed, with the most recent example being that of the 2007-2008 crisis between Russia and Ukraine.

An empirical literature review on the matter of EU energy security has also been conducted by Christou (2021). The aim of this research was to analyze the EU energy security policy over the period between 1995 and 2020. Based on his findings, energy security in the EU is approached in two ways, the approach of enhancing adequate energy supply and the approach of using alternative and more environmental-friendly energy sources, as a means of dealing with the front-burner issue of climate change. This is also verified by the so-called Energy Union Package, as developed by the European Commission in 2015, which represents security of supply as one of its five major pillars, the other four pillars being emissions reduction, internal market integration, energy efficiency and research and innovation on low-carbon technologies. The researcher agrees with Poiana (2017) in that the EU is occupied with its energy security issues only in times of turbulence, i.e. reactively and not proactively. Last but not least, the author also points out that developments in the EU energy security issue have indeed been observed over the last 15 years, which, however, were undermined by the decision of Russia to block natural-gas input to the EU from Ukraine.

An interesting research was also held by Rodríguez-Fernández, Carvajal & Fernández de Tejada (2022). The researchers conducted research, in order to evaluate security of the 27 countries of the EU with respect to adequate supply and use of gas in the region. The researchers collected data about the 27 EU member-states with respect to the two

indicators of energy security, namely the availability of resources and greenhouse gas (GHG) emissions. Based on their findings, the 27 EU member-states have reported marginal negative progress in their energy-security indicators from 2005 to 2015. More specifically, the results of the research reveal that gas energy security in the EU as a whole fell by 1.09% on average over the 10-year review period. This statistic has been combined with a 21% increase in the EU's dependence on imported gas, as well as a 50% reduction in the region's gas reserves. At the same time, gas output fell by 32% between 2005 and 2015. There have been exceptions to the above average results, such as for Luxemburg, which increased its energy security by about 88%, as well as Latvia, which also increased its energy security by about 32% over the review period. Of course, negative exceptions were also identified, such as that of Hungary, whose energy security fell by 31% within the decade 2005-2015, followed by Spain with a reduction of energy security by about 22%. The researchers point out that their results call for immediate action by the EU towards the development of a common energy policy, which shall enhance higher energy security for the region as a whole.

The above findings come in mere disagreement with those of Radovanović, Filipović & Pavlović (2017), who used the indicator Energy Security Index to evaluate energy security of the EU countries with respect to the long-term sustainability of their energy sectors, both in terms of adequacy of gas reserves and their environmental footprint. Based on their statistical findings, after collecting and analysing relevant quantitative data, during the decade 1990-2000 the Energy Security Index of the EU was at low levels, before it starts becoming positive over the period 2000-2008. After 2008, some countries again began showing deteriorating results, as far as the evaluation index under discussion is concerned. Overall, the four economically strongest EU countries, namely the United Kingdom, France, Germany and Italy recorded significantly less fluctuations in energy security over the 23 years before 2017, compared to other countries. At the same time, France and Denmark are the two countries having reported the highest energy reserves, mainly because of their capacity in producing nuclear power as an alternative energy source. In the above context, the researchers noted that energy security shall not involve only gas reserves and environmental footprint, but also the availability of other energy sources, through which

countries have the ability to deal with gas shortages, even at the expense of higher environmental pollution.

Although it becomes evident from the research findings analysed so far, as well as the theoretical framework and literature review held in this chapter, that the EU has an important energy-security problem, there are also the findings of Matsumoto, Doumpos & Andriosopoulos (2018) that provide a different view of the issues. In particular, the researchers applied time-series clustering approaches and three energy security indicators based on the Shannon–Wiener diversity index, namely energy supply, environmental pollution and diversification from primary energy source, for EU countries and the period 1978-2014. Based on their findings, on average EU member-states are subject to adequate energy security and some moderate levels of improvement in this field, where improvement needs to become higher, in order for the EU to meet the challenges of climate change and scarcity of energy sources worldwide.

Table 1 summarizes the main points of the researches that were outlined above:

Table 1: Summary of Previous Research Studies about EU Energy Security

Author(s)	Aim	Method	Results-Conclusions
Poiana (2017)	To provide an overview of the European energy policy evolution	Empirical literature review	Energy security policy of the EU has been more reactive and less proactive It has been mainly driven by its dependence on imported natural gas The EU takes action only when crisis with its imports take place In periods of crisis,

			higher solidarity among the EU member-states has been observed
Christou (2021)	To analyze the EU energy security policy over the period between 1995 and 2020	Empirical literature review	Energy security in the EU is approached in two ways, the approach of enhancing adequate energy supply and the approach of using alternative and more environmental-friendly energy sources Security of supply as one of its five major pillars, the other four pillars being emissions reduction, internal market integration, energy efficiency and research and innovation on low-carbon technologies The EU occupied with energy security issues only in times of turbulence, i.e., reactively and not proactively. Developments in the EU energy security issue have indeed been observed over the last 15 years,

			which, however, were undermined by the decision of Russia to block natural-gas input to the EU from Ukraine
Rodríguez-Fernández, Carvajal & Fernández de Tejada (2022)	To evaluate security of the 27 countries of the EU with respect to adequate supply and use of gas in the region	Quantitative secondary research Data collected about the 27 EU member-states with respect availability of resources and greenhouse gas (GHG) emissions	EU member-states have reported marginal negative progress in their energy-security indicators from 2005 to 2015. Gas energy security in the EU as a whole fell by 1.09% on average This statistic combined with a 21% increase in the EU's dependence on imported gas, as well as a 50% reduction in the region's gas reserves Gas output fell by 32% between 2005 and 2015. Luxemburg and Latvia positive exceptions Hungary and Spain negative exceptions Results call for immediate action by the EU towards the development

			of a common energy policy, which shall enhance higher energy security for the region as a whole
Radovanović, Filipović & Pavlović (2017)	To evaluate energy security of the EU countries	Quantitative secondary research Data collection about U countries' Energy Security Index (long-term sustainability of energy sectors, both in terms of adequacy of gas reserves and their environmental footprint)	During the decade 1990-2000 the Energy Security Index of the EU was at low levels It started becoming positive over the period 2000-2008 After 2008, some countries again began showing deteriorating results United Kingdom, France, Germany and Italy recorded significantly less fluctuations in energy security over the 23 years before 2017 France and Denmark the two countries having reported the highest energy reserves, mainly because of their capacity in producing nuclear power Energy security shall not involve only gas reserves

			and environmental footprint, but also the availability of other energy sources
Matsumoto, Doumpos & Andriosopoulos (2018)	To evaluate energy security of the EU countries	Quantitative secondary research Time-series clustering for three energy security indicators based on the Shannon–Wiener diversity index (energy supply, environmental pollution and diversification from primary energy source) for EU countries and the period 1978-2014	EU member-states subject to adequate energy security and some moderate levels of improvement in this field Improvement needs to become higher, in order for the EU to meet the challenges of climate change and scarcity of energy sources worldwide

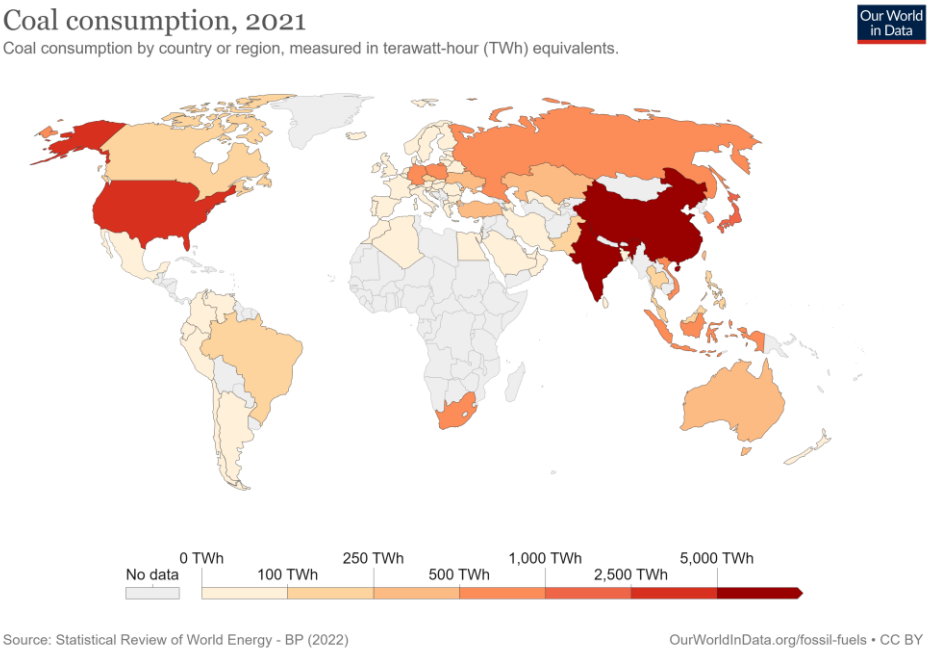
2.3. EU ENERGY SECURITY BEYOND EU BORDERS

It becomes evident from the analysis held so far that the actions of the EU towards energy security are related with the need of the region, as well as the planet as a whole, to take actions towards dealing with the effects of climate change. Europe's decision to lead the effort to rapidly decarbonize its energy system, even implementing an aggressive policy to reduce the use of coal mainly in power generation, has so far had little or no impact on the battle against the climate crisis (Lin, 2022). At least this is what the data on global coal consumption shows, according to which, the reduction in the use of coal in Europe is underlined by the rapid increase recorded mainly in China, but also in India. It follows from the above that at the same time that Europe is committed to reducing carbon emissions, paying a heavy price, due to the current energy crisis, China and India not only do not limit, but significantly increase their emissions, nullifying any benefit from the European climate strategy. As the same data shows, the production of electricity from coal, despite the fact

that it is drastically reduced in the European Union, remains at least stable at the global level (IEA, 2022).

Coal electricity generation over the next 4 years will remain steady at just over 10,000TWh, as increases in China and India are offset by decreases in the US and EU. The figures for the carbon fleet around the world are impressive, as also reflected from what is illustrated in Figure 3. In Europe, there are 468 active coal plants and 27 more are under construction. In China, there are 2363 active coal plants and another 1171 are under construction, which means that the total will reach 3534 coal plants. As far as India is concerned, there are 589 active coal plants in the country, while the country is building 446 to reach 1035 coal plants in total. It is also worth noting that in addition to the coal plants operating within its borders, China is still building 50GW of new coal plants in countries such as Vietnam, Indonesia, Turkey, Bangladesh and Laos, among others. That is, China not only does not limit its own carbon consumption, but instead exports know-how and capital by investing in the development of carbon factories in other countries (Hall, 2021). It is also worth mentioning that according to recent estimates by the International Energy Agency (IEA) on the evolution of global carbon consumption by region until 2024, a continued increase in coal consumption is recorded in China, India and the rest of Asia. As for the official commitments to reduce carbon emissions, the entire G20, the E.U. of 27, the United States, Canada, Great Britain and Japan have committed to a permanent reduction in their emissions, so that by 2050 they have moved to a carbon neutral balance. Instead, China will continue to increase its emissions until 2030 and is committed to net them by 2060 (IEA, 2022). It, thus, becomes evident that any effort made by the E.U. to deal with the climate crisis is preliminarily doomed to failure, if it is not combined by an explicit commitment to reduce emissions from developing countries and especially from China and India, which are currently at the top of the list of the biggest polluters. Otherwise, Europe is doomed to pay the heavy price of the energy transition without a substantial response in the great battle against the climate crisis (Powell, Sativinod & Tomar, 2021).

Figure 3: Global Coal Consumption 2021



(Our World in Data, 2022)

2.4. EU EXTERNAL POLICY AND GLOBAL POLITICAL ECONOMY

There are two dominant theoretical approaches in global political economy and energy geopolitics around energy security: the realist and the liberal. The realist school of thought approaches energy issues in terms of political competition and power, sometimes making use of game theory tools and explaining transnational energy relations as a sum zero game (Broome, 2014). The liberal school, on the contrary, considers energy to be a means of interdependence of markets and economies, which can be used for the benefit of all participants in the economic game of energy. This theory also argues that it is market mechanisms and international organizations that ensure or should ensure the transparency and proper functioning of the global energy markets, based on the principles of good governance (Lavenex, Lehmkuhl & Wichmann, 2009).

The EU, traditionally as an area of industrial states and developed economies, is among those actors of international economic relations for whom energy security is an issue of existential importance. For this reason, both its institutions and member-states are particularly concerned about the unhindered flow of energy to affordable prices, mainly oil

and natural gas, in order to be able to stay competitive in the international competition of economic power (Goldthau & Sitter, 2014). For this reason, many analysts correctly point out that given the Union's high dependence on third-party energy products, the term energy security of the EU has now prevailed to be synonymous with enhancing security of supply (Biermann, Pattberg, Van Asselt et al., 2009).

As it becomes evident from the energy policy that the EU has adopted and followed for decades, as this was thoroughly analysed in a previous section of this chapter, the fact that member-states of the EU have not yet found a robust plan for enhancing a common production and exploitation of energy sources in the region shows how non-European powers such as Russia, the main supplier of energy to the European countries, benefit from the complex framework of energy competition that has been developed both inside the EU and in a global context (Goldthau & Sitter, 2015). Indeed, through Gazprom, Russia supplies 35% to 40% of the total annual needs of the EU in natural gas. Through this process, it is normal to consider that Russia has been trying for years to undermine all the attempts of energy diversification of the EU, which would deprive Russia of economic and political power (Dellecker & Gomart, 2011).

2.5. CONCLUSION

This chapter was the chapter analysing EU external energy governance from a politics' perspective. As the analysis in this chapter reveals, EU member states have made considerable efforts throughout the history of the Union, in order to come up with a central authority governing the normal flow of energy across the Union and with reasonable prices. The above efforts were highly verified with signing the Lisbon Treaty in 2007, after an energy sock that recent conflicts between Russia and Ukraine had caused in the European market. Later on, the development of the European Energy Union, the adoption of Europe's Energy Strategy and the passing of the Third Energy Package against monopolistic practices of energy companies set the basic pillars of EU's policies for the promotion of environmental sustainability, competitiveness of the EU energy market and the security of energy supply. However, the results of such policies have not been the expected ones. In particular, Europe is still highly dependent on energy imports, while actions are mostly taken in periods of

crisis and not proactively. The above have led the Energy Security Index of the EU in being quite low. In any case, even if the EU tries to reduce the production of coal, as a means of reducing carbon emissions, there are countries like India and China, which offset such an effort with their increasing production. From a political economy's perspective, it becomes evident that the complex energy-security framework that has been developed in EU has benefitted exporters of energy, with Russia being at the forefront.

CHAPTER 3: THE POLITICS OF LNG DEVELOPMENT IN WESTERN AND EASTERN EUROPE

3.1. INTRODUCTION

This chapter is occupied with analyzing the politics of LNG development in Western and easter Europe. The chapter starts with analyzing LNG as an alternative energy source and how its market has evolved in a global context and under what market structure. Then, an analysis takes place regarding the state conditions of the LNG market in the EU, as well as Easter and Western Europe.

3.2. THE EMERGING GLOBAL MARKET OF LNG

Natural gas in liquefied form is an environmental-friendly energy source and the planet is "thirsty" for this kind of energy, especially now that concerns about climate change have reached their peak in a global context. In recent years, Liquefied Natural Gas (LNG) claims and constantly recovers its market share in the global market, being a niche market that reports rapid rates in maritime energy transport. In particular, international trade of LNG reported an average annual growth rate of 7.9% from 1995 to 2003. This constitutes the LNG market as the fastest growing than any other sector of the energy industry (Jensen, 2004). Obviously, such growth requires continuous large-scale investment in the entire LNG supply chain. This still comes with an increasing range of risks and opportunities for industries. In the context of the subject of this study, LNG can play a central role in ensuring the transition to safer, cleaner and more reliable energy supply by replacing fossil fuels, providing a flexible alternative to renewable energy production and reducing the risk of energy dependence (Biały, Janusz, Kaciak et al., 2019).

The markets of the Atlantic basins and the Pacific are reacting to price developments in the LNG market, under the pressure of floating producers in the Persian Gulf leading to converging LNG prices globally, while more flexible trading patterns, including spot trades and short-term contracts, increase the liquidity and flexibility of the global LNG market. In this context, the treatment of the legal parameters of the production and the LNG trade is

of vital importance for seizing the opportunity for creating a more flexible and orderly global LNG market (Metelska, Biały, Cieślik et al., 2006).

Looking at the most important geopolitical events that have contributed to the development of the global LNG market, one of these is definitely globalization. Along with the political dimension of the term, there was a change in the market from local to global, mainly after 1990, when the local markets of North and South America, Europe, and Asia acquired connection and competition in the management of the same LNG flows. New markets emerged like that of India and China, creating new geopolitical balances by removing a large portion of power from the U.S.A. (Chen, Yu, Ai et al., 2019). In a similar context, the end of the Cold War and global economic integration created the expectation of a globalized system with complete freedom of flow of goods (including natural gas) and a free purchase balance. However, reality was different, since producing countries and consumers fortified themselves behind their national interests and they tried to influence the global flow in the short and long term, mainly driven by their geopolitical aspirations (Lin & Brooks, 2021).

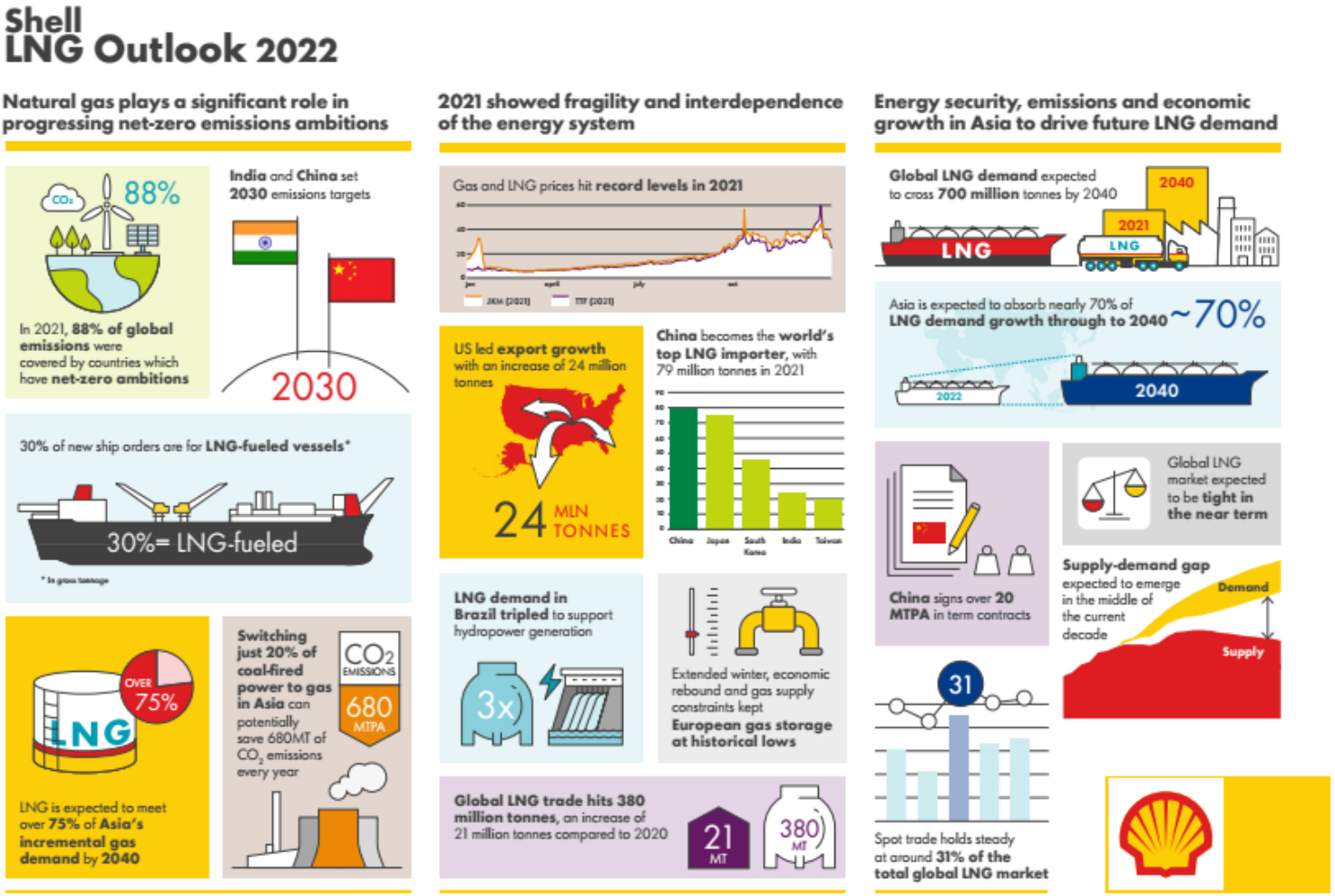
Oligopoly conditions prevail in the global LNG market, since, due to enormous construction costs of the liquefaction and regasification units, suppliers enter into long-term contracts with buyers (usually 20 years), many years before the completion of the investment projects. Because of the huge construction cost of the units, the long duration of the construction period and the long delays in the implementation of the projects, supply at the time being cannot adequately meet demand (Zhang, Xi, Ji et al., 2018). The companies that have the liquefaction terminals and the terminals for LNG regasification, are the ones that determine the market conditions, since they control the global flows through the programmed shipments, while also utilizing the spot market to achieve better prices or terms of negotiation. The major market players are mainly international or state oil companies (BP, Shell, Chevron, Total, etc.), power generation and gas distribution businesses, or chemical industries (Ryan & Ryan, 2015).

Another important characteristic of the global LNG market is that national governments set the operating frameworks at a national level. The tendency to nationalize energy sources,

which emerged after the period 2001-2003, created significant problems for countries of the world, turning their interest towards the development of renewable energy sources, in order to control dependence on gas imports. The explosive growth of the natural gas market investment by national and global capital in the value chain of natural gas reinforced the strategic need of countries to control their sources, despite the willingness to enhance free flow of gas globally (Siliverstovs, L'Hégaret, Neumann et al., 2004). From a geographical distribution's perspective, the mining sources of natural gas are located in some areas with asymmetric global distribution. 70% of known natural gas reserves are in the so-called 'strategic gas shortage', starting from Northern Russia and through central Asia reaches the Middle East. The fact that all producing countries are also consumer countries significantly affects their strategy to get the most results of their natural gas management processes and strategies. It is also worth noting that in contrast to oil, natural gas prices are not set globally, but at a local or regional level (Jiang-Bo, Qiang & Ying, 2014).

The outlook for the global LNG market looks positive, with fundamentals appearing supportive this year and the Russia-Ukraine dispute expected to widen trade and investment in the sector both in the short and long term. The role of LNG as a transitional fuel in the global energy mix appears to have strengthened due to the ongoing global energy shortage and the current focus on energy security, with the latest estimates suggesting that LNG trade will exceed 600 million tonnes. tonnes by 2030. The outlook for the LNG carriers sector in 2022 remains positive mainly due to the very supportive fundamentals. Tonne-miles are expected to grow by 8.5% this year, boosted mainly by European efforts to diversify from Russian pipelines, while fleet growth is forecast to reach up to 4%, following record deliveries last year. In 2023, the market will face some concerns, as tonne-miles are estimated to grow by less than 3%, due to the limited export volumes planned, while fleet capacity is estimated to increase by 4.5%. However, upcoming environmental regulations may have some positive impact. Meanwhile, the energy transition is progressing with estimates of increased natural gas production in the 2030s (Kemene, 2022). This is also highlighted in Shell's outlook of the LNG market, as presented in the following figure:

Figure 4: Shell LNG Outlook 2022



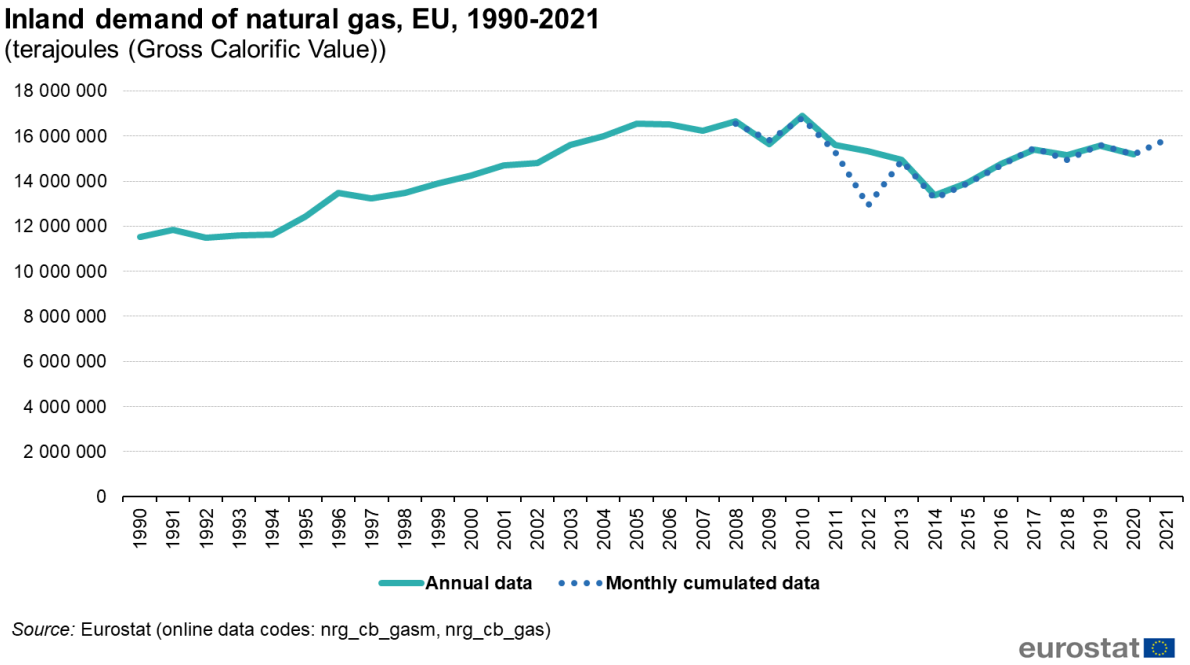
(Shell, 2022)

LNG is expected to play a pivotal role, with a number of projects having received a Final Investment Decision (FID) and coming into force in the coming years, creating increased demand for the fuel in both Europe and Asia. The share of LNG in natural gas production is expected to reach 17% by 2030, up from 12% in 2020. At the same time, as the Russian-Ukrainian war puts the focus on secure energy supply, the prospects for LNG trade appear even more positive. According to estimates, trade in fuel can increase by up to 5%-6% per year over 615 million euros. tons by 2030 (from 4.8% previously and while today it stands at 417 million tons) (Kemene, 2022).

3.3. LNG IN THE EU GAS MARKET

Based on the official statistics provided by Eurostat (2022), domestic natural gas production in Europe continue its downward slope in 2021, falling by 7.6% compared with 2020 to reach 1,755,874 terajoules, further increasing the region's dependency on imported natural gas to a bigger extent, which reached 83% in 2021. The case of the Eurozone is even worse, if it is taken into account that in the euro area, a decrease of 9.8 % was recorded, with production amounting to 1,110,745 terajoules. The above have come at a time when natural gas demand in the EU further increased by 4.3% in 2021, continuing its upward slope since 2014 and actually since 1990, as this is also verified by Figure 5 that follows.

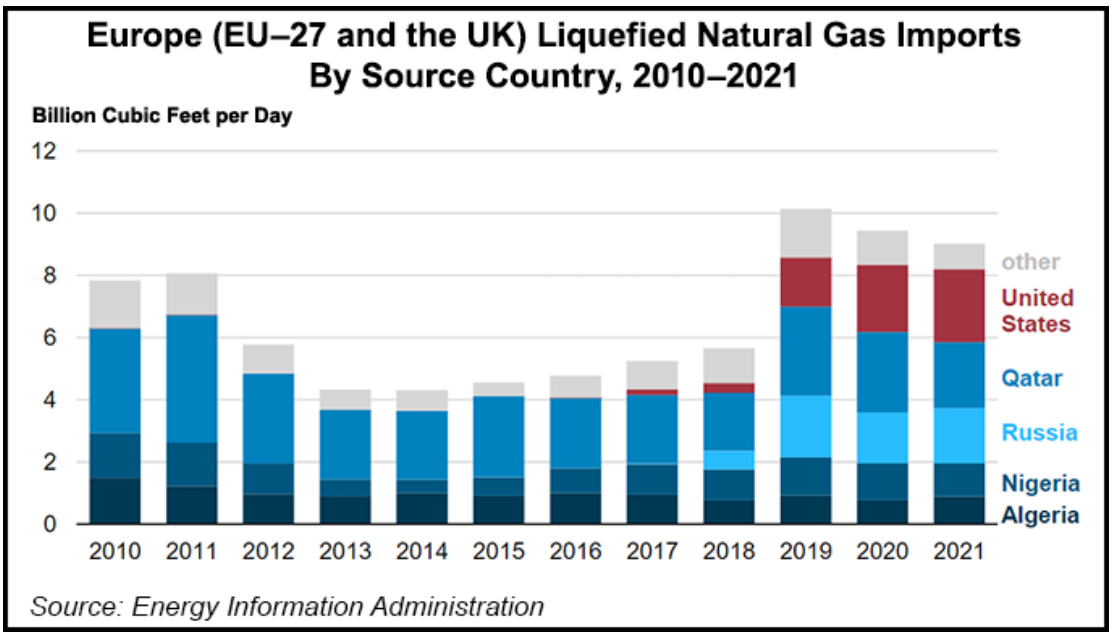
Figure 5: EU Inland Demand for Natural Gas (1990-2021)



(Eurostat, 2022)

Figure 6 presents the countries and regions from which the 27 countries of the EU mostly import natural gas to cover their energy needs:

Figure 6: EU Sources of Imported Natural Gas 2010-2021



(Cocklin, 2022)

As part of its latest measures to deal with the energy crisis that the Russian invasion in Ukraine has caused, Europe is seeking to replace natural gas supplied by Russia and demand for LNG is driving up EU gas prices. Gas prices have already risen five times compared to a year ago, inevitably hitting consumers' incomes. Europe has witnessed that since the end of July 2022, the flow of Russian natural gas from the main European pipeline Nord Stream 1 has been reduced to 20% of capacity, and there are fears of further cuts. If the price continues to rise and supplies fall, Europe could be forced to cut consumption to reduce domestic demand in order to deal with gas shortages. Apart from that, it has also switched to other exporters, as a means of trying to maintain the necessary natural gas reserves to meet its winter demand, with the U.S.A. being at the forefront. Indeed, according to the U.S. Energy Agency, in the first four months of the year the country exported 74% of its LNG to Europe, up from 34% last year. Asia was the main destination in 2020 and 2021 (Energypress, 2022). China, the largest buyer of LNG, is selling what it has left over in Europe at high prices, what analysts consider as Europe's precarious new energy dependence and indirectly profit for Russia. Indeed, the total amount of Chinese LNG that has been resold is potentially over 4 million tons, equivalent to 7% of gas imports from Europe in the first half to June. Market commentators, however, see, in addition to the irony that Europe is changing an authoritarian country of dependence, that in this way Russia ultimately

continues to indirectly sell to the EU, which pays dearly to both Putin and Xi Jinping (Liberal, 2022). The above are also verified by the analysis of Imerisia (2022), according to which Europe bought record quantities of LNG at a discount in the beginning of 2022, due to reduced demand from Asia, as part of its policy of gradual de-dependence on Russian gas.

Despite the above, Europe's LNG terminals, mainly those located in Northern Europe and that cover markets such as the German, the French and the British, have limited capacity to absorb any additional quantities of LNG from the U.S. or other producing countries, if needed. This development further complicates plans to safeguard Europe's energy needs through LNG imports, in case things in Ukraine derail and Russia turns off its gas taps to the EU. It is worth mentioning that Spain has the largest capacity in Europe with six terminals, while Germany has none. In fact, the situation that has recently arisen has inflamed the debate on the political scene in Germany about the need to build an LNG terminal, a debate that also runs counter to the question of what will eventually happen to the Nord Stream 2 pipeline and the flows from Russia. Spain has more space available in its terminals, but there is a practical problem with transporting gas from its warehouses to the rest of Europe. This is because Spain does not have a developed pipeline network with other European countries, apart from the Spain-France gas pipeline (OT, 2022).

3.4. LNG DEVELOPMENT IN EASTERN AND WESTERN EUROPE

The analysis held in the previous section regarding the LNG market in the EU reflect the LNG development prospects in Eastern and Western Europe. On the long-standing construction site of the gas pipeline connecting Norway to Poland on Danish soil, operations have resumed since Russia's invasion of Ukraine. Plans to build methane terminals in northern Germany, Finland or France, new pipeline branches to Spain or the eastern Mediterranean are also at a stage of operations. Europe is working full-steam ahead to reduce its dependency on Russian gas, even if it will take years, according to experts. In Middelfart, on the Danish island of Fyenen, work on the Baltic Pipe pipeline construction site resumed in March 2022 to complete the 900-kilometer-long Norway-Poland link. Just a week after the invasion of Ukraine, the Danish environmental authority, which was concerned about the consequences of Norway's plan to connect the country with Poland, giving permission to

continue the project, after a nine-month hiatus. The 900 km-long partly undersea pipeline is scheduled to be partially operational in October and in full operation on 1 January 2023. At the same time, Nord Stream II seems to have started been considered as a thing of the past. With a transmission capacity of 100 billion cubic meters of natural gas per year, the pipeline will make it possible to secure 50% of Poland's consumption, which announced three years ago the expiration in 2022 of its contract with Russia's Gazprom (Capital, 2022).

However, this good news about Warsaw is likely to complicate the supply of the rest of Europe, in sign of the difficulties that characterise the supply of the European continent. Norway, Europe's second-largest gas supplier after Russia, assures that its production is at its maximum and that natural gas arriving in Poland will no longer be sold in Western Europe. After all, many long-term contracts between Russia and European companies will still be active for 10 or 15 years. According to the European Commission, though, the European Union can completely get rid of Russian gas well before 2030 (Capital, 2022).

With Norway at its peak in production, the deposits in the Netherlands and the United Kingdom are in decline, while Russia, being at the current times an undesirable supplier, Europe is looking for its natural gas from more distant sources in the form of LNG to be transported by ship from the United States, Qatar or even Africa. But the introduction requires the construction of terminals or at least the use of floating storage units of LNG and its conversion into gas. Faced with the abandonment of the Nord Stream II pipeline connecting it to Russia, Germany activated three plans to build methane terminals, which had been considered a low priority, since Berlin had bet everything on the Russian-German pipeline. One station may be ready in winter 2023/24, the two others not before 2026. Finland, in cooperation with Estonia, announced last week a plan to develop a floating import terminal, while the three Baltic countries announced an end to importing Russian gas since April 2022 (Lazarovitch & Quigley, 2022). In Southern Europe, Spain and Portugal are turning into an alternative supply route to Russian gas. In the port of Sinas, the largest in Portugal, the plan has been to double the capacity of the existing terminal in less than two years. Connected to a pipeline with Algeria and with large methane terminals, Spain could be a solution, at least for Western Europe. But there is a lot to do to improve links with the

rest of the European Union through France. Another route under consideration is the connection of eastern Mediterranean gas with Europe (Bull, 2022).

3.5. CONCLUSION

This chapter was occupied with analyzing the LNG market as an alternative energy source. Based on the analysis held in the previous sections, LNG is a very promising environmental-friendly energy source, which has already been occupied by various industrial and transportation sectors. Indeed, LNG is expected to play a pivotal role, with a number of projects having received a Final Investment Decision (FDI) and coming into force in the coming years, creating increased demand for fuel in both Europe and Asia. Despite the above, LNG production in the EU remains at low levels, with countries in the region importing LNG mainly from the United States, Qatar and Russia. LNG inventory in the EU has become even worse, after the current war in Ukraine and the limited supply of natural gas from Russia. Although efforts are made for higher LNG production in Eastern and Western Europe, it seems that the European dependency for LNG on Russia shall last for long.

CHAPTER 4: THE IMPACT OF US LNG ON RUSSIAN NATURAL GAS EXPORT POLICY

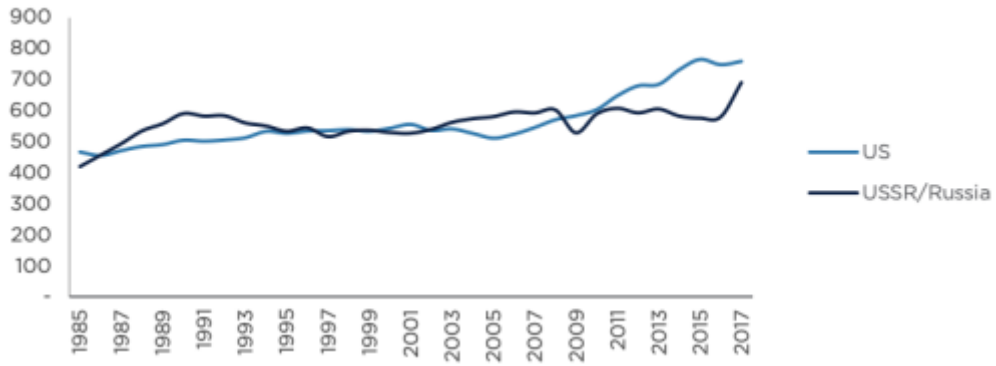
4.1. INTRODUCTION

The aim of this chapter is to analyze the impact of US LNG on Russian natural gas export policy. The chapter starts with the analysis of the types of LNG markets that the U.S.A. and Russia are. Then, analysis focuses on the commercial, geopolitical and institutional influences that the growing LNG exports of the U.S.A. mainly towards Europe shall have for Russia.

4.2. TWO DIFFERENT TYPES OF MARKET

The U.S. and the Russian are the two most major and leading natural gas markets in the world, as this is also verified by the statistics to be provided in the next section of this chapter and as also reflected from Figure 7:

Figure 7: US and Russian Production of Natural Gas 1985-2017



(BP, 2022)

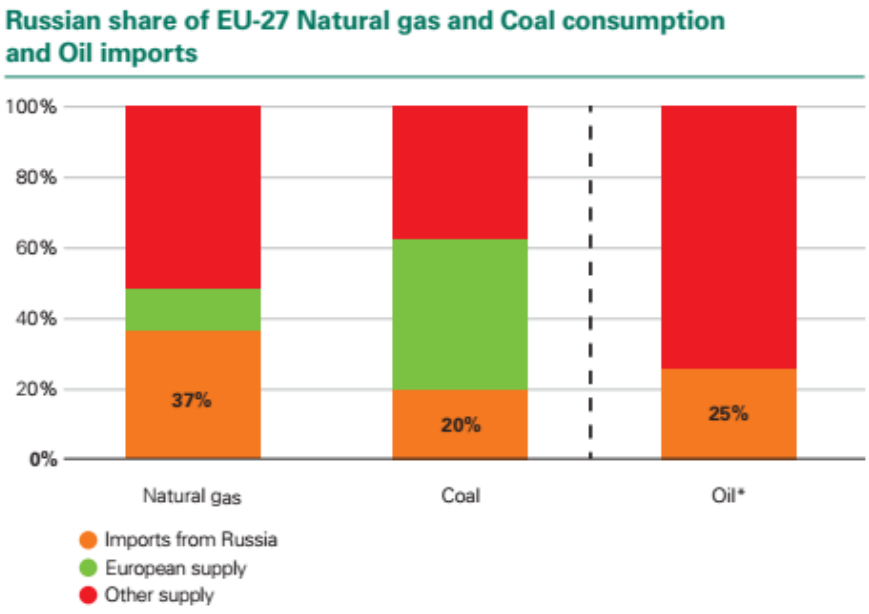
Although both markets refer to producing and exporting natural gas, there are some notable differences between these two markets, mainly as far as their industrial organization is concerned. More particularly, the basic difference between the two markets lies in that the Russian (and former Soviet) gas market has traditionally been a state-owned one, as this is also examined in the next section, as far as the role of Gazprom in the

domestic and international gas market is concerned. In contrast, the U.S. market has been a private market almost since its initial development and especially after the 1970s and the 1980s, when the liberalization of the U.S. gas market led the U.S. state in playing a very minor role in setting the rules and conditions of this market (Bordoff, 2014).

4.3. THE RUSSIAN NATURAL GAS MARKET

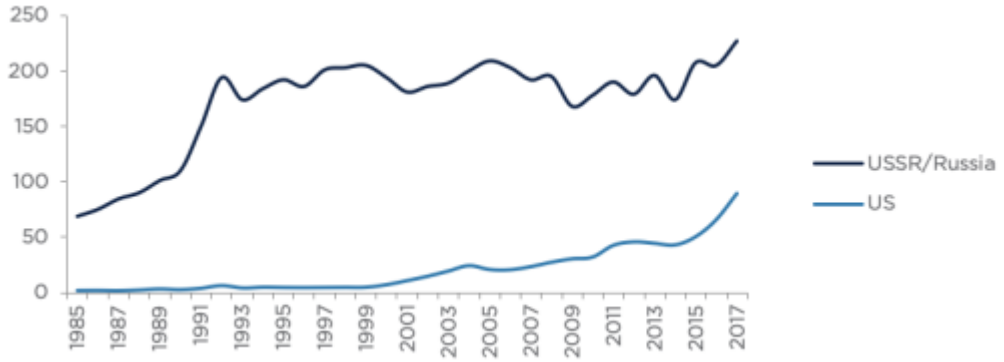
Russia is the largest exporter of gas and oil in the world, while it is also the second most major producer of natural gas, following the U.S.A. According to the International Energy Agency, 45% of Russia's budget in 2021 came from oil and gas revenues. The EU has for long been Russia's best customer for both oil and gas. In 2021, the US Energy Intelligence Agency claims that 49% of Russia's crude oil exports went to European OECD countries. However, the war in Ukraine prompted the EU to want to move away from Russian fossil fuels and Russia will need new customers, as this is also reflected from the analysis so far. Based on the opinion of various market experts across the globe, Russia will likely focus on existing customers that have not imposed sanctions, such as China (CNN Greece, 2022). Figure 8 present the share of Russia in natural gas, coal consumption and oil EU imports, while Figure 9 presents the volumes of natural gas exported by Russia and the U.S.A. all over the world.

Figure 8: Russian Share of EU-27 Natural gas and Coal Consumption and Oil Imports



(BP, 2022)

Figure 9: Natural Gas Exports of Russia and the U.S.A. 1985-2017



(BP, 2022)

One fifth of global reserves of natural gas are located in Russia, mainly in West Siberia and the Volga-Ural oil and gas province. The development of Russia as a major global supplier of natural gas started in the 1950s, when big amounts of natural gas were found in the former Soviet-Union area, thereby creating new opportunities for foreign trade in the country. A landmark year in the industry has been the year 1989, when the USSR Ministry of Gas Production was transformed into the state-owned enterprise Gazprom. The organization is the leading natural-gas producer worldwide, also holding monopolistic power in Russian natural gas exports (Statista, 2022). Under no doubt, the high rise of the Russian natural gas market shall be highly attributed to the high demand from Europe, combined with the steadily declining production volumes of natural gas in the region. It is worth noting that since 2009 European production of natural gas has declined by about 33%. This explains why demand for Russian natural gas in the region increased from 25% in 2009 to 32% in 2021 (CNN Greece, 2022).

In terms of oil, China is Russia's largest non-European customer, accounting for 38% of Russian oil exports to Asian and Oceania countries in 2021. Russia is China's second-largest oil supplier after Saudi Arabia, but the main goal in the coming years will be to outperform its middle eastern rivals to become China's main oil supplier." Another big goal for Moscow will be to significantly increase its natural gas and oil sales in India. The country of 1.38 billion people is the third largest consumer of energy in the world, the vast amount of which comes from import. However, there are doubts about the extent to which countries like China and India can ultimately replace European demand (CNN Greece, 2022).

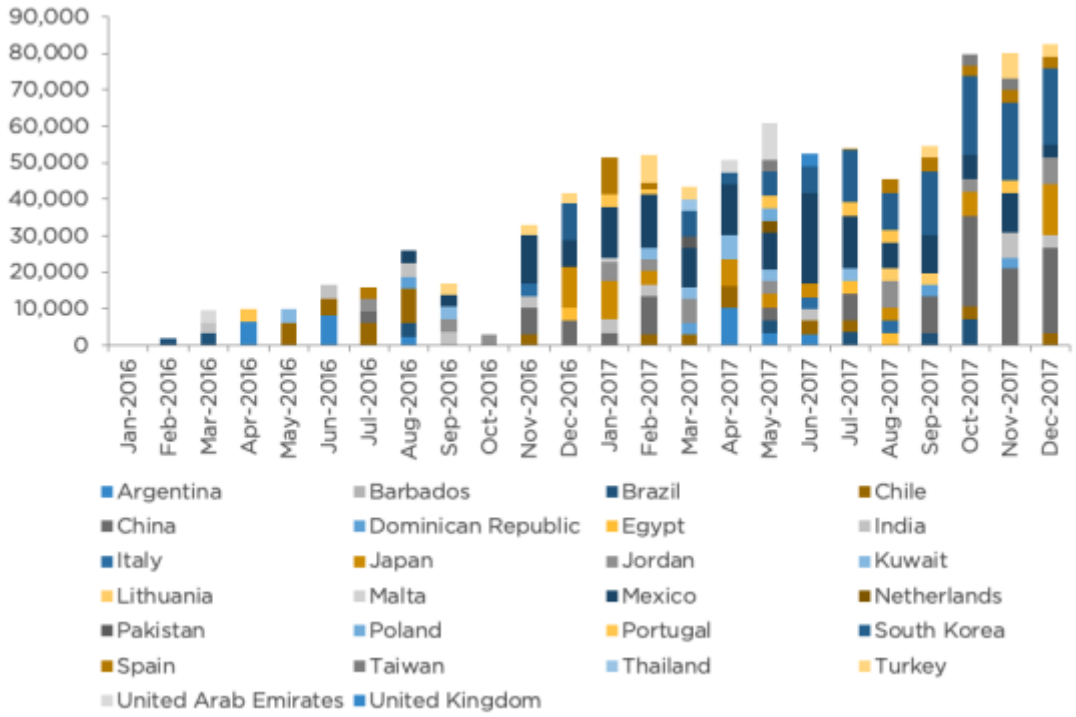
Apart from gas, Russia exports natural gas in LNG form as well. Indeed, based on the data provided by Statista (2022), in 2021 Russia exported about 40 billion cubic meters of LNG, constituting the country as the fourth largest exported of LNG in the world, following Australia, Qatar and the U.S.A. The above figure is 5% lower than that of 2020. Japan, China and France are the three most important consumers of Russia-exported LNG. The planned projects Arctic LNG 2 and Baltic LNG are expected to further increase the potential and exporting power of the Russian LNG market in the years to come (Statista, 2022).

4.4. THE FUTURE IMPACT OF US LNG SUPPLIERS ON RUSSIAN GAS EXPORTS: COMMERCIAL, GEOPOLITICAL, AND INSTITUTIONAL COMPETITION

As mentioned before, Russia follows the U.S.A. in terms of leadership in the production of natural gas worldwide. This fact is adequate enough to explain why the U.S. influence on Russian gas exports is huge. This influence has been a historical one and shall be traced back in the 1970s, when the U.S. tried to block the Gas-for-Pipes Deal between the Soviet Union and the leading European economies in the 1970s. Such attempts, which had many geopolitical episodes, came to an end in 1991, when the Soviet Union collapsed. This was meant to boost Russia's energy-exporting activity to Europe, but the U.S. was mostly occupied with its domestic production and demand, not having any significant interest in Europe (Doane, 1994). In the early 2000s, when the U.S. faced huge gas deficits, Russia was one of the potential LNG suppliers that the U.S. targeted for cooperation, mainly in 2003, when Gazprom announced the start of its negotiations with the U.S., for the latter to be engaged in the Shtokman LNG project, getting supplied with Russian LNG from 2010 and one. However, after a long bidding process, U.S. gas companies were not allowed to participate in Shtokman (Boussena & Locatelli, 2017).

Being the biggest producer of natural gas in the world, the U.S. has significantly competed Russia in LNG exports all over the world, as this is also verified by Figure 10, which shows a wide spread of U.S. LNG-exporting activities all overt the world.

Figure 10: U.S. LNG Exports across the Globe

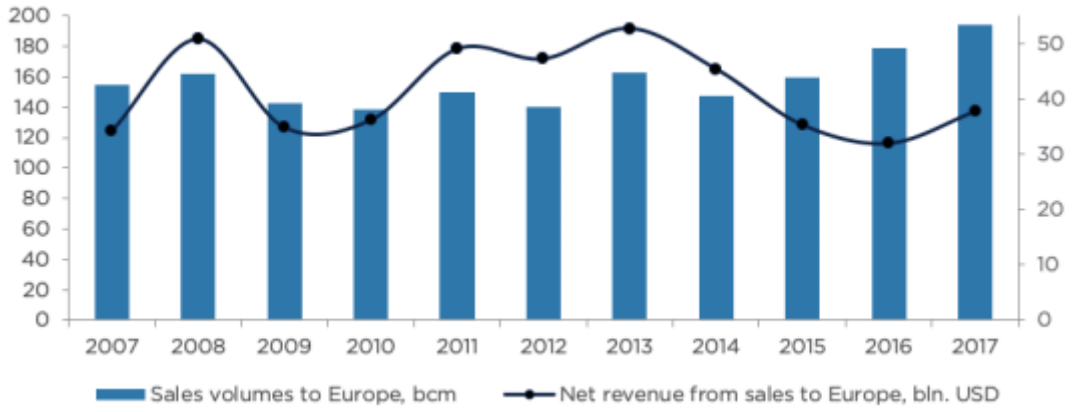


(IEA, 2022)

At the same time, the concentration of the U.S. gas producers in the domestic market meant that Russia totally lost potential exports towards Northern America, a market that Russia had planned to dominate with the Shtokman megaproject and Novatek's Yamal-LNG, agreements that were eventually postponed in 2012 for an undefined time in the future. To make matters worse for Russia, after 2008 and 2009, the fact that the Northern American market became relatively unattractive for Russia, led other major gas producers of the world, such as Qatar, Algeria and Nigeria, to name a few, to proceed with generous investments in developing LNG infrastructure in the U.S.A., as a means of increasing their LNG output, while at the same time also taking advantage of the technology and know-how of the leading gas producer in the world. This fact undermined the competitiveness of Russia and its LNG exports against not only the U.S.A, but also other LNG-producing countries in the world (Boersma & Mitrova, 2017). The oversupply that was created, accompanied by the start of the global economic crisis in 2009, reduced both LNG prices across the globe and the export potential of Russia, especially in its flagship import market of the EU, leading Russia and its Gazprom in abandoning the for long successful strategy of

being based on low prices to attract new customers around the world (Boersma, Mitrova & Losz, 2018). This is highly verified by the fluctuations observed in Gazprom's revenues, as illustrated in Figure 11:

Figure 11: Gazprom's LNG Sales Revenues from Exports to the EU 2007-2017



(PJSC Gazprom, 2017)

As it follows from the above, the U.S. challenge to Russian LNG exports has been mainly an economic and commercial one. Indeed, the higher availability of U.S.-produced LNG has put high competitive pressures on Gazprom, not only in terms of prices, but also in terms of sales, not only in Europe, but also in Asia, with countries in the latter benefiting from having one more reliable LNG supplier, instead of being solely dependent on Russia. Apart from the above, though, there are also geopolitical challenges to be taken into consideration. More specifically, based on the analysis held in the previous chapters, the rise of the U.S.A. as a major global LNG power shall also give it rise as a political power as well, given the role that energy plays in global economics and politics. The magnitude of this geopolitical concern for Russia shall be determined by the magnitude at which the U.S.A. shall invest in its LNG export activities (Arentsen & Kunneke, 2003). Such changes in the power in the global LNG market shall be expected to also change the dynamics of geopolitical relationships in a g lobal context, mainly as far as the relationship between the West and Asia are concerned. To put it differently, given that the U.S.A. and Russia have traditionally been two different political institutions, countries choose to cooperate with one or the other in LNG trade shall also determine to a large extent their political and geopolitical orientation as well (Boersma et al., 2018).

The influence of the U.S. in Russia's gas exports has become even bigger since the start of the War in Ukraine in February 2022. One of the first measures that the U.S. government took, as part of the West's sanctions imposed against Russia, was the total ban of U.S. energy imports from the country, while at the same time closely approaching the EU, as a means of filling in the gap that Russia's reduced supply of natural gas in the region has created (Wilkie, 2022). At the same time, the U.S.A. took advantage of the war in Ukraine to increase its export activities in the world and especially Europe. Indeed, the number one gas producer became the world's top exporter of LNG in the first half of 2022, as reported by IEA. This rise has been highly welcome for Joe Biden's administration, which has sought to strengthen energy ties with Europe, as a way to counter Russia's influence. But given the world's voracious demand for gas, these European imports come at the expense of poorer nations like Pakistan and India, which could face energy deficits or be led to new agreements with Russia. In any case, by June 2022, the U.S. had exported around 57 billion cubic metres of natural gas as LNG, with 39 billion cubic meters, or 68%, going to Europe. This compares with the 34 billion cubic meters, or 35%, of LNG exports shipped from the U.S. to Europe for the whole 2021. This means that the United States has already sent more gas to Europe in the first six months of 2022 than in the 12 months of 2021. If exports to Europe continue at the same pace in the second half of 2022, the overall increase compared to 2021 will be around 45 billion cubic meters (Cocklin, 2022). Further to the above, Biden and European Commission President Ursula Von der Leyen also announced a plan to create a working group to further reduce Europe's dependence on Russian fossil fuels, including natural gas. The Commission is going to ensure that the EU is able to receive around 50 billion cubic meters of additional U.S. LNG at least 2030, while the U.S. is on track to surpass that number this year. The above indicate that the influence of the U.S. on Russian natural and LNG exports is expected to be important in the years to come, at least as far Russian exports to the U.S. market are concerned (White House, 2022). The reaction of Russia to the above aggressive energy policy for Europe remains to be seen, which shall determine how much and if Russian exports overall across the globe shall be negatively influenced in the end or not.

4.5. CONCLUSION

This chapter was occupied with comparing and contrasting the U.S.A. and Russia, the two most major LNG exporters in the world. The basic difference between the two markets lies in that the Russian (and former Soviet) gas market has traditionally been a state-owned one, as this is also analyzed in the next section, as far as the role of Gazprom in the domestic and international gas market is concerned. In contrast, the U.S market has been a private market almost since its initial development and especially after the 1970s and the 1980s. It is worth noting that 45% of Russia's budget in 2021 came from oil and gas revenue, with the EU being for long Russia's best customer for both oil and gas. Being the biggest producer of natural gas in the world, the U.S. has historically competed Russia in LNG exports all over the world, undermining the exports potential of Russia, thereby imposing economic and commercial challenges. Since the start of the recent war in Ukraine, the above challenges have become bigger, with the EU agreeing to be mainly supplied by the U.S.A., as a means of boycotting Russian imports.

CHAPTER 5: THE INTERNATIONAL EU POLICY FOR THE MARITIME SECTOR

5.1. INTRODUCTION

After having providing a thorough analysis about how the EU has dealt with energy security in a wider context, this chapter concentrates with the particular case of the maritime sector. More specifically, this chapter analyses the policies that the EU has developed for its maritime industry, the energy efficiency to be enhanced by shipping companies and how LNG has contributed as an alternative fuel.

5.2. EU POLICY ABOUT MARITIME SECTOR

Transport is the connecting link between production and consumption of goods, which are intended for serving the needs of people, organizations and industries, while also being of vital importance for each country, as they contribute to their sustainable economic development. As far as maritime transport is concerned, it has been estimated that they represent the 98% of world trade transport. Shipping is an important factor for the world economy, having decisive contribution to the well-being, development and integration of markets. Indeed, the shipping industry helps in reducing transportation cost, which is an integral part of the production cost of goods and commodities (Fratila, Gavril, Nita et al., 2021). Sea transport has a lower cost, compared to other means of transport. So, on the one hand competition develops and on the other each country and region can develop the advantages that already has, which may be either of a static nature (comparatively) or of a potential one, the latter coming from the application of knowledge, technology, know-how and innovation (competitively). When significant transportation costs intervene, the differences in production costs between two producers are not reflected, so there is no competition. With low transport costs, distribution and geographical decentralization of production activities and production processes, companies and countries are achieved (Bai, Zhang, Li et al., 2021). At the same time, the rapid decline of protectionism in international trade in recent decades, through educing or even eliminating several finances obstacles, could not be achieved, if it was not accompanied by a decline in transportation costs as well.

Therefore, maritime transport created the broadest favourable conditions for the development of the world economy, both inside the regions and the specific distribution locations of the establishment of industrial production (Akbulaev & Bayramli, 2020). It follows from the above that developing policies for the maritime sector is very important for countries and regions in general, as well as the specific case of the EU region under discussion in this dissertation.

With respect to EU's policy for the maritime sector and the shipping industry in general, shipping is an extremely important sector for the EU authorities and its national governments. Indeed, shipping plays a key role in the development and strengthening of the economy of the EU, as well as the reinforcement of its bargaining power over its external allies and enemies. For this reason, the development, establishment and insurance of European maritime transport is considered as highly necessary. During the last 15 years, through various regulations, directions and decisions of its competent bodies, the EU has tried to develop a common maritime policy (Riddervold, 2018).

The efforts of the EU towards developing a common maritime policy in the region had started around the early 1970s. However, the year 1986 is considered as a defining one, with the interest of the European Commission and the European Council being highly focused on the maritime sector. On February 28, 1986, the Single European Act was approved in Brussels, which laid new foundations for European political cooperation, being put into force in July 1987 (Behr, 2013). In 1986, some of the most defining regulations for the formulation of the EU's unified Maritime Policy are drawn up, such as Regulation (EEC) No. 4055/86 on the application of the principle of freedom of supply services in the field of maritime transport between EU and third parties, Regulation (EEC) No. 4057/86 on unfair practice determination regarding freight rates in maritime transport, as well as Regulation (EEC) No. 4058/86 for the undertaking of coordinated actions, in order to ensure free access to transoceanic transport routes (Germond, 2011).

In the years following 1986 amendments to the above regulations were made, as a means of updating their provisions to meet the changing circumstances and challenges surrounding European maritime transport. The next highly defining year was 1992, when the concept of

the Common European Market was developed, to bring rapid economic development in the region. It was a result of the creation of this common European market that triggered the start of the drafting of the Common Maritime Policy, which gave a special emphasis on protection of the marine environment and safety of human life (Keser, 2011). In the context of the drafting and validation of the European shipping institutional framework, the first White Paper was also written. The content of the first White Paper was intended to provide solutions to key problems identified by EU authorities and member-states' governments in the field of maritime services. Later, in 1996, the European Union redefined its objectives in its field, to focus on the achievement of a satisfactory degree of protection and security of the marine environment, the application of international shipping regulation and through this the maintenance of legitimate competition, as well as the improvement of the competitiveness of the EU in the global shipping industry (Smith, 2016).

At an environmental regulation level, the regulation for maritime traffic "Monitoring, Reporting, Verification" – MRV, adopted in April 2015, has created a pan-European legal framework for monitoring and reporting CO_2 emissions and other relevant information from maritime transport. According to this regulation, ships greater than 5,000 tons, regardless of where vessels or shipping companies are registered, and, which operate trade routes in ports of the European Economy Area – EEA (European Union, Iceland and Norway), have been required since January 2018 to develop and implement systems and procedures to monitor the CO_2 emissions that they cause (European Commission, 2002). Of course, other environmental regulations of global magnitude, as imposed by the International maritime Organization (IMO), are also into force in the region, such as the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Safety of Life at Sea (CONVENTION), to name a few (IMO, 2022).

Overall, in recent years, the EU conducts 90% of its foreign trades and 37% of its inside-region trade through maritime transport. The shipping industry has assisted Europe's efforts to take the lead in world trade. After all, it must not be neglected that Europe is the largest trading partner in the world, as its trade accounts for about 20% of world trade. The above percentages help in understanding the key position that shipping holds in the development of EU economy, increasing the national product, as well as the strategic and negotiating

power of the region (Germond, 2018). At the same time, the above also reflect the very important role that EU maritime policy plays in global shipping, also taking into account that along the EU there are 329 main ports, thereby leading about 33% of all global maritime transport belonging to Europe. At the same time, it is also worth noting that the European merchant fleet accounts for about 41% of total merchant fleet in a global context. In this context, a vital objective for European shipping is compliance with competition rules. At the same time, the EU maritime policy also aims at the development of an attractive and qualitative framework that encompasses the human element, the protection of the environment and the offer of excellent shipping service, the improvement of the competitiveness of European maritime clusters also being included. There are numerous maritime organizations that have been developed, in order to serve the above aims, such as the European Maritime Safety Agency (EMSA), the European Maritime Law Organisation (EMILO) and the D General for Maritime Affairs and Fisheries, to name a few (European Parliament, 2022).

5.3. ENERGY EFFICIENCY IN THE SHIPPING SECTOR

Increase in mobility, compliance with security measures and at the same time reduction of costs, remain the core targets in maritime transport, given that the purpose of the shipping business, as well as any other business in any other sector, is profit maximization. The interest surrounding the control ships' energy efficiency is related to economic, environmental and technical factors. To put it differently, the better understanding of a ship's operational performance is directly linked with fuel costs and environmental pollution (Bialystocki, 2016). Over the past 10 years, the interest around cost savings and energy control has come back into focus, due to high prices of oil and the imperative to take urgent action for tackling climate change (Acciaro, Hoffman & Eide, 2013).

As a result of rapidly rising oil prices, the cost of fuel on ships has risen from 40% to 60% of their total operating costs over the last decade. To save fuel, shipping companies have taken a series of measures, such operating vessel engines at lower speeds, wherever and whenever this is possible, something which, however, progressively leads to under-functioning of the ship and additional engine wear. In this context, shipowners always seek

to operate their ships under optimum technical and operational conditions. The achievement of the optimal operation of ships in terms of energy efficiency is only possible through monitoring fuel consumption, while also consistently following a structured and clearly certain methodology (Soren Hansen, 2018).

Apart from cost-savings, though, energy efficiency in the shipping sector is also required for reducing the environmental footprint of the shipping industry. As obvious the fact that the shipping industry transports about 90% of world's trade constitutes the environmental impact of this industry as really high. Based on the analysis of Schrooten, De Vlieger, Panis et al. (2009), CO_2 emissions are the first to be accused for causing the so-called Greenhouse Effect, which is in turn responsible for global warming. The magnitude of the environmental footprint of the shipping industry can be reflected in that although in 2012 CO_2 emissions from shipping operations accounted for only 2.2% of total CO_2 emissions in the world, this figure is expected to reach 50% by 2050, if immediate actions are not taken, also considering that about 100,000 ships operate in a global context, the number having been increasing by 4% on an average annual basis since 1990 (Rahim, Islam & Kuruppu, 2016). Apart from the above, another source of environmental pollution that the shipping industry is involved in shipping accidents. According to Allianz (2018), in order to reduce environmental pollution, it is important not only to take stricter safety measures to reduce the potential of shipping accidents taking place, but also to reduce the toxicity of cargos and fuels that vessels carry. One way for doing that is to replace conventional fuels with more environmental-friendly ones, such as LNG.

As it will be more thoroughly examined in the next section, LNG is currently one of the "cleanest" energy sources, being the fuel that main shipping companies switched to, as a means of dealing with the 2020 Sulphur Cap. Apart from the obvious environmental benefits that LNG offers, it also offers economic benefits, due to the energy efficiency it offers. More specifically, as Herdzik (2011) points out, the cost of LNG is about 30% lower than that of carbon-based fuel. Further to that, the burning process of LNG is such that less LNG is consumed, compared with fossil fuels, in order to make exactly the same voyage. The above are important aspects of using LNG in the shipping industry, also constituting the further development if such a market in Europe and abroad as highly attractive. In the above

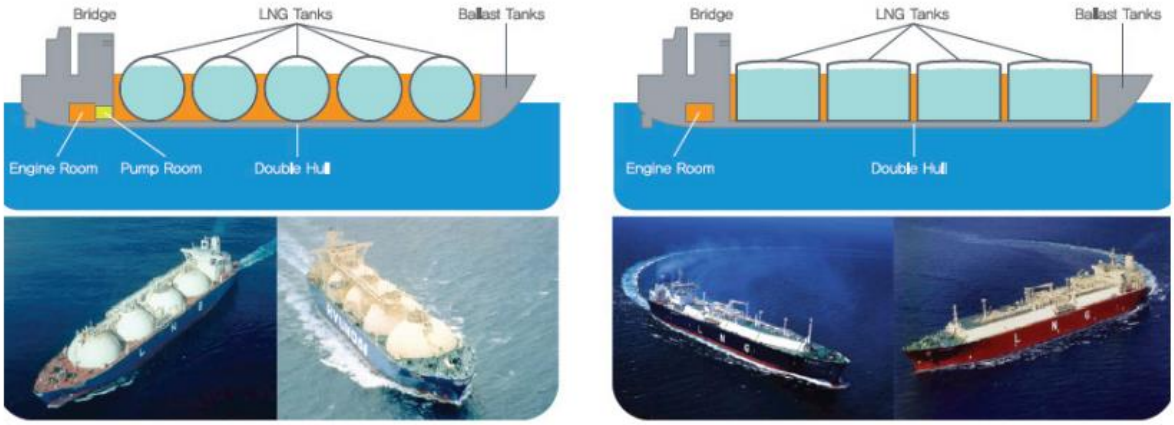
context, in the LNG market, large investments in infrastructure and human resources, complex technology, insurance and maintenance of oil tankers, are not negligible for shipowners (Niavis, Papatheochari, Kyratsoulis et al., 2017).

5.4. LNG AS AN ALTERNATIVE FUEL

As analysed earlier in this dissertation, the LNG market is the fastest-growing energy sector. Obviously, such growth requires continuous large-scale investment in the entire LNG supply chain, with investments in the global LNG-carriers' fleet also being included. The LNG shipping market, benefiting from the need for gradual weaning off of oil and diversifying energy sources, since most reserves are located far from the areas of demand, will be called upon to play a very important role in the transfer of natural gas. The question is whether this mode of transportation will thrive in the long term or will present obstacles to its operation, including the obstacle of cost (Lin & Brooks, 2021).

A typical LNG ship can carry 125,000-138,000 cubic meters of liquefied gas, which corresponds to approximately 2.6-2.8 billion cubic meters of natural gas. Its typical size is 900 feet long, 140 meters wide and 36 feet draft, while the cost of such a carrier was about $160 million until 2019, before the price crisis in almost every product traded emerges, as a result of the COVID-19 pandemic and then the war in Ukraine in 2022. LNG tankers are more environmental-friendly, compared to the other ships, as they use natural gas for propulsion purposes, instead of conventional fuel. With the creation of large physical facilities of Qatar Gas, new classes of large LNG ships were also created, namely the Q-Max and the Q-Flex, which in collaboration with Qatar companies Petroleum's Qatar Gas and RasGas, helped in creating economies of scale for managing the LNG value chain by facilitating the transport of large loads over longer distances (Kolwzan & Narewski, 2012). The modern technologies that such ships are subject to, as well as the caused by new technologies improvement of the liquefaction method and storage of natural gas in tankers allow LNG carriers to carry bigger amounts of LNG. This implies on the one hand that shipping companies can charter part of the transport capacity of their vessels through long-term charter parties and on the other hand providing the rest of their capacity to the spot market (Seamanship International, 2006). Figure 12 presents a typical LNG carrier.

Figure 12: A Typical LNG Carrier



(GIIGNL, 2019)

Apart from using LNG in the shipping industry as an alternative source of energy, though, it is also important to comment on the importance of the shipping industry in boosting the LNG market, thereby dealing with the scarcity of energy sources through the development of a bigger and more robust LNG market in a global context. As known, LNG is natural gas that has been cooled to a liquid condition, approximately -260° Fahrenheit, for shipping and storage. The volume of natural gas in its liquid state is about 600 times smaller than its volume in its gaseous state. This process, which was developed by 19th century, makes it possible to transport natural gas to places, where pipelines do not arrive and do not use natural gas as a transport fuel (Goldemberg, 2006). Except for that, it is obvious that LNG carriers have the ability to transport bigger volumes of LNG, given its liquid state, as described above. In addition, the increase in the global LNG fleet and at the same time the higher transferred capacity in the coming years shall lead the market in more competitive conditions for the benefit of transport costs and the final cost of consumption (Banawan, El-Gohary & Sadek, 2010).

It is highly reflected from the above that the LNG shipping market is growing exponentially. The main reason why interest in LNG returned in the late 1990s was the significant decline in production and transportation costs. The construction of large storage tanks and the building of large transport ships created significant economies scale in the LNG supply and value chain. It becomes, therefore, more than clear that the shipping industry has a very important role to play in the development of the global and the European LNG market. To

put it differently, it is because of the shipping industry that the LNG market has grown to such an exponential extent, due to the many advantages that the shipping sector has offered to the LNG energy sector, as these have been described so far (Elgohary, Seddiek & Salem, 2014). Of course, this important shift of the shipping industry in an industry characterized by monopolistic situations, high capital requirements and significant risks, is of course largely dictated by the need to diversify activities of large companies, but it also reveals an anxious attempt to "run forward", under the pressure of the dramatic changes that take place in the global shipping market. These changes are related to the on-progress shift of the center of gravity of the world economy towards Asia, the emergence of new competitors with global ambitions and the change of the global "energy mix" (Zhang, Shi & Shi, 2018).

The current developments in the global energy market are estimated to require several more LNG carriers. The order for a new tonnage is expected to be supported by the efforts of the companies to renew the fleet, especially in view of the new environmental regulations, with steam turbine ships still accounting for 33% of the tonnage. The fleet of LNG carriers numbers a total of 689 ships, with a total tonnage of 103.6 million. cubic meters (data until the beginning of May), after a rapid growth, amounting to 9.8%, in 2021, as a result of record deliveries (9.4 million cubic meters). This year, the increase in fleet capacity is expected to be "contained" at 4.5%. In total, in 2021, 85 new ships (77>40,000 cubic meters) were placed to order, which is a record number. The strong shipbuilding activity was mainly supported by high demands on projects (in the period 2025-26 a record number of liquefaction facilities will start operating). The average construction price of an LNG carrier has risen from €186 million. dollars at $210 million. dollars during the year. However, the interest in building remains very strong, with the contribution of Qatar's major expansion project. To date, a total of 50 LNG carriers have been placed on order in the year, with the order book including at the beginning of May 2022 222 ships, equivalent to a tonnage of 35.7 million. cubic meters, i.e., 38% of the fleet's tonnage, levels similar to what the market saw in 2016 (Kemene, 2022). Figure 13 presents the development of the global LNG carriers fleet since 2010.

Figure 13: Global LNG Carrier fleet 2005-2025

(Global LNG Hub, 2020)

5.5. CONCLUSION

This chapter focused on EU policies regarding the maritime sector and how the development of the LNG market could foster energy efficiency. Historically, EU authorities have made considerable efforts towards the development of a common European maritime policy, as a means of protecting and developing a transportation sector that is critical for European and overall global trade. At the same time, emphasis was also placed on ensuring that IMO's regulation about safety and environmental protection are well applied across the region. EU maritime policy plays a crucial role in global shipping, taking into account that along the EU there are 329 main ports, thereby leading about 33% of all global maritime transport belonging to Europe. Given the need for urgent protection of the environment, followed by the need for reducing shipping companies' operating costs, alternative shipping fuels shall be used, with LNG being at the forefront, having both advantages and disadvantages for shipping companies and the shipping business overall.

CHAPTER 6: CONCLUSION

The aim of this dissertation was to analyze the case of energy security in Europe and the role that Liquefied Natural Gas (LNG) can play in enhancing and maintaining this security, taking into account the important role of LNG as an alternative fuel in shipping, as well as the role of the shipping industry in transporting LNG and how this can benefit the European economy and environmental protection. More specifically, this dissertation had the following objectives:

- To examine the actions of member-states of the European Union (EU) to ensure energy supply on the inside
- To describe the importance of the development of a robust LNG market in Europe and its impact on the global natural gas market
- To analyze the impact of US LNG on Russian Natural Gas export policy
- To critically examine the European policies for the maritime sector and the use of LNG as an alternative shipping fuel and how helpful could be on carbon footprint reduction
- To provide implications regarding how energy security, economic security and environmental protection in Europe could be enhanced through the development of a European LNG market and the development of a robust LNG shipping market in the area

Based on the analysis held in the main part of the dissertation, there is no doubt that energy is the most important commodity and the energy sectors are the most important industrial sectors for national economies and the global economy as a whole, thereby driving countries and regions to take measures to enhance adequate energy reserves and their overall energy security. The same is also the case of the EU, whose emphasis on policy-making for enhancing energy security in the region shall be traced back to the 1950s and the development of communities for enhancing political, economic and energy cooperation among member-states, while such emphasis was further reinforced by the 2006-2007 conflicts between Russia and Ukraine, exactly as it has happened since February 2022 and the Russian invasion in Ukraine. The EU, traditionally as an area of industrial states and

developed economies, is among those actors of international economic relations for whom energy security is an issue of existential importance. Overall, efforts towards the development of a common energy market in Europe has not flourished at a policy level so far, mainly because it has always been in the minds of national governments to be free to succeed the best energy-supply agreements to promote their national interests. The recent war in Ukraine, though, has once again put pressures on member-states of the EU to commonly succeed in enhancing energy security for the region, mainly through being less dependent on imports from Russia.

A global response to the need for enhancing higher energy security in a global context has been the tremendous development of the global LNG sector, which has been the fastest growing energy sector across the globe since 1995. The development of the LNG sector shall be mainly attributed to globalization and the liberalization of global trade. However, in the case of LNG, a global oligopoly has developed, due to enormous construction costs of the liquefaction and regasification units, suppliers enter into long-term contracts with buyers (usually 20 years), many years before the completion of the investment projects. LNG is expected to play a pivotal role, with a number of projects having received a Final Investment Decision (FID) and coming into force in the coming years, creating increased demand for the fuel in both Europe and Asia. The share of LNG in natural gas production is expected to reach 17% by 2030, up from 12% in 2020. At the same time, as the Russian-Ukrainian war puts the focus on secure energy supply, the prospects for LNG trade appear even more positive. In the case of the EU LNG market, though, the dependence on imports from Russia has become even higher over the last decade. Now that Russia threatens to further cut down on natural gas supply towards the West, Europe's dependence on external sources and mainly the U.S. is expected to further increase, also taking into account the steadily declining gas production volumes in the EU. Even in this case, though, LNG terminals are not enough in number in the EU to be able to store the necessary capacities for the region to cover its energy needs through LNG.

Russia is the biggest exporter of LNG in the world and the second biggest producer after the U.S.A., at least until the beginning of 2022, when the U.S. dominated LNG exports as well, following the sanctions that were imposed to Russian enterprises, as a consequence of the

Russian invasion in Ukraine. The U.S.A. is expected to continue to play an important role in determining Russian LNG exports, while at the same time also shaping geopolitical relations across the globe and mainly between the West and Asia.

What becomes generally evident from the analysis held in the main part of this dissertation is that the LNG market is the only market at the time being that shall be able to offer the EU some energy security potential, especially since its growth potential is highly supported by growth in the global shipping industry. Indeed, apart from the fact that shipping companies have switched towards using LNG as an alternative and more environmental-friendly type of fuel, LNG is also mainly transported by sea. It follows from the above that the efforts of the EU towards enhancing a higher energy security and independence are highly associated with the development of a more robust EU maritime policy, as a means of boosting through maritime policy the potential for LNG to truly become the solution to the need for the EU to cover its energy needs, which grow higher and higher, as years pass by.

Last but not least, this study was subject to certain limitations as well. More specifically, the study was based solely on secondary research findings. Although secondary research helped in collecting and analyzing a vast amount of data and analyzing the subject under research with the use of information from various academic and non-academic sources, both off and online, primary research wold provide more up-to-date and authentic findings regarding the subject under research. In this context, future researchers could conduct primary research on the same subject, collecting information from industry experts and academics with expertise in the fields of energy, global politics, EU policy and the shipping industry, as a means of drawing more up-to-date and authentic insights regarding the true market potential of LNG in the EU, also taking into account the geopolitical challenges that the LNG market, global economy and the global shipping industry currently face.

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