
GEOPOLITICS OF GAS IN THE MEDITERRANEAN

18 June 2013

Miguel Martinez
Hannah Murdock
Floriane Schaeffer



ACKNOWLEDGEMENTS

This report would not have been able to bring together such a complete picture of the state of natural gas in the Mediterranean region without the support of many individuals. In addition to comments and critiques from the Eurogroup Consulting team, professors and other experts provided very useful information over the course of many personal interviews. Special thanks go to the following individuals for the expertise they were willing to lend to the project: Henri Beaussant, Bernard Duhamel, Jérôme Ferrier, Coby van der Linde, Houda Allal and Sohbet Karbuz.

INDEX

ACKNOWLEDGEMENTS	2
LIST OF FIGURES.....	5
EXECUTIVE SUMMARY.....	6
DEFINING THE MEDITERRANEAN REGION	8
SECTION I: THE MEDITERRANEAN REGION: ENERGY PERSPECTIVES AND THE GAS SECTOR ...	9
ENERGY OVERVIEW OF THE MEDITERRANEAN REGION	10
<i>Main energy indicators.....</i>	10
<i>Energy production.....</i>	12
<i>Energy demand.....</i>	13
<i>Energy dependence.....</i>	13
NATURAL GAS IN THE MEDITERRANEAN REGION	13
<i>Gas production.....</i>	14
North African future production	15
East Mediterranean future production.....	16
<i>Gas demand.....</i>	17
<i>Gas dependence.....</i>	19
EUROPE, NATURAL GAS AND THE MEDITERRANEAN	20
<i>European dependency from Mediterranean gas suppliers.....</i>	20
<i>European gas demand.....</i>	22
<i>Projections for demand.....</i>	24
SECTION II: NATURAL GAS PRICING AND INFRASTRUCTURE IN THE MEDITERRANEAN REGION	26
INFRASTRUCTURE	27
<i>Gas infrastructure in the Mediterranean.....</i>	27
North African pipelines	28
LNG infrastructure.....	28
The Southern corridor project	28
THE EUROPEAN INTERNAL ENERGY MARKET AND ITS CONSEQUENCES FOR EURO-MEDITERRANEAN GAS TRADE	29
<i>A pan-European gas network and its implications for the non-EU gas suppliers.....</i>	30
A pan-European gas transmission system	31
Consequences for non-EU gas suppliers	32
PRICING MECHANISMS AND THE 2009 EUROPEAN GAS CRISIS	33
<i>The 2009 European crisis and gas.....</i>	34
<i>Consequences for the Euro-Mediterranean region.....</i>	36
REGULATED PRICES AND FOSSIL-FUEL SUBSIDIES	38
<i>Regulated prices and the subsidising of natural gas consumption.....</i>	38
<i>Moving out of fossil-fuel subsidies and the interaction between gas and electricity.....</i>	40
SECTION III: COOPERATION IN THE MEDITERRANEAN REGION.....	41
COOPERATION WITHIN EUROPE: THE INTERNAL ENERGY MARKET.....	41
<i>European energy policy: principles, targets and mechanisms.....</i>	42
<i>The relevance of the EU internal energy market in the Mediterranean.....</i>	43
The relevance of the EU support of RES and efficiency in the Mediterranean.....	44
EXPANDING COOPERATION TO THE MEDITERRANEAN REGION.....	45
<i>The European Energy Community.....</i>	46
Can the aims and structure of the European Energy Community Treaty be workable for the Mediterranean region?	46
Towards a Mediterranean Energy Community	47
<i>The Energy Charter Treaty.....</i>	48

GEOPOLITICS OF GAS IN THE MEDITERRANEAN.....	48
CONCLUSIONS.....	50
APPENDIX I: NATURAL GAS PRICING MECHANISMS.....	52
<i>Oil-Linked Price Escalation.....</i>	<i>52</i>
<i>Gas-to-gas competition</i>	<i>53</i>
<i>Regulated prices</i>	<i>54</i>
APPENDIX II: NATURAL GAS SUPPLIES IN EUROGAS MEMBER COUNTRIES AND EU, 2011.	55
BIBLIOGRAPHY	56

LIST OF FIGURES

FIG. I: ACTORS IN THE MEDITERRANEAN REGION. SOURCE: OME, 2011	8
FIG. II: SHARE OF TOTAL ENERGY DEMAND. SOURCE: OME, 2011.	10
FIG. III: POPULATION AND ECONOMIC GROWTH. SOURCE OME, 2011.....	11
FIG. IV: MEDITERRANEAN PRIMARY ENERGY PRODUCTION 1990-2009. SOURCE: OME, 2011.	12
FIG. V: HYDROCARBON PRODUCTION IN THE MEDITERRANEAN, 1990-2030.SOURCE: OME, 2011.....	12
FIG. VI: FOSSIL FUEL NET TRADE VOLUMES AND IMPORT DEPENDENCE. SOURCE: OME, 2011.	13
FIG. VII: MEDITERRANEAN GAS PRODUCTION, 1990-2030. SOURCE: OME, 2011.....	14
FIG. VIII: EXPORT POTENTIAL OF THE MAIN GAS PRODUCERS OF THE MEDITERRANEAN. SOURCE: OME, 2011.	15
FIG. IX: MEDITERRANEAN GAS DEMAND. SOURCE: OME, 2011.	18
FIGURE X: GAS CONSUMPTION BY SECTOR.SOURCE: OME, 2011.....	18
FIG. XI: NAME. SOURCE: OME, 2011.....	19
FIG. XII: EU-27 GAS IMPORTS BY COUNTRY OF ORIGIN. SOURCE: EUROPEAN COMMISSION..	20
FIG. XIII: NATURAL GAS DEMAND IN OECD EUROPE 1960-2010 (MCM): SOURCE: HONORÉ, 2010.....	22
FIG. XIV: GAS DEMAND OVER JANUARY-JULY, 2012 VS. 2011. SOURCE: IEA	23
FIG. XV: INDUSTRIAL PRODUCTION IN THE EURO AREA AND EU-27, BASE 100 IN 2005, FOR JAN 2001-OCT 2010. SOURCE: HONORÉ, 2010	23
FIG. XVI: EU-27 EVOLUTION OF ELECTRICITY SUPPLIED, 2003-2012 (IN GWH). SOURCE: EUROSTAT	24
FIG. XVII: EUROPEAN GAS DEMAND VERSUS PRODUCTION (IN BCM): SOURCE: A.T. KEARNEY, 2013.....	25
FIG. XVIII: GAS INFRASTRUCTURE IN THE MEDITERRANEAN: LNG AND PIPELINES (2011). SOURCE: OME, 2011.	27
FIG. XIX: GAS HUBS IN THE EU. SOURCE: MELLINT, 2010.	32
FIG. XX: EUROPEAN PRICE SPREAD: GERMAN CONTRACT AND NBP 2006-2012. SOURCE: MELLING, 2010.....	35
FIG. XXI: IMPACT OF A 15% SPOT PRICE INDEXATION IN OIL-LINKED CONTRACTS. SOURCE: MELLING, 2010.....	37
FIG. XXII: FOSSIL-FUEL CONSUMPTION SUBSIDY RATES AS A PROPORTION OF THE FUEL COST OF SUPPLY (2011). SOURCE: IEA, 2011.....	39
FIG. XXIII: NATURAL GAS SUPPLIES IN EUROGAS MEMBER COUNTRIES AND EU, 2011. SOURCE: EUROGAS –STATISTICAL REPORT, 2012.....	55

EXECUTIVE SUMMARY

The Mediterranean region is heterogeneous in all respects. It brings together three different continents with asymmetries in terms of economic growth, population, political systems, religion and language. To evaluate the possibilities of cooperation going into the future in the Mediterranean region, this report proceeds by analysing the following themes:

- Distribution of resources
- Asymmetries and dependence
- Infrastructure, both existing and underway
- Pricing mechanisms and contractual relationships

The report begins with the distribution of energy resources in the region, first analysing the overall energy outlook and then focusing on gas. The purpose of this introduction is to understand the place gas has in the Mediterranean region. Traditionally oil has dominated the region, but a transition to gas and renewable energy sources (RES) is taking place.

Once this preference for gas in the region is introduced, the first section continues by analysing the asymmetries and dependence in the region. Gas trade in the Mediterranean is greatly unbalanced, with some countries becoming major exporters (mainly Algeria, Libya and Egypt) and others major importers (both the North and South Mediterranean sub-regions in addition to Turkey). Section I analyses the total size of these flows, demonstrating the leveraging power and the varying interests that different actors have, as well as the expectations each actor holds for the future.

The report follows in Section II by analysing the specific mechanisms by which energy is traded in the region, specifically focusing on infrastructure and the pricing mechanisms and contracts that operate between parties. These elements of analysis are key, as they allow for an understanding of the way in which the uneven gas flows in the Mediterranean are economically arranged. Most of the cooperation over gas in the Mediterranean does not take the shape of institutional and political arrangements but rather as the bilateral negotiations between parties signing agreements. The discussion about price mechanisms in the Mediterranean is as important as the political cooperation in the region—if not more—regarding the implications it will have for the future of the Mediterranean gas industry.

Currently, a discussion is taking place in Europe concerning the extent to which gas-to-gas competition will become the preferred price mechanisms for gas. If this were to happen, the whole structure of the gas sector would be altered. Actors would have to adapt to higher price volatility schemes as well as a decline in bilateral agreements. A market-based logic would be put in place to structure the European and the Mediterranean gas industry.

In the South Mediterranean, there are issues arising regarding the consumption mechanisms used. Producing countries use their gas for local consumption under

subsidy schemes that generate problems of their own, such as low efficiencies being promoted in local industries, increasing pollution rates, and a lack of incentive for foreign investment. Understanding these regulated price schemes is crucial for understanding the challenges that lie ahead for the fastest growing gas market in the Mediterranean.

A great deal of the transformation in the Mediterranean gas sector will result from the changing relationships between contracting parties in the Mediterranean based on the pricing mechanisms that they have adopted. Section III explores the possibilities for cooperation beyond this horizon in terms of the institutional settings that can provide reliable and stable frameworks for cooperation in the region. The section begins by looking at Europe and the regulatory efforts of its Internal Energy Market. It then proceeds by exploring the possibilities of expanding these policy frameworks by considering both the European Energy Community and the Energy Charter Treaty.

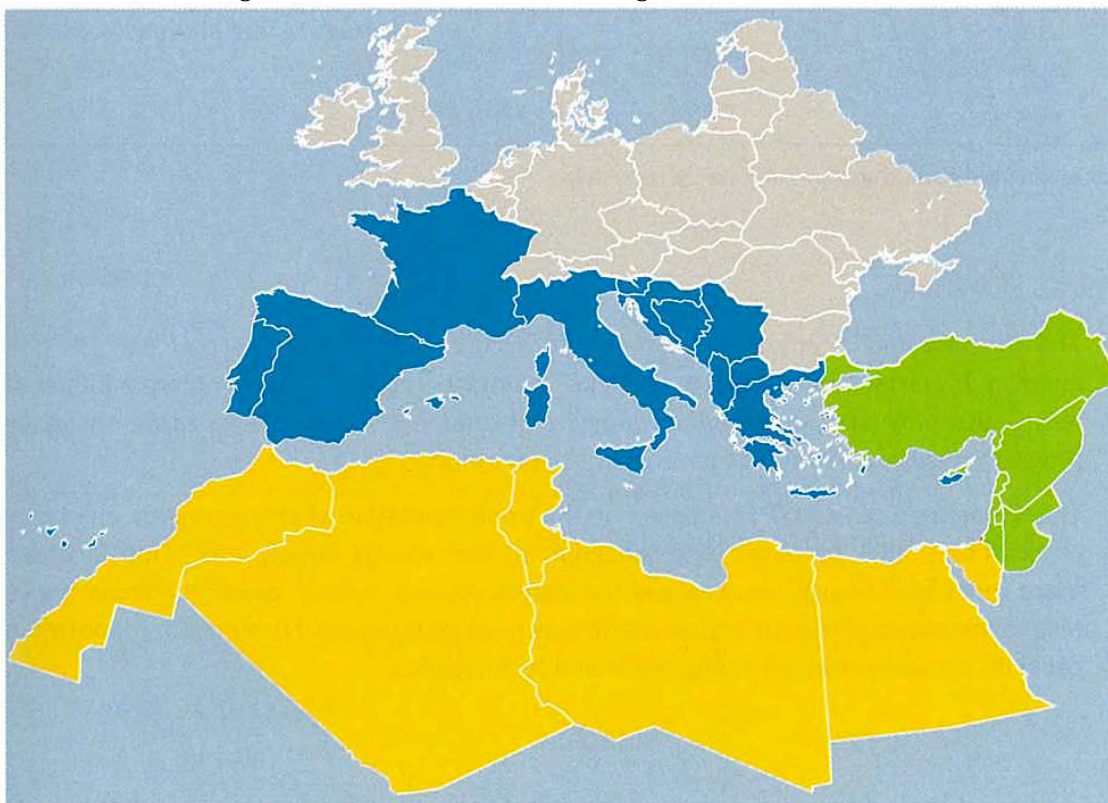
Overall, the possibility of cooperation in the Mediterranean is complex and requires a broad understanding of the region. It is important to explore the links between gas and other energy sources such as RES and oil, in addition to the evolution of the gas sector in the Mediterranean region, the price mechanisms used for gas trade, and the political agreements used for creating common legislation. This report aims to bring together all of these issues to clarify the possibilities of future cooperation in the gas sector within the Euro-Mediterranean region.

DEFINING THE MEDITERRANEAN REGION

The Mediterranean region includes 24 countries and covers nine million square kilometres. In this report we follow the division into three subdivisions made by the Observatoire Méditerranéen de l'Énergie (OME): Southern Europe, Northern Africa, and the Eastern Mediterranean. Figure I below represents this separation:

1. The Southern European region includes Cyprus, France, Greece, Italy, Malta, Portugal, Slovenia, and Spain, while non-EU members include Albania, Bosnia and Herzegovina, Croatia, Macedonia, and Serbia.
2. The Northern Africa region includes Algeria, Egypt, Libya, Tunisia, and Morocco.
3. The Eastern Mediterranean region consists of Israel, Jordan, Lebanon, Palestine, Syria, and Turkey.

Fig. I: Actors in the Mediterranean region. Source: OME 2011



SECTION I: THE MEDITERRANEAN REGION: ENERGY

PERSPECTIVES AND THE GAS SECTOR

The Mediterranean region is a complex and it is built upon numerous imbalances, including welfare levels, GDP growth and population distribution. Similarly, the energy sector is also built upon deep imbalances. Some countries such as Algeria, Libya and Egypt hold most of the fossil fuel reserves, while others such as North Mediterranean countries account for the biggest share of gas consumption. Overall, these uneven distributions have created complex trade routes and flows in the Mediterranean.

Within this picture, it is possible to outline some of the trends that are expected to take place in the Mediterranean region, including:

- Moderate increase of oil consumption
- Great increase of gas consumption
- Modest increase of RES

While the Mediterranean region has traditionally prioritised oil as a preferred energy source, a turn to gas can be observed from the 2000s onward. This is important for the region, as a turn to gas is likely to create a new energy scenario in which:

- North Mediterranean countries will sustain the highest consumption rates although with modest or no increase.
- South and East Mediterranean countries will increase gas consumption by the largest margins.

The reasons for this uneven pattern of gas consumption are partly linked to the EU economic crisis, which has lowered the expectations for increasing gas consumption, but also to the improving economic conditions of both the South and East Mediterranean basins. The increase in GDP and population in these regions will likely be reflected in electricity production (along with growth in the industry and residential sectors), which is expected to increase the overall gas consumption in the region.

The uneven evolution of gas markets is expected to change the dependency rates in the region. Europe is expected to maintain its dependency levels while gas-producing countries are expected to divert some of their production to local consumption rather than exporting it.

The impact of Mediterranean gas is not uniform across Europe. Countries along the southern border of Europe are more dependent on imports from the Mediterranean, while Northern and Eastern Europe are more dependent on Russia and Norway. This uneven dependence on Mediterranean gas has led to heterogeneous interests within the European Union regarding the region.

ENERGY OVERVIEW OF THE MEDITERRANEAN REGION

The following sections analyse the main indicators that define the Mediterranean region. These include variables such as GDP variations and population growth as well as demand and supply trends for primary energy sources. The report continues by examining how gas consumption trends in the region are deeply rooted in these factors. The main points to take into account are:

- The asymmetries in GDP and population growth that are embodied in the Mediterranean region.
- The prospectus for gas to become the preferred energy source of the Mediterranean region

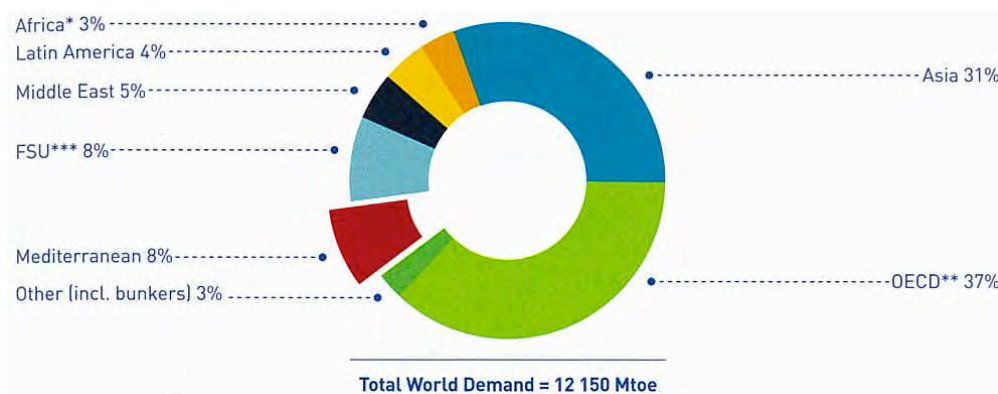
MAIN ENERGY INDICATORS

- 7% of world population
- 10% of world GDP
- 8% energy demand

The Mediterranean is a key region when it comes to energy. It has been at the centre of the twenty-first century with the dependence of western economies on oil, and it is now at the centre of a new transformation where gas and RES are playing a central role. The importance of the region does not only stem from the abundance of resources but also from its economic and social weight.

The Mediterranean region gathers 500 million people representing 7% of the world population and 10% of the world GDP. It accounts for 8% of the world's energy consumption, 4.6% of the world's proven oil reserves, and 4.7% of the world's proven gas reserves.¹ Figure II shows the share of world energy demand that the Mediterranean region accounts for.

Fig. II: Share of total energy demand. Source: OME, 2011.

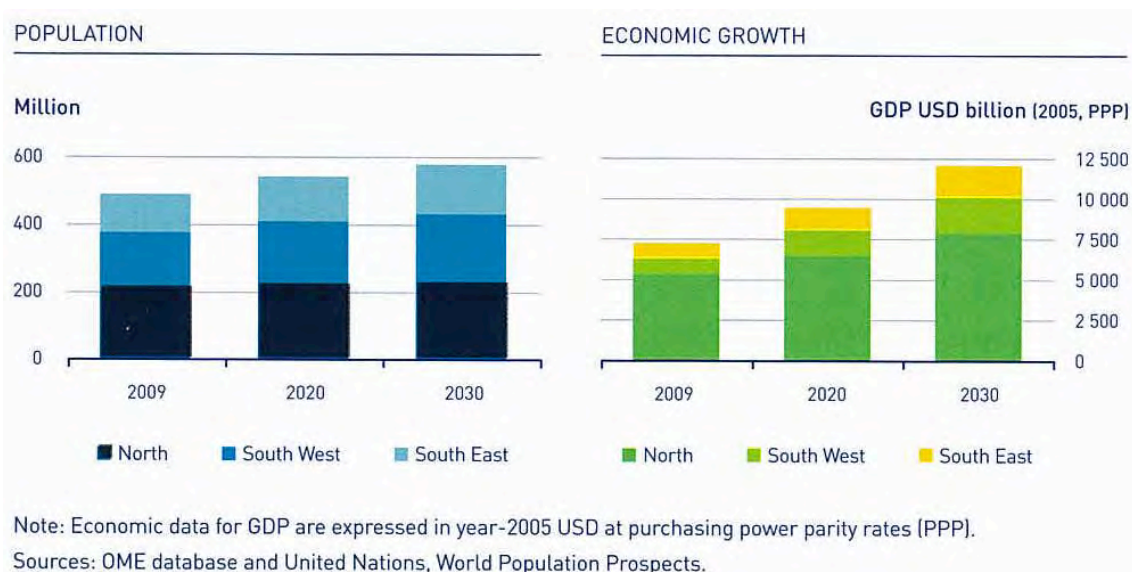


¹ Mohamed Zine, "The Arab Spring and the Oil Industry," Geo ExPro, 4(9), 2012.

To understand the disparities within the region it is useful to point at both economic and population growth expectations. Both allow for understanding of some of the major asymmetries that constitute the Mediterranean region:

- Economic growth:** Energy consumption shadows GDP variations in such a way that an increase in GDP is likely to reflect an increase in demand for energy. For the Mediterranean region economic growth is expected to be asymmetric: North Mediterranean countries account for a moderate growth while South and East countries account for the highest increase in the region. The asymmetry translates in a different distribution of demand for energy in the region. While the North is slowly increasing its demand, the South Mediterranean region is expected to account for the largest increase. Figure III below represents the expected growth evolution in the Mediterranean. While the North basin accounts for the largest share of GDP, the South accounts for the largest increase in GDP to 2030.
- Population growth:** Energy consumption also reflects variations in population. While North European countries are experiencing a stabilisation of their population size, South and East Mediterranean countries account for higher growth rates. The Mediterranean currently holds 500 million people and an additional 90 million people are expected to arrive by 2030. Up to 60% of this increase is expected to take place in South Mediterranean countries. Figure III shows population variation by region.

Fig. III: Population and economic growth. Source OME 2011.

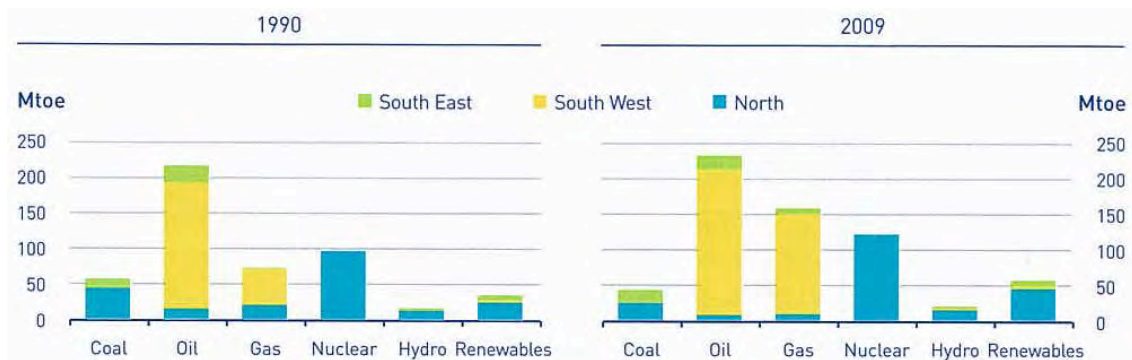


ENERGY PRODUCTION

- Production of all energy sources will grow to meet increasing demand for energy:
- Gas production will increase to match oil production levels by 2030.
- Renewables are the second-fastest growing energy source.

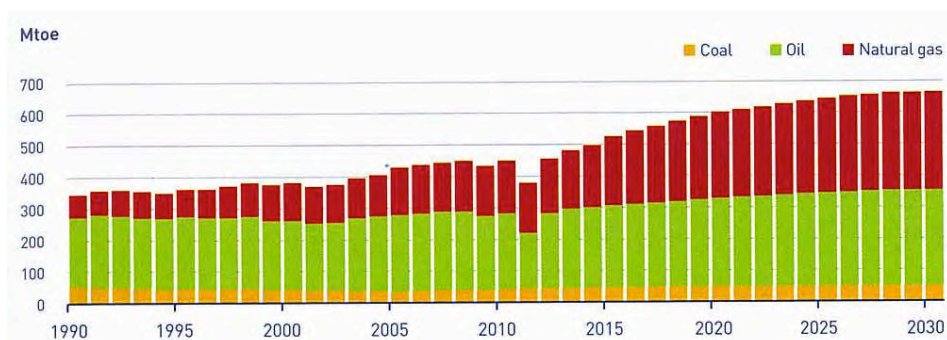
Oil has been the energy source accounting for the highest production levels in the Mediterranean region. This is mainly because of reserves in Libya but also in Algeria and Egypt. However, production for oil is expected to increase at lower rates going into the future, opening the possibility of other sources to experience greater growth rates. In particular, both gas and RES have accounted for the largest increases between 1990 and 2009. Figure IV shows the evolution of the energy mix for the region during this period, with the largest growth coming from gas. The Southern border has seen the largest increase, while RES have also experienced a notable growth (although far lower than that of gas), especially in the North and East Mediterranean regions.

Fig. IV: Mediterranean Primary Energy Production 1990-2009. Source: OME, 2011.



Oil has been the preferred energy source of the region, but gas is expected to equal production levels by 2030. As most of this growth in gas is expected in the South Mediterranean basin, it is important to evaluate the economic mechanisms that will determine gas consumption in the region. Figure V represents the evolution of fossil fuel production in the region (1990-2030) and illustrates the increasing importance of gas.

Fig. V: Hydrocarbon production in the Mediterranean, 1990-2030. Source: OME, 2011.



ENERGY DEMAND

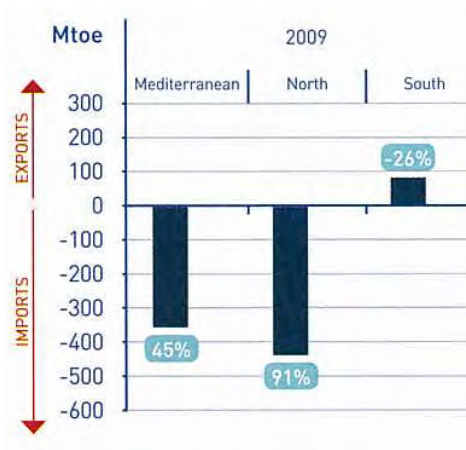
- Demand for all energy sources expected to increase in the region.
- Gas to experience the largest increase in demand.
- RES to follow at lower levels.

Total demand for energy is expected to increase in the Mediterranean region similar to the aforementioned increase in production. Factors of economic growth (both population and GDP) indicate the trend of growing energy demand in the region. However, while the consumption of oil is expected to stabilise, demand for gas is expected to experience the largest increase, followed closely by RES.

ENERGY DEPENDENCE

Overall, the Mediterranean region is a net importer of energy resources. Despite its notable levels of reserves and production, the region imports 45% of its consumed resources. However, these numbers are not equally distributed among the sub-regions. The North Mediterranean region accounts for 91% of fossil fuel dependence while the South Mediterranean basin is a net exporter by -26%. Figure VI shows this distribution.

Fig. VI: Fossil fuel net trade volumes and import dependence. Source: OME, 2011.



NATURAL GAS IN THE MEDITERRANEAN REGION

Gas is expected to become the preferred energy source of the Mediterranean. The following section analyses the trends in production and demand specifically for natural gas in the region as well as the dependency schemes that these are expected to produce.

GAS PRODUCTION

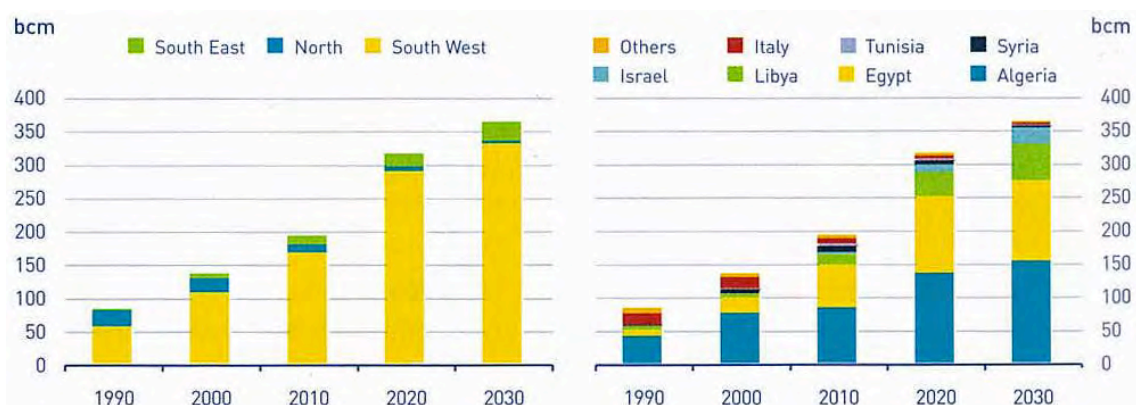
- The Mediterranean has been increasing production since 1990.
- Production is expected to plateau around 2030.
- Algeria, Libya and Egypt account for 85% of the total Mediterranean production.
- Algeria is the single most important exporter to the EU.
- Gas reserves to increase in major producers to double current levels guaranteeing future supply.

Overall, the Mediterranean region has experienced an increase of production that has led to doubling production volumes between 1990 and 2010. A steady increase of 40% per decade has been maintained throughout this period, with total production in 2010 amounting to 194 bcm.

Production is unevenly distributed and mostly concentrated in the South basin. Up to 87% of production comes from this area, while the East Mediterranean currently accounts for 7% and the North Mediterranean for 6%.

In the South Mediterranean, production is dominated by Algeria, Libya and Egypt. In 2010, 44% of the total production came from Algeria (85 bcm), while Egypt produced 33% (64 bcm) and Libya 8% (16 bcm). Together with Syria's 9 bcm and Italy's 8 bcm, these countries represent 94% of the Mediterranean gas production. Figure VII displays this distribution along with the future expected production.

Fig. VII: Mediterranean gas production, 1990-2030. Source: OME, 2011.



- **Algeria** is the largest gas producer in the Mediterranean, exporting mainly to Spain, Italy, France and Turkey.
- **Egypt** uses 75% of its gas for domestic consumption and exports the remaining 25% (mainly to Spain, the United States, Jordan and Israel).
- **Libyan** gas is seeking to recover from pre-war levels. 93% of the exports are directed to Italy.

The challenges for gas production in the region come from the difficulty of producers to keep up with demand for gas. While demand is expected to increase more than 7% annually, gas production remains almost flat since 2005-2006.

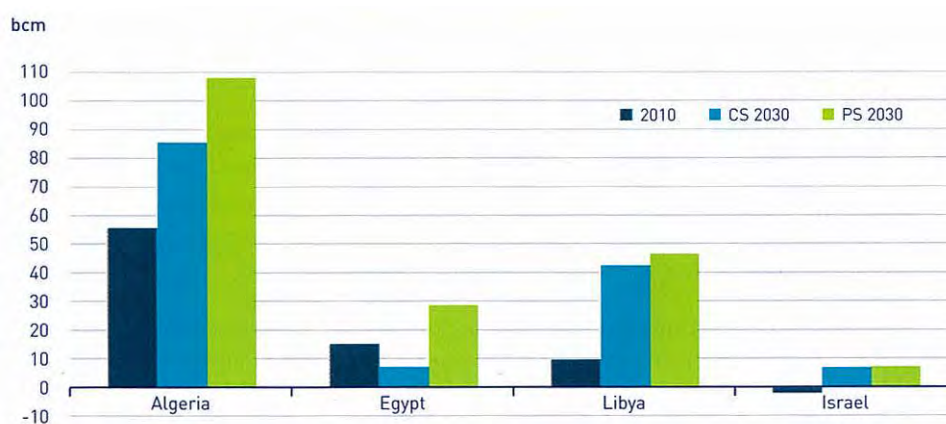
The reasons for the difficulty of increasing gas production generally come from fiscal and investment schemes being used and by the lack of institutional efficiency in producing countries. Looking at specific countries, the reasons for this difficulty in increasing gas production are²:

- **Algeria:** Elections, constitutional change, presidential succession and hydrocarbon law amendments.
- **Egypt:** Political wrangling, social pressure, fiscal crisis and pricing reforms.
- **Libya:** Contrasting political, economic and oil priorities.

North African future production

In terms of reserves, the projections made by OME (2011) predict a notable increase of gas coming from the major Mediterranean producers. Remarkably, both Algeria and Libya are expected to increase their production to almost double current levels. The numbers point to the continuity of the gas flows from gas producers. Figure VIII represents the expected evolution of the main reserves in the region.

Fig. VIII: Export potential of the main gas producers of the Mediterranean. Source: OME, 2011.



Note: CS = Conservative Scenario; PS = Proactive Scenario.

Onshore Egypt has known resources in the Western Desert, and offshore Egypt continues to see more exploration for resources in the Ultra Deep Nile Delta. Further potential resources are to be explored in the Levant Basin and Red Sea. However, **overall gas production in Egypt is declining, and what remains will likely be used domestically.**

There will be more logistical rather than political issues to solve in Libya, due to recently having experienced a full-scale war. The most likely scenario to occur in Libya is that its new army and police will be involved in an attempt to fairly

² Darbouche, H. (2012). North African Gas Markets in a Changing Political Context. Presented at the MENA Energy Conference 2012, Chatham House.

managing the industry and revenue.³ Libya has potential onshore natural gas resources in the East Sirte Deep Gas Paleozoic play, as well as potential offshore resources in the Palagian Basin, Gulf of Sirte, and Cyrenaica Basin. The country also has potentially recoverable shale reserves estimated to be 290 Tcf. **In the short-to medium-term, no projects are likely to be developed in Libya, as the aim of the country's new leadership will be focused on re-building the political and economic institutions.** Achieving pre-revolution production levels of oil is the primary goal. In terms of gas, it is likely that the domestic Libyan market will require the country to continue to be a relatively small gas exporter to 2020 without much opportunity to expand beyond existing gas projects.⁴

Algeria's resource potential along with its mature infrastructure have given the country more economic stability than other post-revolution countries in the region. Because 60% of Algeria's revenue comes from oil and gas, the Algerian government was proactive in initiating reforms to prevent the same type of large protests and unrest that occurred in neighbouring countries.⁵ **Though the country is searching for more gas to export, it is seeing a continued increase in domestic demand of 5-6% per year, making the future of its exports less promising.** Algeria has potential resources in the Reggane/Tindouf Basin as well as offshore in the Mediterranean Sea. It has some potential shale resources in its Silurian and Frasnian Basins. It is estimated that there exist less than 1000 Tcf of recoverable resources.

East Mediterranean future production

Some potentially significant maritime gas fields have been discovered recently in the East Mediterranean region, fuelling the tension between the neighbouring countries. In a rather small zone, a large quantity of gas is expected, which countries such as Israel, Cyprus, Turkey, Greece, and Lebanon might want to contest. The gas might not be easy to access, as it is located deep in the sea (approximately 2000m), which requires heavy investment. Recent natural gas discoveries in the eastern Mediterranean Sea have included the Mari, Tamar, and Leviathan gas fields, dramatically changing the energy outlook for Israel in particular.

The Mari was discovered in 2000 and is part of a group of gas fields in the Pleshet Basin just offshore southern Israel, and gas-in-place estimates range from 1.2 to 1.3 Tcf of recoverable gas.⁶ Surrounding the Mari are the smaller fields of Noa South, Nir, Or, and Or South, which have a combined total of 1 Tcf of recoverable gas.

³ Darbouche, Hakim (2012). "The Pricing of Internationally Traded Gas in MENA and Sub-Saharan Africa." p. 226. On Stern, J. (2012). *The Pricing of Internationally Traded Gas*. Oxford University Press

⁴ Ibid.

⁵ Ibid.

⁶ Economides, M. (2011, January 4). Natural gas: Changing the geopolitics of Eastern Mediterranean and beyond. *Energy Tribune*. Retrieved from <http://www.energytribune.com/articles.cfm/6207/Natural-Gas-Changing-the-Geopolitics-of-Eastern-Mediterranean-and-Beyond>.

The Tamar and the Leviathan fields, however, are much larger. The Tamar, discovered in 2009, holds 8.4 Tcf and is located offshore the northern coast of Israel. The Leviathan field is by far the largest discovery yet in the eastern Mediterranean and is located northwest of the Tamar. The Leviathan was discovered in 2010 and holds at least 16 Tcf of recoverable gas. Taken together, the fields are expected to be worth 4 billion dollars a year. They are a vital stake for Cyprus, which is currently experiencing serious economic problems, and Israel, which has had some difficulty in accessing cheap energy. Because some maritime boundaries are contested, the tension in the area is causing potential investors to move carefully.⁷

One potential solution to the geopolitics in the Eastern Mediterranean in terms of where gas should be landed could be FLNG. All that would be needed is to find an agreement on how to pay the different governments involved. This option could be less costly because it would circumnavigate aboveground problems and therefore avoid much of the cost normally associated with production and transportation. Security is easy with pipeline gas and even easier with LNG. Additionally, transport of LNG is inexpensive and less politically charged, making it an increasingly attractive option. Because it is still a somewhat new technology, FLNG facilities are rather costly, but given their potential advantages, they have the possibility of being something of a game changer. However, it should be noted that these new discoveries in the Eastern Mediterranean are years from production for export; though they should be taken into account for the future, it remains to be seen what their impact will be.⁸

GAS DEMAND

- Gas consumption in the Mediterranean region doubled in the 1990-2009 period from 15% to 28% of the total energy demand.
- Future consumption patterns are asymmetric.
- Gas demand is expected to stabilize at high levels in the North Mediterranean basin.
- The South and East Mediterranean regions account for the biggest increase in gas consumption.

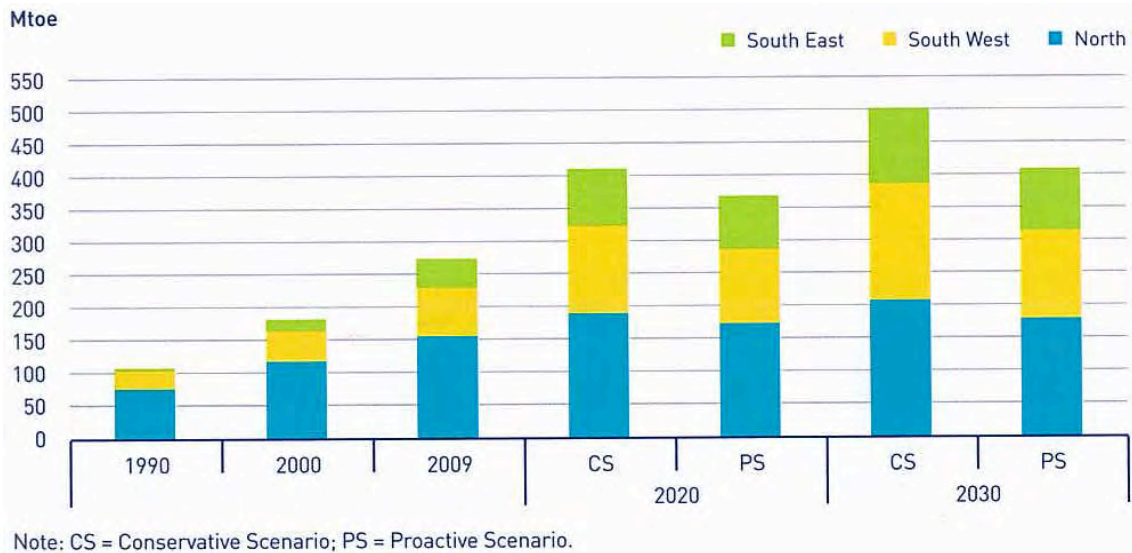
Demand for gas in the Mediterranean has increased from 108 Mtoe in 1990 to 274 Mtoe in 2009 with a 5% average annual growth rate. The total increase has altered the energy mix, taking gas from a share of 15% in 1990 to 28% in 2009. In all regions of the Mediterranean gas has increased its share of the total energy mix and it is expected to continue like this 2030. The biggest increases are expected to come, first from the East Mediterranean region, second by the South Mediterranean region. The North Mediterranean region, together with the whole

⁷ Ibid.

⁸ Michael Ratner, Paul Belkin, Jim Nichol, and Steven Woehrel, "Europe's Energy Security: Options and Challenges to Natural Gas Supply Diversification," Congressional Research Service, March 15 2013, <http://www.fas.org/sgp/crs/row/R42405.pdf>.

of Europe remains under notable uncertainty about whether its demand will stagnate or decrease during this time. Figure IX shows the evolution of gas consumption by sub-region in the Mediterranean.

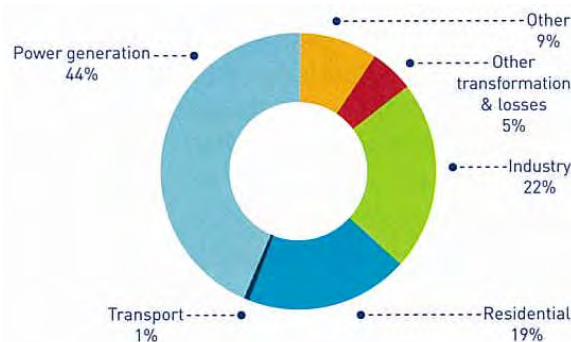
Fig. IX: Mediterranean gas demand. Source: OME, 2011.



The distribution of demand is uneven between the North Mediterranean and the rest of the region. In 2009 the North Mediterranean accounted for 57% of the region’s total gas demand. However, this share is likely to decrease as the South and East regions experience a greater increase. The South Mediterranean region has passed from consuming 29% of the total Mediterranean consumption in 1990 to 43% in 2009.

Finally, regarding the distribution of consumption, there are three sectors accounting for the gross of consumption: electricity generation, residential uses and industry consumption. Figure X shows this distribution:

Figure X: Gas consumption by sector. Source: OME, 2011.

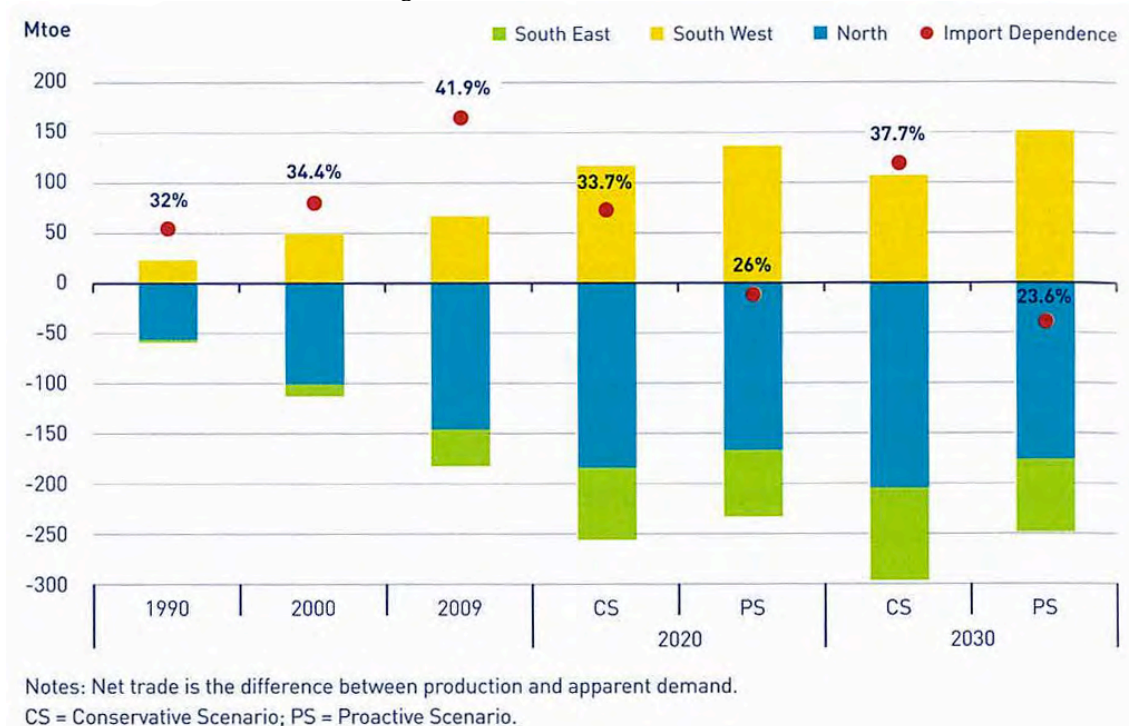


GAS DEPENDENCE

- The Mediterranean is a net gas-importing region.
- Gas imports will continue being necessary to meet demand.
- The North and East Mediterranean account for the greatest dependency levels.

Overall, the Mediterranean imports more gas than it produces. This again varies regarding the different sub-regions considered, but the general trend is a net dependency from gas. The region needs more gas than it produces to meet demand—a trend that will continue into the future. Figure XI shows how these trends have evolved in the past and how they are expected to continue until 2030.

Fig. XI: Name. Source: OME, 2011.



Dependence in the North Mediterranean region is expected to continue as EU countries have little gas production of their own. However, dependency might vary depending on the evolution of the gas market. Further penetration of RES along with a continuation of the current economic crisis are both expected to decrease demand for gas, and therefore decrease dependence on producing countries.

The South Mediterranean countries face a different perspective. In countries having resources of their own (mainly Algeria, Libya and Egypt), dependency is expected to stay low since domestic consumption can be met with local gas production.

EUROPE, NATURAL GAS AND THE MEDITERRANEAN

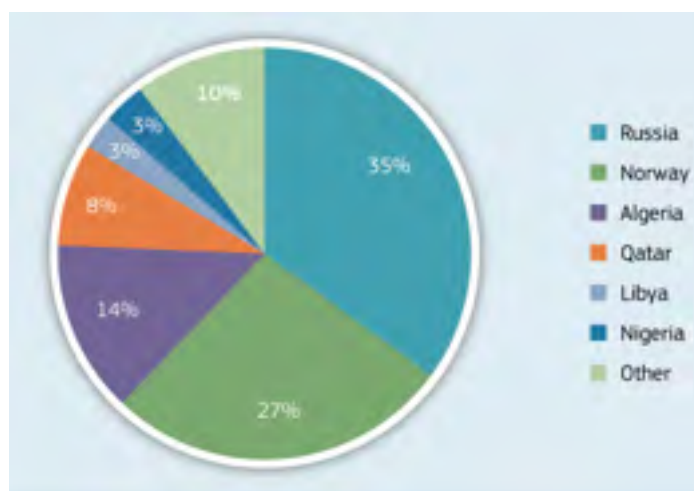
The following section explores the dependence Europe has from Mediterranean gas as well as the current crisis its gas sector is undergoing.

EUROPEAN DEPENDENCY FROM MEDITERRANEAN GAS SUPPLIERS

- In 2011, Europe imported 83% of its gas from four producers: Norway, Russia, Algeria and Qatar.
- Mediterranean gas imports represented 20% of the total gas consumed in the EU.
- The distribution of Mediterranean gas in Europe is uneven with low or no consumption in Northern and Eastern Europe and high dependency rates in Southern Europe.
- South European countries hold a variable but high dependency from Mediterranean gas imports.
- Mediterranean gas exported to Europe does not use complex transit routes (as occurs with Russia's gas exports).

To understand the relation that Europe holds vis-à-vis Mediterranean suppliers it is important to look at how European imports are distributed within the EU. There are currently four great suppliers providing more than 80% of the gas consumed in the EU: Norway, Russia, Algeria and Qatar. Each of them supplies the continent through very different routes and the result is very different dependency structures of EU countries from these supplies. Figure XII below shows the distribution of EU gas imports by country of origin.

Fig. XII: EU-27 gas imports by country of origin. Source: European Commission.



Qatar mainly provides its gas through LNG. Norway provides gas to Nord European

countries by both LNG and pipeline gas. The case of Russia is special as most of its gas travels long distance across borders to reach its final destination. As Section II explains, this has important consequences for the interaction between Russia and the EU internal gas market. Finally, the case of the Mediterranean is also particular as it supplies mainly South European countries. While Gazprom mainly supplies Eastern and Northern Europe, Mediterranean gas is mainly consumed in the Southern part of the EU, more specifically in Portugal, Spain, France and Italy (together with Turkey). This gives a first hint about European dependency on Mediterranean gas: it is not Europe as a whole that consumes Mediterranean gas but rather the Southern border.

A second element of analysis to understand the European dependency on Mediterranean gas is the energy mix of Southern European countries. By looking at the country of origin of the gas they consume, it is possible to understand the degree to which these countries are dependent on Mediterranean gas. Appendix II provides cross information of the gas exports provided by Mediterranean producers and the percentage these represent for importing countries. Three countries in the South of Europe account for most of the consumption of Mediterranean gas: Portugal, Spain, France and Italy. Focusing on the countries accounting for the majority of Mediterranean exports to Europe, it is possible to outline the following data⁹:

- In **Portugal**, gas represented 19% of the total primary energy consumption in 2010. Gas imported from the Mediterranean represented 37% of the total gas consumed. Gas was imported mainly from Algeria (37%) and Nigeria (52%)
- In **Spain**, gas represented 24% of the total primary energy consumption in 2010. Gas imported from the Mediterranean represented 42% of the total gas consumed. Imports came from Algeria (32%), Nigeria (20%), Qatar (15%), Norway (9%), Egypt (7%) and Libya (1%).
- In **France**, gas represented 16% of the total primary energy consumption in 2010. Gas imported from the Mediterranean represented 14% of the total gas consumed. The gross of imports came from Norway (30%), Netherlands (15%), Russia (13%), Algeria (13%) and Nigeria (7%).
- In **Italy**, gas represented 40% of the total primary energy consumption in 2010. Gas imported from the Mediterranean represented 39% of the total gas consumed. The gross of imports came from Algeria (36%), Russia (19%), Libya (12%), and Netherlands (4%).

The single most important Mediterranean exporter to Europe is Algeria with 44bcm supplied to Europe in 2011. Alone, Algeria represents 13% of the total EU gas imports. When looking at exports by destination, the following countries receive the following share of Algerian exports: Portugal (4%), Spain (26%), France (10%), Italy (44%) and Turkey (8%).

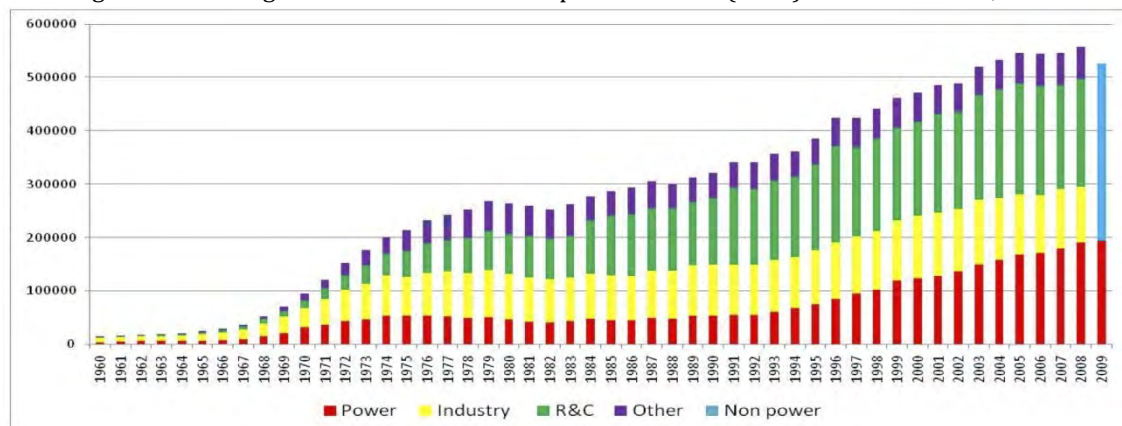
⁹ Source: International Energy Agency statistics.

EUROPEAN GAS DEMAND

- Demand increased continuously in the 1990-2009 period.
- The European gas sector is currently undergoing a large crisis due to:
 - The effects of the 2008 EU economic crisis.
 - EU policies for supporting RES and energy efficiency.
 - The contracting system based on oil-linked contracts.
 - Competition from cheaper alternative energy sources (e.g., coal)

The analysis of European gas demand is centred on what started as the 2009 gas crisis. Since the 1990s, natural gas consumption has increased steadily. It did at an annual rate of 4.2% in the 1990s and 2% until 2008. With the start of the 2008 financial crisis, the EU gas market fell by 5.6% to 2003 levels. The analysis of this turn is crucial for understanding the Mediterranean reason as the gross of the changes that are expected to arrive in the sector are directly linked with this decrease of consumption. Figure XIII below accounts for the increase of consumption previous to the 2009 crisis.

Fig. XIII: Natural gas demand in OECD Europe 1960-2010 (mcm): Source: Honoré, 2010



Sources: IEA (annual), *Natural Gas Information*, part IV, table 3A (several issues) ; IEA (monthly),

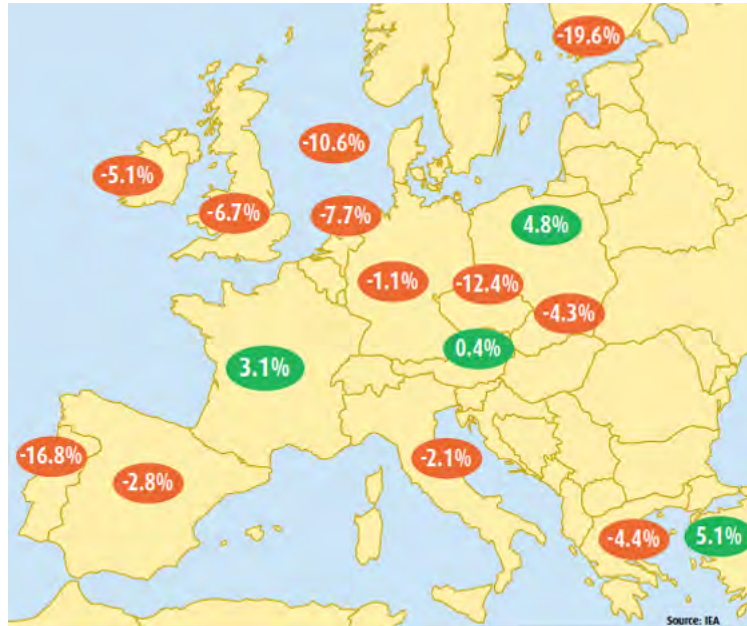
In 2007, the subprime crisis started and eventually turned into a severe global recession. The result was a 1% decline in the world's GDP and a 4.1% decline in the Euro area. The effects over Europe were uneven with countries such as France, Germany, Portugal, Slovakia and Sweden being less affected and with others such as Spain, Ireland and Greece being more affected. By 2010, EU economies were achieving some recovery with the exceptions of Greece, Ireland, Spain, Portugal and Italy.

The effects of the crisis have been uneven for the gas sector with some countries being hit harder, particularly Finland, Luxemburg, Hungary, Italy, Sweden, Germany, Czech Republic and Spain.¹⁰ Figure XIV below shows the variation of gas

¹⁰ Honoré, A. (2011). Economic recession and natural gas demand in Europe: what happened in 2008-2010? oxfordenergy.org. Oxford Institute for Energy Studies.

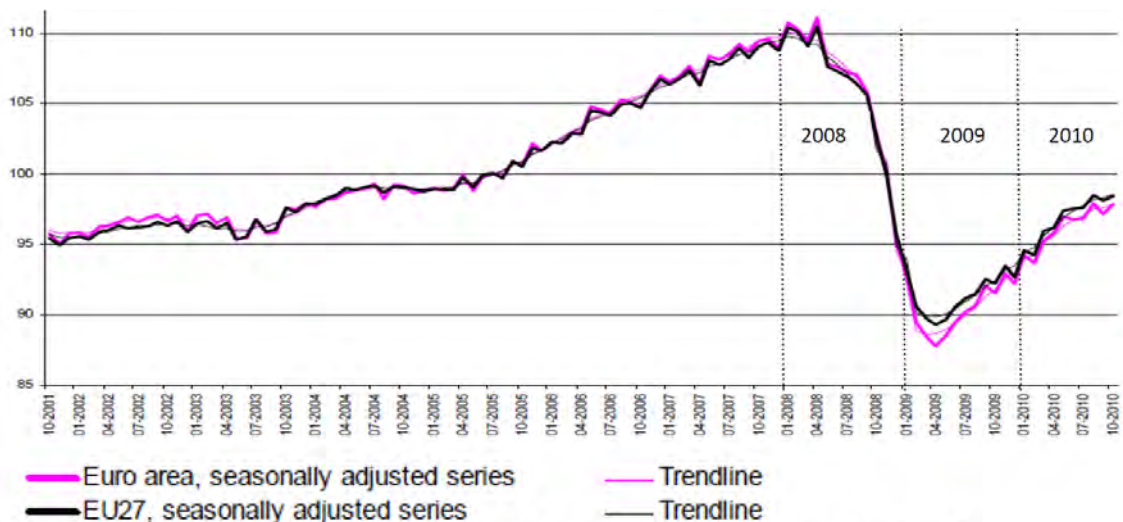
consumption in the EU in the January - July period between 2011 and 2012. It shows signs of recovery in some countries with the majority still experimenting further decreases.

Fig. XIV: Gas demand over January-July, 2012 vs. 2011. Source: IEA



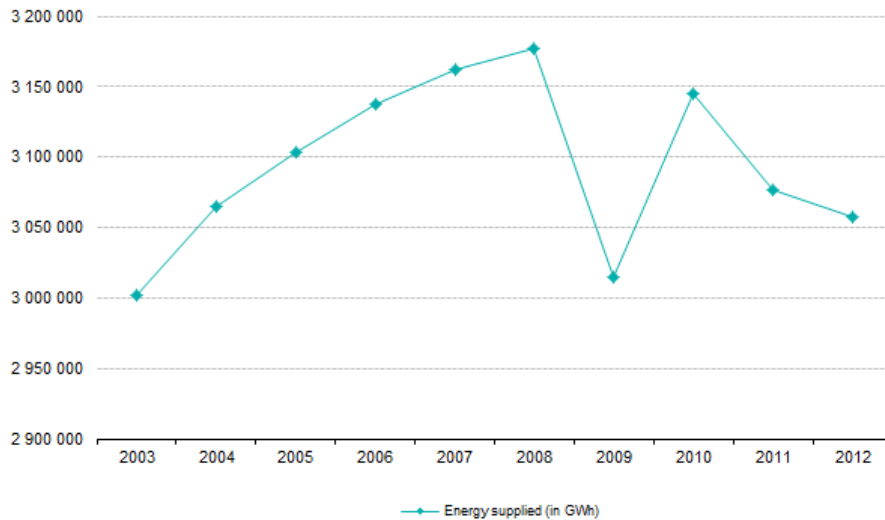
The decrease in gas consumption mostly affected the electricity and industrial sectors, which have only gone back to pre-2008 levels. Figures XV and XVI below show the variation if both of these sectors, which account for the gross of EU gas consumption.

Fig. XV: Industrial production in the Euro area and EU-27, base 100 in 2005, for Jan 2001-Oct 2010. Source: Honoré, 2010



Source: Eurostat, News Release, Euro Indicators, 192/2010, 14 December 2010, page 1

Fig. XVI: EU-27 Evolution of electricity supplied, 2003-2012 (in GWh). Source: Eurostat



Besides the 2007 economic crisis, there are other factors that explain the 2009 European gas crisis. These include:

- European policies on both RES and energy efficiency (see Section III)
- Low flexibility of European gas contracts (see Section II)
- Competition from cheap coal coming from USA.

PROJECTIONS FOR DEMAND

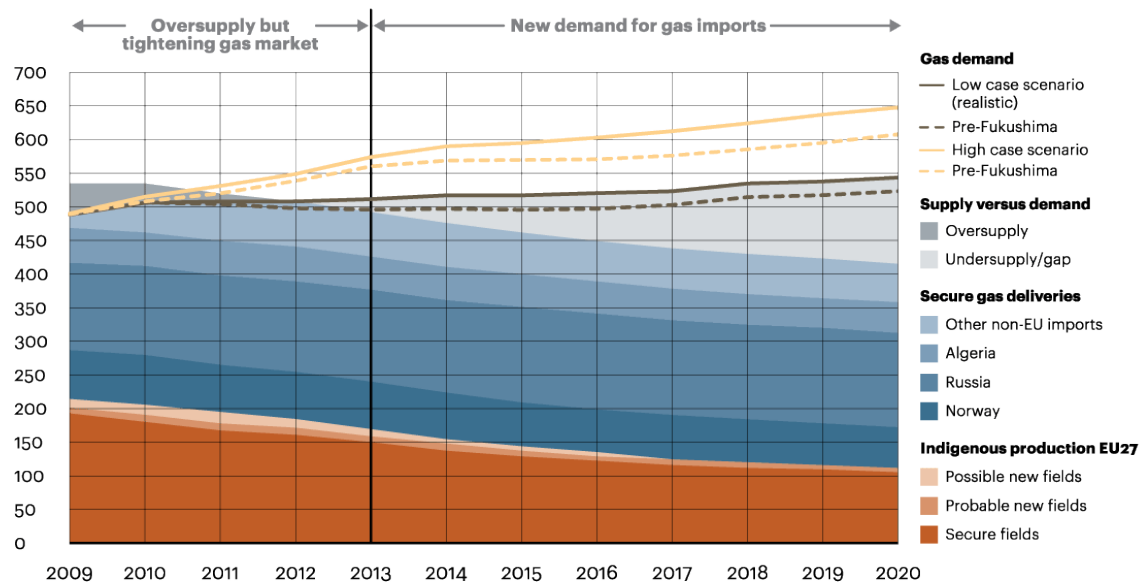
The primary factors that will determine the future of demand for gas in Europe are (1) continued economic growth of two percent per annum, (2) practically stagnant population growth, (3) the higher price of gas compared to other regions, (4) the trend of consumers being increasingly environmentally conscientious, (5) attempting to conserve energy and improve efficiency, and (6) expanding use of renewables and/or nuclear.¹¹ Demand has abruptly diminished since 2010 in the European Union. In comparison, Turkey has had the largest increase in demand in the Mediterranean region—more than the five most important European countries combined.

The European Union will see less and less demand for gas for energy production largely due to its continued push for renewables. Spain, Germany, and Denmark have placed the largest emphasis on renewable development. In effect, Europe has abandoned its policy based on the carbon tax for one that focuses more on renewables. As the financial crisis was the largest explanation for Europe's decrease in gas demand, even as Europe recovers, its consumption will continue to diminish; the only exception to this trend would be if the promise of renewables were not delivered.

¹¹ Natural Gas Demand and Supply: Long-Term Outlook to 2030. Eurogas. <http://www.eurogas.org/uploaded/Eurogas%20long%20term%20outlook%20to%202030%20-%20final.pdf>.

Current projections for gas consumption in Europe predict a mere 0.4 percent growth per year in a lower-demand scenario (see Figure XVII). Despite a partial higher reliance on gas compared to nuclear following Fukushima—an expected increase of 20-40bcm per year—declining domestic production will lead to a 27 percent increase in gas imports—expected to rise from 327bcm today to 413bcm in 2020.¹²

Fig. XVII: European Gas Demand versus Production (in bcm): Source: A.T. Kearney, 2013.



Notes: Data includes only planned gas supply; unplanned liquefied natural gas supply is not considered.

As is evident in Figure XVII, there was an oversupply of gas compared to production in Europe prior to 2010, but the situation has been reversed and the undersupply gap will continue to grow. Production in existing fields will continue to decrease, as would any possible or probable new fields. Europe’s gas demand will surpass the guaranteed supply of its secured gas suppliers—notably Russia, Norway, and Algeria—despite its heavier focus on domestic renewable energy sources. The “low case scenario” depicted in Figure X displays the more realistic expectations for European demand. European gas demand for energy production will continue to diminish, shown by the trend line in this scenario remaining relatively flat. The point in all this is, once again, that the industry will seek customers in other regions where gas demand is actually increasing. Based on current predictions, there will be no “golden age of gas” in Europe.

¹² “The Future of the European Gas Supply,” A.T. Kearney, http://www.atkearney.com/paper/-/asset_publisher/dVxv4Hz2h8bS/content/the-future-of-the-european-gas-supply/10192.

SECTION II: NATURAL GAS PRICING AND INFRASTRUCTURE IN THE MEDITERRANEAN REGION

Section I has analysed the fundamental asymmetries that characterise the Mediterranean region in term of GDP, population, gas production and consumption. These basic imbalances later translate in different infrastructure networks together with different contractual relationships between the actors involved.

To understand how trade is structured in the Mediterranean region, Section II follows by looking at infrastructure, contractual relationships, and pricing mechanisms.

An examination of the infrastructure network allows understanding of the physical connections that exist within the Mediterranean. Analysis in Section I showed South to North gas flows that correspond to a network of pipelines crossing from Algeria to different countries of destination in the North Mediterranean region, which will be outlined here.

Second, the report continues by looking at the different contractual relationships and pricing mechanisms in the region. For this it differentiates between the European Market and the North African gas market. The main topics of discussion regarding the former have to do with the creation of the EU internal gas market and the challenges that it has created for traditional oil-linked contracts. The revision of these contracts is transforming the region, and questions about the future of this contractual practice are still open and to be decided in the future. The Mediterranean as one of the main suppliers of the EU gas market is very affected by this discussion.

The topics discussed in this section regarding the North African basin relate to a different pricing mechanism. While European debates are built around gas-to-gas competition and oil-linked contracts, the South Mediterranean border faces the problems of using lower price levels. The asymmetries in welfare levels between the North and South Mediterranean countries translate into different pricing mechanisms. The challenges that the Southern basin is facing due to the use of regulated prices are linked to the loss of export revenues and the loss of efficiency in industries consuming domestic gas.

Much of the transformation to come in the Mediterranean region will not happen as a result of institutional and political cooperation among countries but rather as a result of the developments covered in this section:

- Infrastructure developments
- The European internal gas market and its implications for transit and contractual practices
- The use of regulated prices in gas-producing countries in the South Mediterranean basin

INFRASTRUCTURE

After examining the region's imbalances in the previous section, a look into the gas infrastructure network provides understanding of the way in which these asymmetries translate into physical connections. Both the pipeline and LNG systems allow gas to flow from the South Mediterranean region, mainly going from Algeria and Libya to Europe.

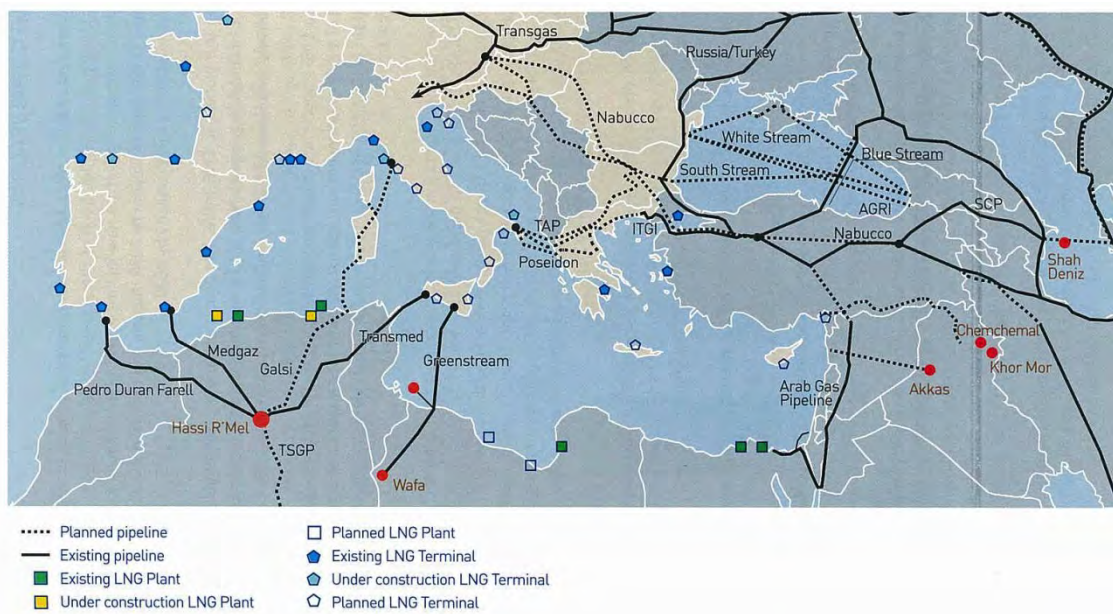
As opposed to this network, the gas consumed domestically in the North Mediterranean basin does not need a pipeline network as complex as the one crossing the Mediterranean Sea to Europe.

GAS INFRASTRUCTURE IN THE MEDITERRANEAN

Traditionally, Europe has been dependent on four major distribution circuits for its gas supply. Figure XVIII illustrates the pipelines and LNG terminals falling within the following regions:

- **The EU corridor:** linking Great Britain with the Netherlands.
- **The Norway corridor:** linking Norway, the United Kingdom, Germany and France.
- **The Eastern Corridor:** linking Russia with Eastern and Central Europe.
- **The Mediterranean Corridor:** linking Algeria and Libya with Europe.

Fig. XVIII: Gas infrastructure in the Mediterranean: LNG and pipelines (2011). Source OME, 2011.



North African pipelines

- **Algeria** supplies gas to Europe through three pipelines: through Italy with the Enrico Mattei gas route; through Spain via the Maghreb-Europe pipeline; and through the Medgaz pipeline. A fourth one, the Galsi pipeline, is currently being planned linking Algeria to Italy (expected to be completed in 2014).
- In **Libya**, the onshore Wafa field and the offshore Bouri field are linked to Italy through the Green Stream pipeline, started in 2004. Due to the political turmoil in Libya, the Green Stream was shut down in February 2011 but shortly reopened after.
- **Egypt** exports its gas by the Arab Gas pipeline, reaching Jordan, Syria, and Lebanon, and the route could eventually be extended to Turkey.

LNG infrastructure

For significant volumes travelling longer distances, transportation of gas via pipeline is less expensive; however, the initial infrastructure development is expensive and is only worth it if long-term contracts can be secured. LNG is a flexible complement and sometimes alternative to pipeline infrastructures. Gas is shipped at very low temperature (-160°C) in a liquid form and is regasified back to its previous state when it reaches its final destination in order to be distributed for consumption. This process requires liquefaction and regasification plants in both supplier and consumer ports. LNG is an important means of gas distribution in the Mediterranean. Algeria is one of the main LNG exporters in the world and exports mainly to Europe and Asia.

In addition to the LNG plants in Libya, Egypt, and Algeria, there are numerous regasification plants on the shores of Southern European countries, including Spain (Huelva-Cartagena-Barcelona), France (Fos, Montoir de Bretagne), Italy (La Spezia), Turkey (Marmara, Ereğlisi), and Greece (Revithousa).

The Southern corridor project

To diversify the sources of European energy supply, new transportation facilities are being built between Europe and Central Asian countries. The **Southern Corridor** project was started in 1997 with the Interstate Oil and Gas Transport to Europe (INOGATE) program of energy cooperation between the European Union and Central Asian countries. It was extended with the Baku initiative in 2004, aiming to facilitate the progressive integration of energy markets as well as to create transportation facilities for gas in Europe.

In 2006, the European Parliament and the European Council decided to build new natural gas pipelines to Europe from the Central Asian sources. The clear objective of this project is to ensure security of supply and to try to find an alternative to the classic vertical integration system in which the producers also transport gas to the consumption destination. The European commission aimed to strengthen competition and reduce prices; thus two projects were proposed to realise a Southern gas corridor: **Nabucco** and the **Interconnector Turkey-Greece-Italy**.

The EU expects this corridor to be able to supply 10 to 20% of EU gas demand by 2020, which would represent approximately 45-90bcm per year.¹³ Even though it appears to be a valid solution to solve Europe's security of supply issues, many geopolitical constraints emerge in this area (i.e., tensions in the Central Asian countries, Russian involvement, and the current situation in Iraq and Iran).

The most reliable field in the Caspian region is the Shah Deniz II, an offshore complex in Azerbaijan. It is operated mainly by BP and Statoil, each holding 25.5% of the shares. Other shareholders include SOCAR, Total, Lukoil, NIOC, and TPAO. It is expected to enter into operation between 2017 and 2018 and its output would be roughly 16bcm (6 of which would be delivered to Turkey while the rest goes to Europe). The expected output is much smaller than Commission expectations, which has led stakeholders to place the Nabucco project on hold and start looking for new pipeline prospects, including:

- The Trans-Adriatic Pipeline (TAP)
- South-East Europe Pipeline
- Nabucco West
- Trans-Anatolian Pipeline (TANAP)

The **TANAP** arose from the initiative of the Azerbaijani Socar Company and is the most probable project to be completed, signalling the end of the Nabucco 1 project. It would run from Georgia to Bulgaria across Turkey and could provide access to the gas fields in Turkmenistan. **This project completely changes the project set by the European Commission, and its primary intention is to bring more competition to the gas market.** The final choice of route should be decided in 2013. However, there are still some political issues to be solved, including the territorial dispute between Azerbaijan and Turkmenistan on the Kyapaz-Serdar field and the opposition of Russia and Iran to the completion of the project. The South Stream and the TANAP will likely not compete against each other in the region because gas production in the region will not be sufficient to fill two pipelines.

Export infrastructure capacity should be sufficient to meet the required transportation needs by 2030 at the regional scale. However, **countries such as Israel and Cyprus will need to build new export infrastructure to trade the potentially significant gas resources to be developed in offshore fields, and Libya will need to expand its export infrastructure going into the future.**

THE EUROPEAN INTERNAL ENERGY MARKET AND ITS CONSEQUENCES FOR EURO-MEDITERRANEAN GAS TRADE

After examining the physical network that serves to connect the Mediterranean from border to border, this section continues by looking at the EU internal gas

¹³ Nicolo Sartori. "The Southern Gas Corridor: Needs, Opportunities and Constraints." Document IAI 11(I 08). June 2011.

market to evaluate what are the implication of this new infrastructure and regulatory system for the region. More specifically, the section addresses the new configuration that the EU network will adopt and how this is likely to bring new relations with gas producers in the region. Europe is mainly a consumer market, however, the design of its network is likely to alter the relations with Mediterranean neighbours.

The North Mediterranean gas sector is partly shaped by the European project for an internal market for gas, which will be discussed in detail in Section III. For the whole Mediterranean region, this has meant the emergence of a market for gas that structures gas trade around market mechanisms where prices are set according to supply and demand. Furthermore, a whole network of infrastructure, including pipelines, interconnectors and gas exchanges (both for physical and financial trade), is currently under construction to allow gas to flow between the previously isolated national networks. The Northern basin of the Mediterranean will rely on this system, and its effects will be felt in the entire region, including between EU consumers and Mediterranean gas suppliers.

A PAN-EUROPEAN GAS NETWORK AND ITS IMPLICATIONS FOR THE NON-EU GAS SUPPLIERS

- The policy proposal for the EU internal gas market was presented in 1988 by the EU Commission.
- The project gained further impulse with the Third Legislative Package approved in 2009.
- The Gas Target Model envisages a EU gas network constituted by regions rather than national networks.
- An 'entry-exit' model is expected to bring a new regulatory framework for countries exporting their gas to Europe.
- Mediterranean gas exporters are not greatly affected by this as their gas arrives directly to countries of destiny and does not have to cross multiple borders within the EU (as occurs with Russia).

The North Mediterranean gas sector is partly shaped by the European project of an internal market for gas. For the whole Mediterranean region, this has meant the emergence of a market for gas that structures gas trade around market mechanisms where prices are set according to supply and demand. Furthermore, a network of infrastructure, including pipelines, interconnectors and gas exchanges (both for physical and financial trade), is currently under construction to allow gas to flow between the previously isolated national networks. The Northern basin of the Mediterranean will rely on this system and its effects are to be felt in the whole region, including between EU consumers and Mediterranean gas suppliers.

A pan-European gas transmission system

The liberalisation of the EU energy sector was launched in the end of the 1980 by the EU Commission but did not achieve formal treaty-based competences until 2009 in the Lisbon Treaty. Other competences that have been used for these transformations are the Single European Market (SEM), which justified the application of competition law, and the development of European environmental policy. By linking both SEM and environmentalism, the Community was able to legislate of member states' competences over their energy sectors. This reach was granted by the 1987 Single European Act (SEA), which allowed the Community to adopt legally binding measures affecting the energy sector of Member States without having and unanimous agreement for it (under the qualified majority voting procedure).

In dealing with both electricity and gas, the Community approved an inter alia Gas Transit Directive (1991), the First Gas Directive (1998), the Second Gas Directive (2003), a Directive concerning safeguard security of gas supply (2004) and Gas Regulation 177 (2005). Before reaching a Third Gas Directive (2009), the European Commission began to use EU competition law to implement SEM more efficiently. However, a 2005 sector inquiry showed that more than competition law would be needed to achieve the internal energy market. A Third Energy Package for Gas was accepted in 2009 including a Third Gas Directive and Regulation 715. The initiative is seen by the EC as the ultimate tool for creating a single liberalised EU gas market. It became law in March 2011 and it envisages the application of the different ownership unbundling options together with the development of regulatory network codes by the end of 2014. The implementation of the Third Energy Package includes:

- Unbundling of transmission networks
- Transmission system operators (TSOs) certifying unbundling requirements
- An entry-exit access model for transmission
- Development of pan-European Network codes on cross-border issues
- Two new EU level agencies, the Agency for Cooperation of Energy Regulators (ACER) and the European Network of TSOs (ENTSOG), for the coordination and implementation of the EU internal gas market

Additionally the Council of European Energy Regulators (CEER) has produced a 'Gas Target Model' for providing a vision of what a single liberalized gas market should be. 'It defines *an end-point* of the liberalization process of the EU gas sector as *establishing functioning wholesale markets* and *connecting* them with one another as well as ensuring *secure supply to and economic investment* in these markets.'¹⁴ The Gas Target Model seeks to create:

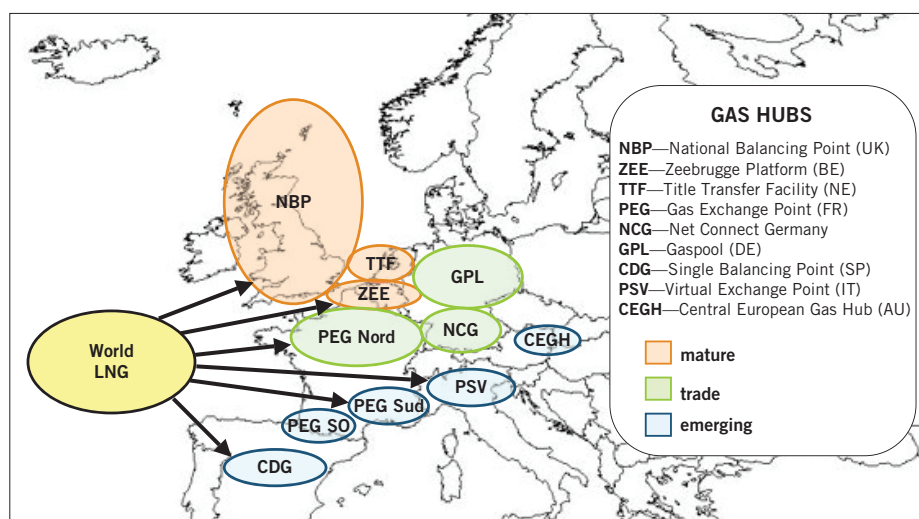
- Sufficient and low concentration of players active in the wholesale market
- Availability of gas from diversified sources
- Multitude of customers (i.e., sufficient gas demand)

¹⁴ Yafimava, K. (2013). The EU Third Package for Gas and the Gas Target Model. Oxford Institute for Energy Studies

- Minimum level of virtually exchanged gas as opposed to the physically exchanged gas (i.e., churn rate)

For the implementation of this target, the Gas Target Model envisages wholesale market not corresponding exactly to national networks but rather to regional areas. It suggests that it is zones, rather than countries, should constitute the foundation of the single EU gas market.¹⁵ Figure XIX shows the main gas hubs to constitute the EU network:

Fig. XIX: Gas hubs in the EU. Source: Mellint, 2010.



Consequences for non-EU gas suppliers

All together, the Third Package, the Gas Target Model and the Network Codes (which are not yet finalised) will change the structure of the European gas sector, both in terms of the market architecture and in terms of the behaviour of stakeholders. This has two immediate consequences for non-EU gas providers:

- The first one is the depoliticisation of gas trade. Traditionally, Europe has handled its gas contracts around long-term bilateral agreements between countries (or rather state owned monopolies). However, the EU internal gas market proposes a single pan-European gas carrier for producers to supply their gas organised around regional rather than state-designed networks. This common carrier is expected to organise transit as well as prices. Both of these matters are currently part of contracts discussion and can, to some degree, fade away with the implementation of the EU internal gas market.
- The second consequence has to do with the transit model. The Gas Target Model proposes an 'entry-exit' zone where entry capacity is independent from exit capacity. This means that any gas entering the market zone can be commercially delivered at any point of that same network. Contrary to this, transit through EU countries to deliver gas past borders usually had end-clauses to determine the end price at the country of destination. This type of pricing clause will be no longer possible, creating new challenges when

¹⁵ Ibid.

planning delivery across borders (within Europe) and when planning new infrastructure across borders.

The degree of input Mediterranean providers have to these schemes is limited, as opposed to other providers. Gazprom, which delivers its gas to Europe across multiple national borders and with a multiplicity of destination clauses, will have to face serious re-adjustment. Conversely, as Mediterranean producers deliver most of their gas directly to their customers (these being mainly Portugal, Spain, France and Italy), implementation of new transition schemes is not expected to bring additional difficulties.

On a different level, what is expected to have a great influence over Mediterranean gas trade is the structure of gas contracts that are currently being used. As the next section explains, debates around oil-linked contracts and gas-to-gas competition are likely to affect trade in the Mediterranean region to a large degree. The section explores the structure of the contracts and how, given the little flexibility they provide they have amplified the effects of the European economical crisis in the gas sector.

PRICING MECHANISMS AND THE 2009 EUROPEAN GAS CRISIS

Besides a new transit network for gas within the European Union, the internal gas market has brought an entirely different industrial model for the EU gas sector. This goes from pricing mechanisms to investment trends, contractual relationships, and volatility schemes for gas. While Mediterranean suppliers are less likely to be affected by the new transit framework (due to the proximity of delivery destinations), changes in price mechanisms are likely to have important repercussions over the structure of gas trade in the region. The following section explores how debates around pricing mechanisms around gas trade in Europe are likely to have broad consequences over the contractual relations between European gas customers and Mediterranean gas providers.

Traditionally, the region has used a formula that linked gas prices to oil. This has resulted in less price flexibility for gas (making it less competitive vis-à-vis other energy sources) while simultaneously allowing for long-term stability, which is highly valued by the industry for infrastructure planning and investment. This lack of flexibility, however, ended up amplifying the effects of the 2008 economic crises for the EU gas sector and partially contributed to a gas crisis in Europe in 2009. The result is key for the Mediterranean region, as the emergence of a EU gas market challenges current contractual relations between North and East Mediterranean suppliers and EU consumers, along with the continuation of existing pricing mechanisms. These changes are likely to affect the decrease in EU gas demand currently occurring, as well as the perspectives for gas in the Mediterranean region. Debates concerning oil-linked contracts versus gas-to-gas competition are likely to affect trade in the Mediterranean region to a large degree.

THE 2009 EUROPEAN CRISIS AND GAS

- A hybrid-pricing situation has coexisted in Europe since the 2000s.
- Oil-linked prices were traditionally below spot gas in this hybrid pricing system.
- The 2008 EU economic crisis reversed the situation, causing spot prices to be lower than oil-linked levels.
- Losses for EU gas wholesalers have raised questions about the future of oil-linked contracts vis-à-vis gas competition.

Continental Europe has kept oil-linked contracts at the heart of its gas sector. However, the emergence of gas-to-gas competition in Europe began in the UK National Balancing Point for gas (NBP) in the mid-1990s. By the 2000s, spot-priced gas was being sold in continental Europe through the interconnections that linked the United Kingdom to Belgium (Zeebrugge) and the Netherlands (Title Transfer Facility), creating what is referred to as hybrid pricing: both oil-linked prices and gas-to-gas competition coexisted at the same time allowing arbitrage opportunities between two different price levels for gas.

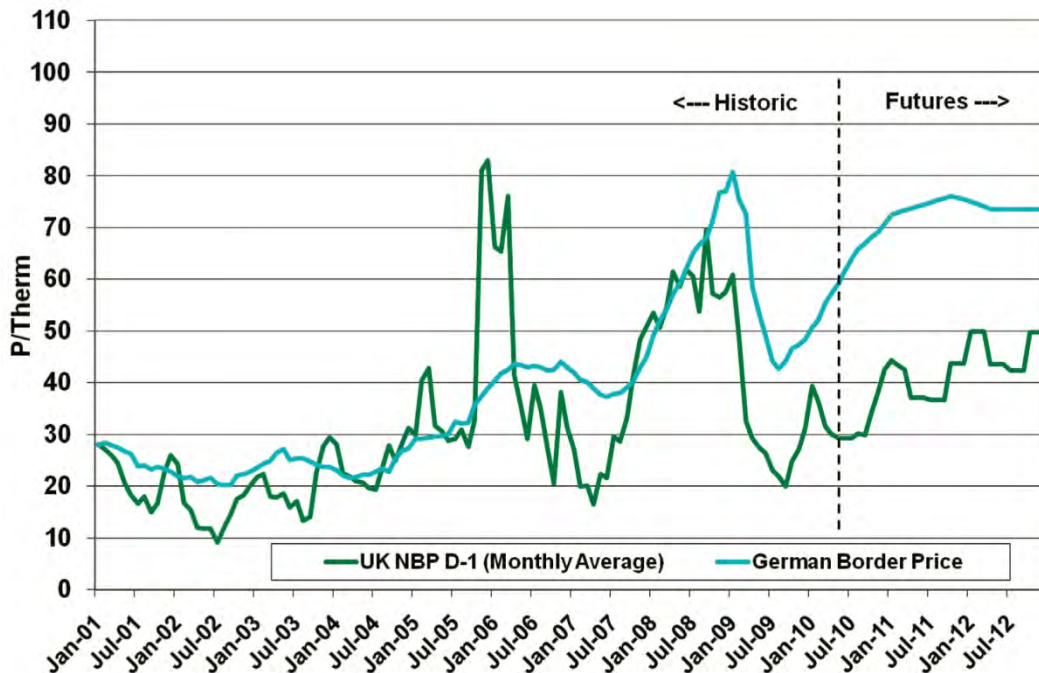
The situation remained sustainable until 2008 when the economic crisis hit Europe. The flexibility of gas-to-gas prices proved to be more efficient for adapting to new demand levels than oil-link contracts did. The result has been an increase contracts using a gas-to-gas basis with huge losses for gas wholesalers over oil-linked contracts. Overall, the question remains concerning the future of oil-linked contracts and their renegotiation in the short term.

Traditionally, European gas wholesalers have bought their gas over oil-linked prices and have re-sold over-contracted quantities on spot markets. This has allowed purchasing cheaper gas over oil-linked contracts while selling the excess quantities on gas-to-gas markets. In the face of the crisis, this situation reversed, driving oil-linked contracts to higher price levels than gas-to-gas competition. This has created unexpected problems for EU buyers, as most of their gas was contracted at what became more expensive oil-linked gas. As the crisis persisted, more gas was diverted to gas markets further driving down the price of spot gas. Additionally, LNG cargoes coming to Europe on spot prices basis further contributed to widening the gap between gas-to-gas prices and oil-linked contracts.

During 2010 and 2011, hub prices were on average 25% lower than oil linked contracts.¹⁶ Figure XX below represents the differences in price levels between gas being delivered on the basis of gas-to-gas competition (in blue) and the gas being delivered through oil-linked contracts (in green).

¹⁶ Jonathan Stern and Howard Rogers. "The Transition to Hub-Based Gas Pricing in Continental Europe." Oxford Institute for Energy Studies. March 2011.

Fig. XX: European Price Spread: German contract and NBP 2006-2012. Source: Melling, 2010..



There are several factors that have contributed to creating this price differential between oil-linked contracts and gas-to-gas competition in the advent of the 2008 crisis, including the EU internal gas market, conditions of oversupply, and uncertainty in demand predictions.

- **The EU internal gas market.** The new market structure brought growing liberalisation, liquidity, transparency and competition to the sector. Gas utilities became subject to the same rules as companies operating in other sectors which included¹⁷:
 - Elimination of destination clauses
 - Improved third-party carriage
 - EU pressure to reduce unnecessary “contractual congestion” at cross-border points where unused capacity is not released into the market in a timely manner
 - Enhanced interconnectivity between regional producers and consumers (Tampen Link, Langeled, BBL, IUK)
 - Large-scale regasification capacity expansion and development in liberalised, liquid markets (UK, Belgium)
 - Unification of disparate balancing zones (France) and/or separate pipeline systems (Germany)
 - Growth of a new breed of competitor—the second-tier players—previously constrained by the incumbents

¹⁷ Anthony J. Melling. *Natural Gas Pricing and its Future: Europe as the Battleground*. Washington, DC: Carnegie Endowment, 2010.

- **Conditions of oversupply.** This was the single most relevant cause contributing to the 2009 EU gas crisis.¹⁸ As explained above, decreasing demand drove utilities to sell higher quantities on the spot market lowering spot prices.
- **Uncertainty in demand predictions.** This occurred especially in power generation and contributed to enlarging the gap between spot and oil-linked prices. Oil-linked contracts are incompatible with traded electricity markets as generators have no liquid spot and futures markets and hence, little incentives to sign long-term commitments.

All together, **the hybrid price structure at work in the EU gas market has created an unsustainable level of losses for EU gas importers.** What is at stake here is the continuity of oil-linked contracts (vis-à-vis gas to gas competition) and the different strategies that have been adopted by to soften the losses produced by its lack of flexibility.

CONSEQUENCES FOR THE EURO-MEDITERRANEAN REGION

- Contract revisions have taken place with the main EU suppliers (Russia, Norway and Algeria).
- Oil-linked prices have come to include 15% spot prices on temporary basis of 3 years.
- The strategy might have to face more incoming volumes of spot prices.
- Pressure is not relieved but only shifted from EU wholesale buyers to end customers.
- The future of oil-linked contracts is yet to be seen.

The 2008 economic crisis decreased consumption of gas in the European Union; however, the distribution of losses has not been uniform. At the same time consumption was decreasing, oil-linked contracts maintained their mandatory take-or-pay levels, which meant that EU wholesalers had to acquire contracted gas quantities at a time where consumption had decreased in Europe. The 2009 EU gas crisis together with the contract schemes in use has created a great pressure on EU gas wholesalers who purchase their gas from exporters, including those of the Mediterranean. The implication of this for the Mediterranean region is that part of the existing contracts was renegotiated after 2010.

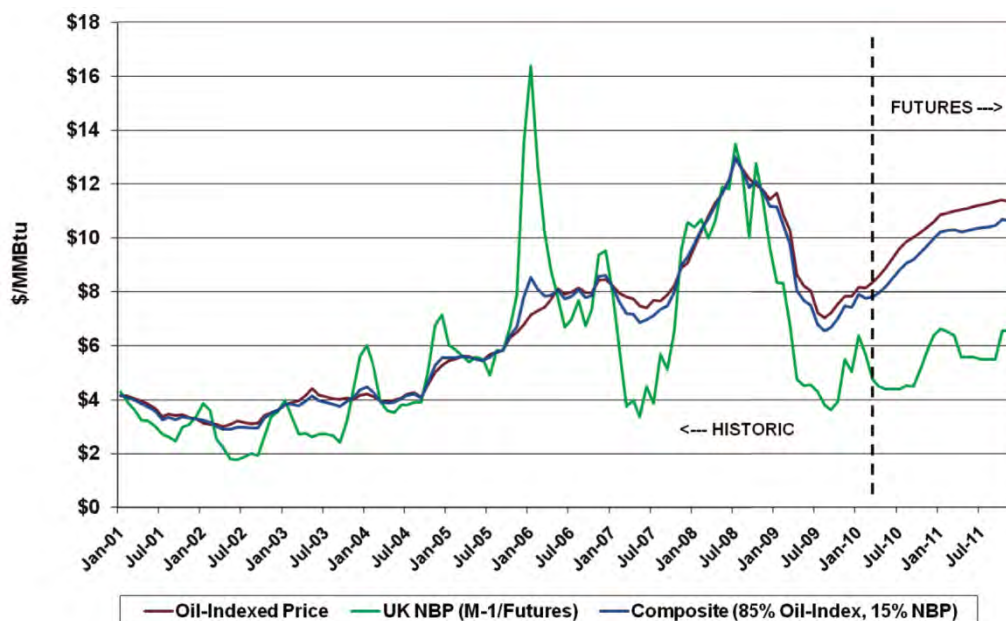
In order to make the situation sustainable, exporters to Europe (mainly Norway, Russia, Algeria and Qatar) have accepted the renegotiation of contracts. The highest profit-maximising strategy for them is to accept some degree of volume flexibility in order for EU wholesalers to adapt to lower consumption levels. Initially, the reduction quantities were set on a temporary basis, so a return to previous conditions is expected after a brief period of around three years.

¹⁸ Ibid.

The most relevant case for the Mediterranean is that of Sonatrach, which exports 50bcm of the gas imported by Europe each year.¹⁹ The Algerian company has shown less flexibility of pricing renegotiations mainly because its main customers (Portugal, Spain and Italy) are less open to competition from cheaper supplies than member states in Northern Europe.

Overall, the different strategies adopted by gas exporters to Europe have allowed a 15% price link to spot prices in an oil-linked contract, which has meant that in practice, EU wholesalers have received a 5% price discount over their oil-linked levels.²⁰ Figure XXI below shows how this discount interacts in the current hybrid-pricing context:

Fig. XXI: Impact of a 15% spot price indexation in oil-linked contracts. Source: Melling, 2010.



The volume reduction strategy has to be considered in terms of two difficulties it faces:

- **Although contract revisions apply for the next three years the strategy is seen to face further difficulties as new spot volumes could be flowing to Europe**, especially as conditions of oversupply continue and as LNG imports maintain the ability to access willing customers.
- **The strategy does not really relieve the pressure but just shifts it.** Initially it was wholesalers who were mostly affected by hybrid prices. After the revision of contracts it is likely that the problem will be shifted to end-consumers, as EU wholesalers will have to decide to whom they sell at oil-linked prices and to whom at spot prices. As there is not enough spot gas for all customers, some are expected to benefit as other face higher gas prices.

Overall, the price revision strategy has allowed some flexibility of contracts in the short and medium term, but has not ended the debates about pricing mechanisms

¹⁹ Fillippos Proedrou. EU Energy Security in the Gas Sector: Evolving Dynamics, Policy Dilemmas and Prospects. Farnham: Ashgate, 2012.

²⁰ Anthony J. Melling. Natural Gas Pricing and its Future: Europe as the Battleground. Washington, DC: Carnegie Endowment, 2010.

in the European Union. The events analysed have shown the dynamics that structure gas trade in the Euro-Mediterranean region. Changes at this level are expected to bring transformations to the gas sector outside other political and institutional framework. **The question remains as to the future of oil-linked contracts and whether producers will move to gas-to-gas competition or whether oil-linked contracts will continue being used.**

REGULATED PRICES AND FOSSIL-FUEL SUBSIDIES

- Mediterranean gas producers use local gas for domestic consumption.
- Prices are set at levels lower than imports.
- This has the effect of ‘subsidising’ local industries.
- Problems linked to these practices are: loss of revenues from gas exports, loss of efficiency and environmental issues due to high levels of inefficient consumption.

The North Mediterranean basin accounts for the bulk of the consumption in the region, rendering it highly concerned with the gross of the transmission network that crosses the Mediterranean from South to North. However, the South and Eastern basins of the Mediterranean, despite the lower welfare levels, account for the gross of the increase in gas consumption in the region, as mentioned in Section I. To understand this, it is important to look into the pricing mechanisms—particularly the regulation of prices—that are used in these countries for the consumption of gas. The following section analyses the particularities of this as well as the problems that are linked to it.

REGULATED PRICES AND THE SUBSIDISING OF NATURAL GAS CONSUMPTION

The Southern basin holds the three biggest gas producers in the region: Algeria, Libya and Egypt. These countries by themselves account for much of the total demand in the region and are expected to further increase their demand going into the future. As opposed to EU price levels, which are currently around 9 US dollars per MMBtu, prices for domestic consumption in these countries are well below. Within the MENA region they vary from \$0.75/MMBtu in Saudi Arabia, \$0.8/MMBtu in Kuwait, \$1/MMBtu in Qatar, to 0.6/MMBtu in Algeria and \$1.25-4/MMBtu in Egypt.²¹

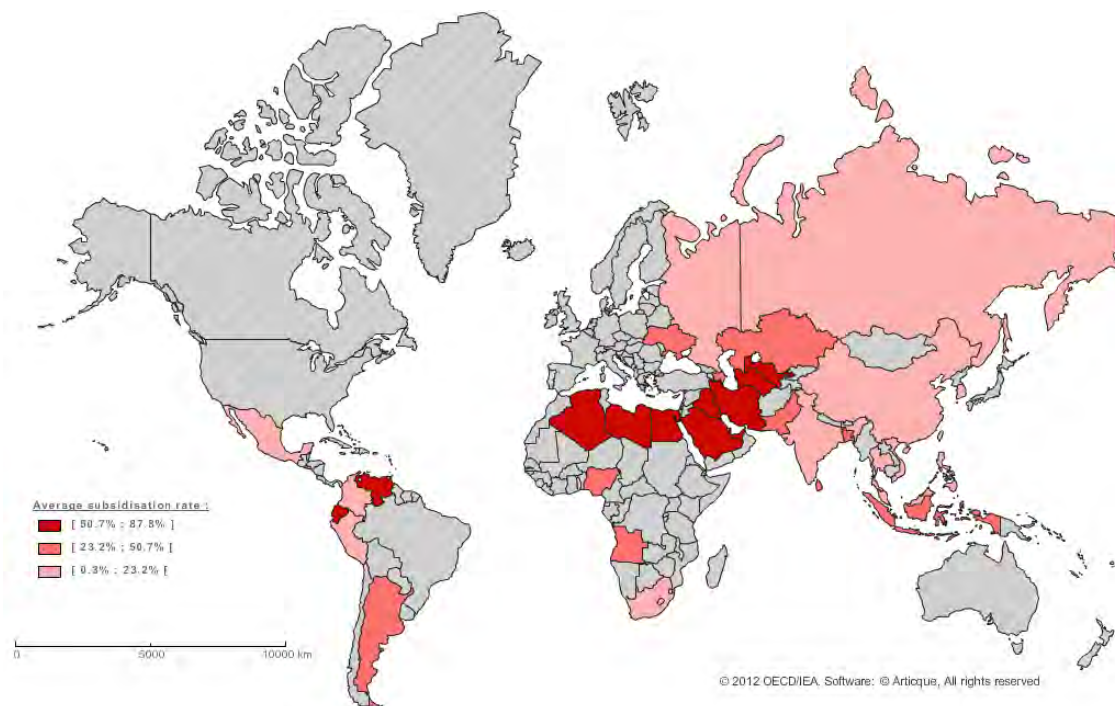
Regulated prices in gas-producing countries support local industries by providing them with lower priced gas. The aim of these policies has to do with the use of local

²¹ Darbouche, Hakim (2012). “The Pricing of Internationally Traded Gas in MENA and Sub-Saharan Africa.” p. 225. On Stern, J. (2012). The Pricing of Internationally Traded Gas. Oxford University Press

resources to alleviate poverty and to promote economic development. The ownership of fossil fuel reserves is seen as a possibility to benefit local populations.

However, despite the importance of these targets, subsidising strategies have several downturns of their own. **Gas consumed domestically at cheap prices is subtracted from potential exports, which are sold at much higher prices, resulting in the government losing revenues because of the gas it diverts for local consumption. Additionally, these types of practices encourage low efficiencies in local industries, negatively affecting both security of supply and climate change.** The IEA sees the lowering of fossil fuels at a world scale as a practice that could cut growth in CO₂ by 1.7 Gt and slash growth in energy demand by 4.1%²². Figure XXII below shows the world distribution of countries subsidising fossil fuel consumption. Among these countries it is possible to see Mediterranean gas producers with some of the highest subsidy levels.

Fig. XXII: Fossil-fuel consumption subsidy rates as a proportion of the fuel cost of supply (2011).
Source: IEA, 2011.



Subsidising fossil fuels not only decreases revenues from exports and decreases efficiency, but the IEA also points to the following problems generated by regulated pricing²³:

- Encourage wasteful consumption
- Hasten the decline of exports
- Threaten energy security increasing imports
- Encourage fuel adulteration and smuggling

²² International Energy Agency:

<http://www.iea.org/publications/worldenergyoutlook/resources/energysubsidies/>

²³ Ibid.

- Discourage investment in energy infrastructure
- Disproportionally benefit the middle class and rich (only 5% to 15% percent of global fossil fuel goes to the lowest 20% income group)
- Distort markets and create barriers to clean energy investment
- Dampen global-demand responsiveness to high prices
- Increase CO2 emissions and exacerbate local pollution

MOVING OUT OF FOSSIL-FUEL SUBSIDIES AND THE INTERACTION BETWEEN GAS AND ELECTRICITY

According to the structure of growth in the South Mediterranean region—both in terms of the economy and population—countries using local gas production for domestic consumption will use a great deal of their gas for electricity generation. Electricity will be the largest growing gas-consuming sector in these countries.²⁴ For this reason, **an efficiency increase for the gas consumed under regulated prices can be achieved by linking the gas and electricity sectors of gas producing countries.** While a large part of the developments that are expected to take place in South-to-North gas trade concern the contractual mechanisms used, a large part of the developments that are to take place within the South Mediterranean concern the ways in which electricity will be tied to the gas sector in these countries.

The following Section III allows for exploration of some of the ways in which electricity can be tied to gas. When looking at exports by destination, the following countries receive the following share of Algerian exports: Portugal (4%), Spain (26%), France (10%), Italy (44%) and Turkey (8%). It is in this context that some of the move away from fossil fuel subsidies can be explored within the Mediterranean region.

²⁴ Observatoire Méditerranéen de l'Énergie. *Mediterranean Energy Perspectives*, 2011.

SECTION III: COOPERATION IN THE MEDITERRANEAN REGION

Section I has analysed the different trends in the Mediterranean gas sector. Following this picture, Section II has focussed on the infrastructure and pricing mechanisms that are currently being used to trade gas in the region. The following section explores the different political and institutional settings that aim at coordinating cooperation within the Mediterranean region.

The asymmetries at all levels existing in the Mediterranean have made cooperation a central goal for all players in the region. Different actors hold different interests. To explore these grounds this report proceeds by looking at:

- The European Union's energy policy, including its goals, principles and regulatory institutions
- The possibilities of expanding Europe's energy policy framework in the Mediterranean through both the European Energy Community and the Energy Charter Treaty

It is important to note that the gas sector has experienced limited cooperation. Most of the attempts to coordinate efforts over the energy sector have taken place in electricity rather than in gas.

Additionally, there is no specific framework for cooperation over energy in the Mediterranean region. While the European Energy Community is applied mostly to countries focusing on access to the European Union, the Energy Charter Treaty mainly focuses on investment protection and does not include Mediterranean countries as full members. Despite the lack of common institutions, both frameworks together with the now mature EU energy policy provide useful guidelines to think about the possibilities of cooperation over gas in the Mediterranean region.

COOPERATION WITHIN EUROPE: THE INTERNAL ENERGY MARKET

The core of cooperation in the Mediterranean region takes place in the Northern part of the region. Europe has achieved the greatest political and economical integration, not only in the region but also in the broader global context. The European Union consists of a common market that is currently being extended to the energy sector, and it is also the only currency area in the world where Member States share a single monetary policy. The question to be made regarding the Mediterranean region and gas cooperation is to what extent the developments in

the European energy sector are likely to influence the broader Mediterranean region. Energy has been at the centre of the different external policies of the European Union, and attempts to export this regulation have been made (particularly with the European Energy Community). To respond to this question, this reports seeks to examine the European policy on energy to review the attempts and possibilities of building broader cooperation in the Mediterranean region over this framework.

EUROPEAN ENERGY POLICY: PRINCIPLES, TARGETS AND MECHANISMS.

The 20/20/20 energy roadmap is the core of the European energy policy programme. It is structured around three clear principles:

- Affordability of energy prices and job creation through the implementation of competition in the energy sector.
- Security of supply: The assurance of a continuous a reliable use of energy together with the need of diversification (both of energy sources and suppliers).
- Sustainability: The commitment to limiting the impact of energy policies on climate change, the reduction of emissions and the implementation of energy savings by achieving energy efficiency goals.

In order to achieve these principles, the EU Commission has set a 20/20/20 strategy aimed at achieving three specific targets:

- 20% of RES in the overall European energy mix.
- 20% of RES in the overall European energy mix
- 20% emissions reduction.

These policy targets are pursued according to three different mechanisms:

The first and most important is the EU Single Market. This is the cornerstone of Europe's energy policy and the block upon which the other two mechanisms (the implementation of renewables and efficiency) rely on. It is also a project that has great potential for export in the Mediterranean region as it seeks to assure a stable regulatory network together with competition in the energy sector.

The internal energy market has seen three directives between 1997 and 2007, and it is built around the aim of promoting competition in a previously monopoly structured sector. It seeks to allow Third Party Access (TPA), which assures that transmission networks can be accessed not only by owners but also by other utilities under a regime of competition.

The Third Legislative Package (2007) set up strong independent national regulators to look over the implementation process of the internal energy market. These regulators are legally and functionally independent. They have resources of their own and they have power to issue binding regulation and to impose penalties. In addition to national regulators, the Third Legislative Package created EU-level regulators to monitor and coordinate the transformation of the EU energy sector. These are ACER, which is the general energy regulator, and ENTSOG, which specifically targets gas regulation.

The second mechanism to implement Europe's goals on energy policy is the support of RES. The directive was published in 2009 and provides a common framework for promotion of RES, establishing:

- An EU-level directive for promoting RES
- Legally binding targets for each Member State: each country has a target based on their starting point.
- National RES action plans for each Member State
- Guarantee of access, integration and operation of RES in the electricity grids.
- Guarantees of origin.
- Cooperation mechanisms.

Finally, the last mechanism of the EU energy policy is energy efficiency. One of the main drivers of energy policy is energy security. Reducing consumption reduces dependency on exporting countries. To that end, the European Union adopted an energy efficiency directive (2012) that includes:

- Energy performance of buildings.
- Eco-design and eco-labelling regulation, which sets minimum and maximum production rates and is expected to generate important savings. The US, China and Saudi Arabia, among others, have adopted this legislation.

THE RELEVANCE OF THE EU INTERNAL ENERGY MARKET IN THE MEDITERRANEAN

The creation of a European internal energy market has meant the harmonisation of 27 previously isolated national energy policies. This by itself is an experience from which much can be learned regarding the creation of a common framework for gas (and electricity) in the Mediterranean region. The EU experience has provided a threefold framework:

- A regulatory framework including directives and common EU legislation for the implementation of a common energy market
- An economic reform towards the implementation of a market-based logic
- An institutional framework including the creation of various energy regulators (National Regulatory Agencies [NRAs], CEER, ACER, ENTSOE and ENTSOG)

Overall, the implementation of a common EU energy policy has allowed the promotion of competition in a sector previously dominated by national monopolies. The creation of a competitive internal market has required the use of regulation in an area where monopolies previously determined the configuration of the sector. Regulation is therefore the inverse of competition law, and regulators are expected to monitor the EU energy market but also to take action when competition law is breached. As the EU internal market has brought together national networks, regulators have dealt with cross-border issues too. For this

they started the Madrid and Florence forums, which brought together private actors with regulators under the presence of the EU Commission.

Regarding the Mediterranean, Europe's achievements towards a common energy market lay the groundwork for the possibility of arranging a common framework for the whole region. This would allow a higher level of coordination and more stable legal codes together with more competition to attract foreign direct investment to the region. This sort of coordination is already working for electricity with common regional regulators (e.g., Med-TSO and Med-Reg), but it is still lacking for gas.

The reasons for this asymmetry between gas and electricity cooperation have to do with two matters:

- First, the electricity sector has unique characteristics that make cooperation a higher priority than in the gas sector. On one side, electricity cannot be stored. This means that in order to achieve better transmission balances, countries can greatly benefit from integrating their transmission networks with other countries. On the other hand, higher rates of RES penetration also benefit from cross-border connection. As opposed to gas, the characteristics of electricity call for interconnections and cooperation between national networks.
- Second, the European Union has more leveraging power with electricity than with gas. This means that the European Union can push for higher cooperation over electricity than in gas. The North Mediterranean has a well-developed electricity network from which the rest of the Mediterranean can benefit by exporting electricity and integrating into the grid. However, the case is different with gas as Europe has less to offer in terms of resources. Most of the reserves are located in the South Mediterranean, leaving less room for the European Union to push for cooperation over gas.

The relevance of the EU support of RES and efficiency in the Mediterranean

European policies in support of RES and energy efficiency are not directly linked to gas. However, these two goals have some common ground with gas, especially in the Mediterranean region. The support of RES and efficiency has provided several advantages for developing a more efficient trade in the region:

- First, RES and efficiency are the only two instruments for non-fossil fuel producers to benefit from autonomous energy sources. As Section I of this report states, energy dependency is uneven in the Mediterranean, and it is especially high for those countries that do not have fossil fuel reserves. Both RES and energy efficiency are two important tools to implement energy security policies. For example, some countries have turned to RES following the disruptions in Egyptian gas delivery.
- Second, RES and energy efficiency policies are easier to finance as there are international institutions providing investment for these projects. RES is not the cheapest source when compared to coal; however, as investment for RES projects is easier to access under climate change concerns,

implementation of RES technologies is a feasible energy security target in the Mediterranean region.

By changing to RES and energy efficiency, countries subsidising their gas consumption can de-couple electricity production from gas. Subsidies create inefficient industries, so switching to RES and lowering consumption through energy efficiency can free gas volumes for exports. This not only allows higher revenues for exporting countries but also ensures security of supply for importing countries.

Cooperation on gas in the Mediterranean can only be achieved by means of cooperation in the broader energy sector, especially when it comes to electricity. For this purpose, there are already projects for creating common regulatory environments in the Mediterranean (Med-TSO and Med-Reg) as well as industrial initiatives to implement RES and energy efficiency. Examples of the latter are Dii and Medgrid. Additionally the European Bank for Reconstruction provides investment to finance such projects under the rationale that a more integrated Mediterranean electricity sector is likely to limit the impact of climate change policies.

EXPANDING COOPERATION TO THE MEDITERRANEAN REGION

The economic, regulatory and institutional framework resulting from the making of a common EU policy is the most complete framework of cooperation around energy in the Mediterranean region. To look at the possibilities of expanding these cooperation mechanisms over the Mediterranean, this section looks at institutional arrangements that have been used in the region starting with the initial policies of the 1990s, followed by both the Energy Charter Treaty and the European Energy Community initiatives.

Cooperation over energy has been present in different European policies since 1995, beginning with the case of the Barcelona Process in 1995, the European Neighbourhood Policy in 2003 and the Union for the Mediterranean in 2011. Around these frameworks designed for political reform on the basis of bilateral agreements, regional initiatives specifically targeting energy were created (i.e., Med-Reg and Med-TSO, both targeting the electricity sector).

There are two difficulties these institutional frameworks have faced for creating a common regulatory environment for energy in the Mediterranean region:

- First, it was not until after 2010 that the European Union managed to create a solid regulatory project to implement its own internal energy market. Cooperation in the region prior to 2010 would have likely faced a lack of cohesion. New cooperation attempts should be explored based on the recent developments in EU energy policy, which have taken place since 2009 and the acceptance of the Third Legislative Package for the energy sector.

- Second, although these agreements touched on energy, they did not specifically target this sector. Hence, cooperation on energy in the Mediterranean needs energy-focused agreements.

To examine a more energy-based framework for cooperation in the region, this report continues by examining two projects: the Energy Charter Treaty and the European Energy Community. Both are European initiatives, each with a different scope. While the Energy Charter Treaty looks at creating a framework for protecting investment in energy projects, the European Energy Community looks at exporting the EU *acquis communautaire* to countries waiting for access to the European Union. Neither of these frameworks is completely appropriate for the Mediterranean region; however, both of **these projects provide key insights about how cooperation can evolve in the region.**

THE EUROPEAN ENERGY COMMUNITY

The European Energy Community was created in 2005 for the previously unified Soviet system with the goal of exporting legislation. As this project was initially envisioned for the Eastern side of Europe, it could therefore pose a problem in application to the Mediterranean. The objectives of the project are:

- Creation of a market framework to attract investment.
- Facilitation of cross border supply.
- Integrating East European markets into the EU.
- Ensuring the expansion of EU energy policy goals into non-EU countries: market competition, sustainability and security.

To pursue these goals, the EU Energy Community can suspend contractual parties as members of the Community in cases where rules are breached. The enforcement is not as binding as the European Court of Justice; however, there is some degree of soft law that can be applied. The treaty establishes strong binding measures that aim to:

- Partially implement the internal energy market *acquis communautaire*.
- Partially implement the institutional framework supporting the market.

The governance structure of the European Energy Community is made up of the Ministerial Council (a permanent high-level group), a regulatory board, a secretariat and different fora to discuss the various energy sections (i.e., electricity, gas, and social, political and economic issues).

Can the aims and structure of the European Energy Community Treaty be workable for the Mediterranean region?

The European Energy Community faces two difficulties in order to expand over the Mediterranean region:

- First, countries under the Treaty are already looking for accession in the European Union, meaning that they are already implementing a large portion of the *acquis communautaire* in addition to the specific legislation

on energy. However, this is not the case for non-European countries in the Mediterranean region.

- Second, countries in the Mediterranean region are more heterogeneous than those signing the Treaty. In order to expand a common framework for energy, a partnership beyond the limits of the European Union would have to be developed to factor in these differences.

Despite the difficulties for extending the European Energy Community to the Mediterranean, there is already some action being taken:

- Support of programmes to reform the energy sector in Mediterranean countries: This is usually done over budget support programmes that are signed between the EU Commission and partner countries. This is a way of monitoring and supporting reforms and includes projects being developed in Morocco, Tunisia and Jordan.
- Support of investment projects: The Neighbourhood Investment Facility facilitates grants for investment when backed by the European Commission. Projects in this direction have been developed in Egypt (for wind farms) and Morocco (for concentrated solar power).
- Regional integration: The Treaty has supported the creation of both Med-Reg and Med-TSO for the integration of electricity markets in the Mediterranean region.
- Industrial projects supported by the EU Commission, including Desertec and Dii, both of which target electricity.

Towards a Mediterranean Energy Community

A regional partnership for the region would be focused on several issues in line with some of the transformations that have taken place in the European Union:

- Electricity market integration
- Renewable energy market development
- Wider market reforms, including transition from monopolies to competition
- Investment protection guarantees and dispute resolution mechanisms
- Support of reforms for trade liberalisation
- Implementation of transparency, monitoring and non-discrimination mechanisms

Regarding the scope of the agreements, there are two possibilities to be considered. The first consists of bilateral agreements seeking conversion with the EU regulatory system. This includes the support of mutual action plans and agendas for specific partner countries so that reforms are implemented on the basis of cohesion and homogenisation. An example of this procedure is the Energy Charter Treaty (which is examined in the next section) and free-trade agreements for the region.

The second approach to a Mediterranean Energy agreement would be a multilateral one, which implies a more complex framework and lighter reforms (as

more countries are involved in agreements, the less important reforms can come to be).

THE ENERGY CHARTER TREATY

The second treaty that can support cooperation over gas in the Mediterranean is the Energy Charter Treaty (ECT). This is an international agreement aimed at establishing a multilateral framework for cross-border cooperation in the energy sector. It covers all industry activities including trade, transit and investment in energy efficiency, and it is legally binding and includes dispute resolution mechanisms. Initiated by Europe in 1991, the Treaty was signed by fifty-one countries together with the European Union in 1994. In 1998, some countries failed to ratify the agreement (such as Russia and Norway) but remained observers of the agreement.

Just as with the European Energy Community, the ECT was initiated by the European Union to integrate the energy sectors of the post-Soviet space and Eastern Europe after 1989. Its role expanded from these original tasks as the Treaty became a framework to promote principles of openness of global energy markets and non-discrimination in order to stimulate foreign direct investment and global cross-border trade.

The ECT is a Euro-Asian association that has expanded beyond its initial reach. Countries in the Mediterranean that already take part of it as observers are Morocco, Algeria, Egypt and Turkey in addition to countries from the North Mediterranean basin. The ECT:

- Recognises sovereignty of countries over energy
- Does not prescribe areas that should be dedicated to resource exploitation
- Does not impose taxing regimes
- Applies a non-discrimination principle for energy transit
- Applies investment protection regimes

The Treaty faces two main difficulties in the Mediterranean: First, there are few Mediterranean countries that observe the Treaty, and none are full members. Second, the ECT seeks to protect investment in the region but fails to promote more ambitious regulation linked to the framework Europe developed for its energy sector.

GEOPOLITICS OF GAS IN THE MEDITERRANEAN

Overall, the possibility of cooperation between Europe and the wider Mediterranean region on the field of gas is a complex one. Most of the cooperation in the region has taken place in electricity rather than in the gas sector. As this section mentions above, Europe has more leveraging power in the area of

electricity, and it does not hold any resources of its own to push for specific regional agreements.

The European strategy to manage cooperation in the energy sector has been primarily centred on economic interests. **The creation of an internal energy market is expected to deliver goals on energy security**, meaning that the targets for achieving specific guarantees for supply are expected to be built over a market-based logic rather than on the basis of institutional and political cooperation. Europe's strategy is to make the internal market its primary instrument in foreign policy, including concerning gas in the Mediterranean.

Rather than focusing on cooperation, the majority of the discussion on Mediterranean gas is currently looking at the types of contracts, pricing mechanisms and price levels that should be adopted in order to continue sustainable agreements. Cooperation between Europe and the Mediterranean region is difficult primarily due to the heterogeneity of the region. Furthermore, the recent Arab Springs have not contributed to easing any tensions.

The geopolitical conclusion for Europe is that cooperation over gas can be more easily achieved with single producers rather than with a multiplicity of them. Case in point: While the Mediterranean region has a more diversified agenda with several countries taking part in discussions, Russia is a single actor, thereby making agreements much less complex. Southern European countries are particularly concerned with the exports from Algeria, while the rest of Europe relies on different exporters, mainly Norway and Russia. It appears that cooperation over gas might be developing more quickly toward the east rather than toward the Mediterranean. Little cooperation has occurred in the Mediterranean region thus far, and a large part of Europe's efforts to create a foreign policy have progressed toward the east (i.e., Russia and the post-Soviet space) rather than toward the south.

While Central and Eastern Europe depend on Russia for their gas supply, most of Southern Europe depends on the Mediterranean for theirs. It is therefore in the interest of this region to create feasible agreements between Mediterranean countries to continue and refine cooperation over gas. Although it will be a more complex process than working with a single actor, it is far from an impossible task and can be constructed using the already existing treaties as a starting point.

CONCLUSIONS

The possibilities that lay ahead for cooperation in the gas industry in the Mediterranean region are complex and depend on the different asymmetries that characterise the region. The imbalances that exist at all levels and that contribute to defining a heterogeneous region limit cooperation to specific areas and among specific players. The most ambitious plans for developing cooperation have been developed by the European Union; however, they have been the most general projects and therefore have been the least effective ones. Both the Energy Community Treaty and the Energy Charter Treaty have found limited success when being applied to the wider Mediterranean region.

Heterogeneity in the Mediterranean is primarily a result of asymmetric growth trends, in terms of both economics and population. Europe faces low growth expectations for the next decades while the rest of the Mediterranean—particularly the Southern basin—enjoys higher growth expectations. The implication for gas will be uneven consumption in the region, which will move a notable share of the expected increase in consumption from the North Mediterranean to the South.

In order to consider how cooperation will be built in the region, it is crucial to understand this re-distribution of gas consumption. Most of the transformation in the gas sector in the Mediterranean will come from the specific economic schemes that will be used for these reconfigurations. There are two trends to take into account in this respect, which will be key in examining the expected transformation in the region:

- First, the European internal energy market is currently engaged in a debate around the extent to which oil-linked prices will move to gas-to-gas competition. A shift to the latter will imply a switch to a market-based logic for gas that could well extend to the Mediterranean region. This in itself points to a huge transformation in the gas industry that could be beyond the scope of any cooperation schemes. The result of a gas-to-gas competition scheme implies that the gas business model for the region would completely change and would begin to include higher volatility of prices in addition to the signalling the end of bilateral agreements (which have been based more on politics and economics). A move toward a gas market in the Mediterranean would mean, to some degree, the depoliticisation of gas trade in the region.
- Second, the greatest increase in gas consumption will come from South Mediterranean countries. As the price mechanisms used for this consumption are neither oil-linked prices nor gas-to-gas competition but rather regulated prices within each producing country, there are different problems here. This gas consumption works under subsidised price schemes that provide lower prices for domestically consumed gas. The problems this generates have to do with low-efficiency local industries, a significant amount of pollution, and few incentives for foreign investment. Overall, cooperation will be possible in those countries within the South Mediterranean where Europe is able to aid

in reducing gas consumption. The main tool of cooperation in these cases is the financing of RES projects. The possibility of doing so will allow producing countries to free more production for exports. It is both an industrial policy and a policy for securing supplies that will motivate EU cooperation in the region in terms of implementing RES.

Cooperation in the Mediterranean can take the form of institutional frameworks for exports, as well as implementing regulatory mechanisms based to some degree on the experience of European energy policy. While debates around pricing mechanisms tend to involve fewer parties, broader political frameworks tend to add complexity to agreements. Both the European Energy Community and the Energy Charter Treaty demonstrate the possibilities of cooperation in addition to the limits of these projects. The main difficulty for extending cooperation will be determining how to bring together the region's heterogeneity.

Overall, the greatest changes in the region are expected to result from the renegotiation of gas contracts and pricing mechanisms for gas. Regarding institutional frameworks, the fate of gas remains tied to that of electricity and RES promotion—two areas in which the European Union enjoys more leveraging power. It is within these dynamics that the European Union can bring together cooperation over gas in the Mediterranean region.

APPENDIX I: NATURAL GAS PRICING MECHANISMS

Three pricing mechanisms are currently being used in the Mediterranean region:

- Oil-linked escalation,
- Gas-to-gas competition.
- Regulate prices.

OIL-LINKED PRICE ESCALATION

- Gas prices are linked to oil prices
- This provides a stable framework to protect against volatility, thereby facilitating investment
- As prices do not adjust easily to supply and demand, gas can become uncompetitive

Oil-linked contracts typically tie gas prices to oil prices. The formula was originally conceived for creating a price for gas when markets for gas were not liquid enough. By tying the price of gas to oil, gas prices are set according to a market that is liquid enough.

The formula for oil-linked prices follows the prices of oil and can come to include other variables such as prices for electricity and coal. Contracts are usually signed for long periods of time, which go up to 20 and 25 years (although current trends point to shorter 10- to 15-year contracts being signed). This provides a stable framework for planning for both investment and profitability. The main advantage of this mechanism is that it creates a stable framework that maintains volatility at low levels, which allows for more easily planning large infrastructure projects.

While linking gas prices to oil maintains some stability in prices, it detaches these contracts from competition with other energy sources (such as RES and coal). Therefore, oil-linked prices have the risk of turning uncompetitive, which is currently the case in Europe—oil-linked prices are well above gas-to-gas competition prices. Stability in these cases comes at the price of removing the link of gas prices from supply and demand conditions. In a business environment where efficiency is pursued, this can become a threat for industries relying on competitive gas prices.

GAS-TO-GAS COMPETITION

- Based on supply and demand
- Structured around gas exchanges ('gas hubs') both physical and financial
- More efficient allocation of resources but higher price volatility

While oil-linked gas is traded over bilateral contracts, gas-to-gas competition relies on a totally different industry model to set prices. Gas markets are exchanges in which the price of gas is set according to supply and demand conditions over different periods (daily, weekly, monthly, quarterly, seasonally, annually, or longer). Trading takes place in physical hubs (e.g., Henry Hub in the United States or NBP in the United Kingdom), which are supported by futures market (e.g., NYMEX or ICE) and online commodity exchanges (e.g., ICE or OCM). This means that the physical exchange of gas is operated in parallel to different financial levels that allow for setting the price of gas. As opposed to oil-linked prices, gas-to-gas competition sets the price according to supply and demand conditions based on the different physical and financial levels that interact in markets. While oil-linked contracts provide stability, gas-to-gas competition provides efficient prices to allocate resources based on supply and demand conditions.

Market prices for gas are more efficient, but for the same reason, they are more volatile. Prices vary in order to adapt to different conditions (e.g., weather variations, disruptions, new reserves being found, new projects coming online, etc.), rendering prices more volatile, which is the biggest concern linked to gas markets.²⁵

The main requirement to implement gas-to-gas markets is to have the proper infrastructure in place along with sufficient supply. The former provides arbitrage opportunities between prices in different points; the latter creates the liquidity levels needed to avoid market squeezes and manipulation. Initially it was the United Kingdom and the United States that developed reliable gas markets. However, there is now an ongoing debate about whether the EU internal gas market is mature enough to turn from oil-linked contracts to gas-to-gas competition.²⁶

²⁵ Bruce Henning, Michael Sloan, and Maria de Leon. *Natural Gas and Energy Price Volatility*. Washington, DC: American Gas Foundation, 2003.

²⁶ *The Pricing of Internationally Traded Gas*. Jonathan P. Stern, ed. The Oxford Institute for Energy Studies, 2012.

REGULATED PRICES

- Mainly used by gas producing countries
- Prices are set at specific price levels on the basis of the costs of production
- The use of subsidies lowers the efficiency of subsidized industries and lowers incentives for foreign direct investment

While the two previous pricing mechanisms apply to internationally traded gas, a third formula has been established mainly for domestically consumed gas. Regulated prices are common in countries that subsidise local consumption of gas instead of exporting it. A percentage of the gas they extract is dedicated to domestic consumption while the rest of it is exported. The Middle East, the North African basin and Russia all use this formula to some degree.

Typically, the price of gas is tied to production costs, but it can be set above or below these costs. This price benchmark allows gas to be consumed at a minimum price while still covering production costs. However, sometimes prices can be set below cost production and have exports pay for the difference. In countries using the latter, additional problems have arisen due to the loss of revenues due to the export quantities being diverted for domestic consumption.

APPENDIX II: NATURAL GAS SUPPLIES IN EUROGAS MEMBER COUNTRIES AND THE EU, 2011.

Fig. XXIII: Natural gas supplies in Eurogas member countries and EU, 2011. Source: Eurogas – Statistical Report 2012.

↳ NATURAL GAS SUPPLIES IN EUROGAS MEMBER COUNTRIES AND EU, 2011

TWh	Indigenous Production	Russia	Norway	Algeria	Qatar	Other sources*	Changes in stocks**	Other balances	Total Net Supplies	% Change 2011/2010
AUSTRIA	18.8	59.8	14.5	0.0	0.0	29.4	-22.1	-4.9	95.6	-6%
BELGIUM	0.0	3.4	82.4	0.0	30.8	66.9	-0.2	0.0	183.3	-15%
BULGARIA	4.2	29.3	0.0	0.0	0.0	0.0	0.2	-1.4	32.3	11%
CZECH REPUBLIC	1.4	63.3	12.2	0.0	0.0	23.2	-10.0	-4.6	85.5	-10%
DENMARK	81.7	0.0	0.0	0.0	0.0	-31.9	-1.8	-7.4	40.6	-18%
ESTONIA	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	6.5	-10%
FINLAND	0.0	43.4	0.0	0.0	0.0	0.0	0.0	0.0	43.4	-12%
FRANCE	6.5	72.6	182.9	66.7	37.4	135.0	-22.4	-1.5	477.2	-13%
GERMANY	137.3	336.9	303.1	0.0	0.0	110.2	-22.8	0.0	864.7	-11%
GREECE	0.0	30.3	0.0	8.7	1.9	10.5	-0.1	-0.1	51.2	23%
HUNGARY	32.5	72.6	0.0	0.0	0.0	5.6	14.0	-0.6	124.2	-6%
IRELAND	2.1	0.0	0.0	0.0	0.0	51.1	0.0	0.0	53.2	-12%
ITALY	88.5	247.1	38.6	242.8	65.7	149.0	-8.2	0.9	824.4	-6%
LATVIA	0.0	16.2	0.0	0.0	0.0	0.0	0.0	0.0	16.2	-13%
LITHUANIA	0.0	57.0	0.0	0.0	0.0	-21.9	-0.1	0.0	35.0	9%
LUXEMBOURG	0.0	3.2	6.9	0.0	0.0	3.2	0.0	0.0	13.4	-13%
NETHERLANDS	746.7	44.0	129.0	0.9	3.7	-481.6	0.0	15.8	458.3	-10%
POLAND	47.6	102.7	0.0	0.0	0.0	17.4	-8.4	-1.4	157.9	2%
PORTUGAL	0.0	0.0	0.0	21.6	0.0	36.9	0.0	0.0	58.5	0%
ROMANIA	117.0	34.2	0.0	0.0	0.0	0.0	-0.4	0.0	150.8	3%
SLOVAKIA	1.0	62.4	0.0	0.0	0.0	-5.7	0.2	-0.1	57.7	-3%
SLOVENIA	0.0	5.3	0.0	2.6	0.0	0.9	-0.1	0.1	8.8	-16%
SPAIN	1.9	0.0	13.9	147.4	51.5	160.4	-4.5	1.6	372.2	-7%
SWEDEN	0.0	0.0	0.0	0.0	0.0	14.9	0.0	0.0	14.9	-20%
UNITED KINGDOM	526.7	0.0	244.2	2.6	230.6	-76.7	-22.6	-0.1	904.7	-17%
EU	1 813.9	1 290.1	1 027.7	493.3	421.6	196.8	-109.2	-3.7	5 130.5	-10%
% Change 2011/2010	-11%	2%	-3%	-8%	21%	-45%	-199%	-78%	-10%	-10%
SWITZERLAND	0.0	7.6	7.3	0.0	0.0	19.6	0.0	0.0	34.5	-10%
TURKEY	8.1	270.3	0.0	44.2	0.0	144.7	0.0	2.4	469.7	18%

Units: terawatt hour (gross calorific value).

Note: Figures are best estimates available at the time of publication.

* Including net exports.

** (-) Injection / (+) Withdrawal.

BIBLIOGRAPHY

- Akcollu, Y. (2006). Major Challenges to the Liberalisation of the Turkish Natural Gas Market. Oxford Institute for Energy Studies.
- Alami, R. (2005a). Financial Aspects of Arab Power Development (pp. 1-84). Oxford Institute for Energy Studies.
- Alami, R. (2005b). Changing Financial Structures in the Arab World: Some Implications for Oil and Gas. Oxford Institute for Energy Studies.
- CPI Workshop Report. (2012). European Electricity Infrastructure: Planning, Regulation, and Financing. Florence School of Regulation.
- Darbouche, H. (2008). Decoding Algeria's ENP Policy: Differentiation by Other Means? *Mediterranean Politics*, 13(3), 371-389.
- Darbouche, H. (2012). North African Gas Markets in a Changing Political Context. Presented at the MENA Energy Conference 2012, Chatham House.
- Darbouche, H., El-Katiri, L., & Fattouh, B. (2012). East Mediterranean Gas: what kind of a game-changer? Oxford Institute for Energy Studies.
- Darbouche, H. (2007a). Russian-Algerian cooperation and the "gas OPEC": What's in the pipeline? Centre for European Policy Studies. Centre for European Policy Studies.
- Darbouche, H. (2007b). What will it take to resolve the dispute in Western Sahara?. Centre for European Policy Studies.
- Darbouche, H. (2011). Algeria's shifting gas export strategy: Between policy and market constraints. Oxford Institute for Energy Studies.
- Darbouche, H. (2011). Algeria's shifting gas export strategy: Between policy and market constraints. Oxford Institute for Energy Studies.
- European Commission. (2012). Energy Roadmap 2050
- European Commission. (2007). Towards a "Post-Carbon Society":
- European Commission. (2010a). Europe 2020: A European strategy for smart, sustainable and inclusive growth
- European Commission. (2010b). EU energy trends to 2030.
- European Commission. (2012). EU Energy in Figures. Statistical Pocketbook 2012.
- European Council. (2010). Internal security strategy for the European Union: Towards a European security model
- Fattouh, B. (2007). How Secure Are Middle East Oil Supplies?. Oxford Institute for Energy Studies.

- Fattouh, B., & Darbouche, H. (2011). *The Implications of the Arab Uprisings for Oil and Gas Markets*. Oxford Institute for Energy Studies.
- Giamouridis, A. (2012). *The Offshore Discovery in the Republic of Cyprus: Monetisation Prospects and Challenges*. Oxford Institute for Energy Studies.
- Glachant, J. M., & Hallack, M. (2010). *The Gas Transportation Network as a 'Lego' game: How to play with it?* European University Institute. Robert Schuman Centre For Advanced Studies.
- Haase, N. (2008). *European gas market liberalisation: Are regulatory regimes moving towards convergence?* Oxford Institute for Energy Studies.
- Heather, P. (2012). *Continental European Gas Hubs: Are they fit for purpose?*. Oxford Institute for Energy Studies.
- Henderson, J. (2012). *The Potential Impact of North American LNG Exports*. Oxford Institute for Energy Studies.
- Honoré, A. (2010). *European Natural Gas Demand, Supply & Pricing, cycles, seasons and the impact of LNG price arbitrage*. Oxford University Press.
- Honoré, A. (2011). *Economic recession and natural gas demand in Europe: what happened in 2008-2010?* oxfordenergy.org. Oxford Institute for Energy Studies.
- Honoré, A. (2011). *The Spanish Gas Market: Demand Trends Post Recession and Consequences for the Industry*. Oxford Institute for Energy Studies.
- International Crisis Group. (2012). *Aphrodite's Gift: Can Cypriot Gas Power a New Dialogue?* International Crisis Group.
- International Energy Agency. (2007). *Oil Supply Security 2007*.
- International Energy Agency. (2008). *Natural Gas Market Review 2008: Optimising investments and ensuring security in a high-priced environment*.
- International Energy Agency. (2011a). *World Energy Outlook 2011. Are we entering a golden age of gas?* Special Report
- International Energy Agency. (2011b). *Medium-Term Oil and Gas Markets 2011*.
- International Energy Agency. (2012a). *Golden Rules for a Golden Age of Gas: World Energy Outlook Special Report on Unconventional Gas*.
- International Energy Agency. (2012b). *World Energy Outlook 2012*.
- International Energy Agency. (2012c). *Annex of Regulation and Best Practice*.
- International Energy Agency. (2012d). *Gas Pricing and Regulation: China's Challenges and IEA Experience*.
- Konoplyanik, A. A. (2010). *Evolution of Gas Pricing in Continental Europe: Modernisation of Indexation Formulas Versus Gas to gas Competition*. Dundee University. Centre for Energy, Petroleum & Mineral Law & Policy.

- Ledesma, D. (2013). East Africa Gas - Potential for Export. Oxford Institute for Energy Studies.
- Observatoire Méditerranéen de l'Energie (2011), Mediterranean Energy Perspectives 2011
- Popovici, V. (2011, November 27). Europe's new energy frontier. europeanenergyreview.eu. Retrieved November 6, 2012, from <http://www.europeanenergyreview.eu/site/pagina.php?id=3309>
- Skinner, R. (2006). World Energy Trends: Recent Developments and their Implications for Arab Countries. Oxford Institute for Energy Studies.
- Stern, J. (2007). Is There A Rationale for the Continuing Link to Oil Product Prices in Continental European Long-Term Gas Contracts?. Oxford Institute for Energy Studies.
- Stern, J. (2009). Continental European Long-Term Gas Contracts: is a transition away from oil product-linked pricing inevitable and imminent? Oxford Institute for Energy Studies.
- Stern, J. (2012). The Pricing of Internationally Traded Gas. Oxford University Press.
- Stern, J., & Rogers, H. V. (2013). The Transition to Hub-Based Pricing in Continental Europe: A Response to Sergei Komlev of Gazprom Export. Oxford Institute for Energy Studies.
- Union, International Gas. (2010). Natural Gas Unlocking the Low Carbon Future.
- Vos, I. (2012). The Impact of Wind Power on European Natural Gas Markets. The European Wind Industry Magazine.
- Yafimava, K. (2013). The EU Third Package for Gas and the Gas Target Model. Oxford Institute for Energy Studies.

Contact :

Miguel Martinez - miguelescrito@gmail.com
Hannah Murdock - hannah.murdock@sciences-po.org
Floriane Schaeffer - floriane.schaeffer@sciences-po.org

Contact

François POUZERATTE

Associé

francois.pouzeratte@eurogroupeconsulting.fr

Mob. +33 (0)6 16 70 47 83

Jérémie BARON

Manager

francois.pouzeratte@eurogroupeconsulting.fr

Mob. +33 (0)6 16 70 47 83

EUROGROUP CONSULTING FRANCE

Tour Vista

52/54 Quai De Dion Bouton

92806 Puteaux Cedex

Tel. + 33 (0)1 49 07 57 00

Fax + 33 (0)1 49 07 57 57

E-mail info@eurogroupeconsulting.fr

www.eurogroupeconsulting.fr