



# Development of Natural Gas Resources in the Eastern Mediterranean Region during the First Quarter of the Twenty-first Century

## A Study in Political Geography



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### ABSTRACT

The recent discoveries of natural gas in the Eastern Mediterranean Area by Egypt and Israel from 2009 to 2022 have had significant geopolitical, financial, economic, and strategic implications. These discoveries have bolstered the economic status of both nations, granting them a regional role in the natural gas market and increasing their influence, potentially altering the balance of power among other Eastern Area countries. Moreover, these developments have reshaped the dynamics of conflicts in the region, including disputes between Lebanon and Israel, and Turkey and Cyprus over maritime boundaries, as well as the ongoing Israeli-Palestinian conflict. The political, economic, and military rapprochement between Israel, Cyprus, and Greece, exemplified by the 2016 summit in Nicosia, sought to establish a new geopolitical entity in the Eastern Mediterranean and strengthen the naval presence of these three nations, alongside Russia and the U.S., both of which maintain fleets in the region. This situation necessitates that Egypt and Israel bolster their naval capabilities to safeguard energy infrastructure against potential threats. Each nation strives to secure its maritime energy interests, define its exclusive economic zones, and increase the number of warships and helicopters to ensure energy security, which has become a key element in the national security equation for the region.

### Introduction

Energy resources are the lifeblood of economic activities, particularly in industrialized nations, due to their substantial impact on

economic, political, and military dimensions. The Eastern Mediterranean holds significant geopolitical importance that has grown with the discovery of vast energy reserves in its deep waters over the past years. However, the

complex nature of the conflicts interactions in this region could make these discoveries a decisive turning point that determines the future of the countries in the area and reshapes the map of alliances and enmities. It could also open the door for cooperation and integration among the area countries, potentially transforming them into a key player in the global energy market. Nonetheless, technical issues related to the exploitation of these resources, methods of marketing them, as well as border disputes and the aspirations for leadership by some countries, remain obstacles to the potential for regional cooperation in the field. In fact, these issues hint at the possibility of reigniting conflict in this region.

Political risks, especially regional conflicts and disputes over water rights and drilling, have become increasingly important for the future development of natural gas in the Eastern Mediterranean with the discovery of more gas fields. Beyond just raising issues for gas exploration, regional conflicts could pose greater challenges to industry efforts to establish export routes to access international markets and promote natural gas development in the region while confronting geopolitical challenges. Therefore, government officials from Egypt, Cyprus, Greece, Israel, Italy, Jordan, and the Palestinian Authority established the Eastern Mediterranean Gas Forum in January 2019. The Cairo-based forum aims to support member efforts to maximize the benefits of their natural resources and regional energy infrastructure through mutual cooperation.

### Study Significance

The importance of this study revolves around the significance of gas discoveries in the Eastern Mediterranean from a geopolitical and economic perspective, as well as the geostrategic importance of these discoveries.

The Mediterranean Sea plays a crucial role in global energy security, and the importance of the study area lies in its vast reserves of natural gas, as estimated by the U.S. Geological Survey in 2010. The Eastern Mediterranean region has attracted the attention of many countries, making this study significant for analyzing the political

and military escalation in the Eastern Mediterranean area.

### Study Objectives

1. To determine the importance of geopolitical and geo-economic variables on the conflict in the Eastern Mediterranean area.
2. To explore further gas discoveries in the Eastern Mediterranean and their significance in fueling conflicts between the countries in the region.

### Methodology and Approach

The regional approach was applied, where the Eastern Mediterranean is studied as a geographic region with distinctive characteristics. Additionally, the analytical method was used to analyze quantitative data, providing a clear picture of the levels of political power in the region. The quantitative method was also employed to conduct various calculations to measure the elements, variables, and components of the comprehensive political power of a state. Moreover, the cartographic method was used to design and produce maps and graphical representations of the Eastern Mediterranean area by applying modern techniques such as Geographic Information Systems (GIS) to satellite imagery.

### Previous Studies

Several studies have addressed the topic, the most important of which is: the study ([Aish, 2004](#)), which aimed to highlight the concept of Egypt's exclusive economic zone and the marine resources it contains and the relationship of those resources to its international relations. The study ([Maite, 2012](#)) highlighted the features of the distribution of natural gas fields in the area, especially for the countries of Israel, Cyprus, Lebanon, Sorba, and Palestine, and the study ([Bufman, 2014](#)) reviewed the potential of natural gas and its impact on the Israeli economy. The study ([Bakir, 2018](#)) focused on the conflicts over gas in the eastern Mediterranean area and the dangers of its ignition, and showed A study ([Abdo, 2019](#)) features and the future of the natural gas map in the eastern Mediterranean region, and a study ([Owaida, 2019](#)) highlighted

the importance of natural gas discoveries in the eastern Mediterranean and the possibilities for exploitation, while shedding light on Israeli influence and its relationship with the discovered gas. The study (Abdullah, 2021) explained the review of the legal system in demarcating the exclusive economic zone of the Eastern Mediterranean countries in light of the United Nations Convention on the Law of the Sea, and the study (Abdel Karim, 2021) showed the exclusive economic zones, their resources, and the geographical factors affecting those resources in the eastern Mediterranean.

### **Maritime Political Influence of Eastern Mediterranean Countries**

The Exclusive Economic Zone (EEZ), as defined in the 1982 United Nations Convention on the Law of the Sea, is a sea zone where a sovereign state has exclusive rights concerning the exploration and use of marine resources, including energy production from water and wind. The EEZ is relatively new compared to other maritime zones, as its regulations were legally established by the United Nations Convention. This concept emerged in response to the growing needs of coastal states to exploit the diverse resources of the seas, especially after significant technological advancements in energy exploration and marine fishing. The concept of the EEZ revolves around maximizing control over marine natural resources off the coasts of certain countries to benefit from these riches to the fullest extent possible (Abdullah, 2021, p. 58).

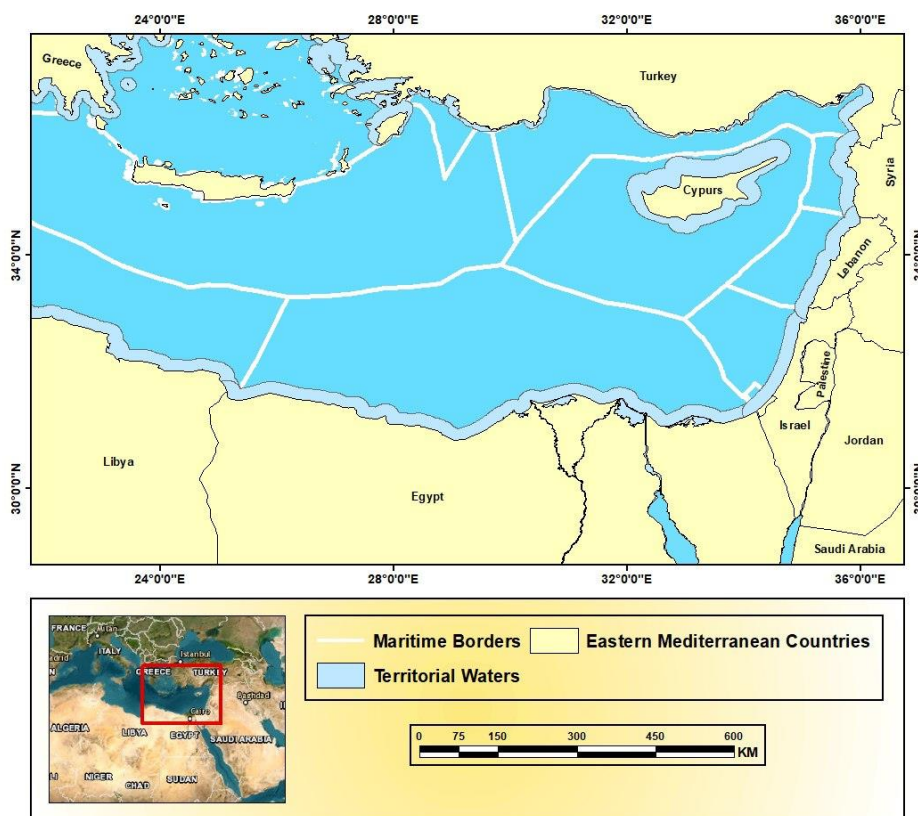
The Convention, in Article 55, Defines the Boundaries of the Exclusive Economic Zone. The EEZ is set to not exceed 200 nautical miles (321 km) measured from the baselines of the coastal state's territorial sea. The convention clarifies that the EEZ lies beyond and adjacent to the territorial sea of the coastal state and is governed by the legal system established in this section. Under this system, the rights and jurisdiction of the coastal state, as well as the rights and freedoms of other states, are subject to the relevant provisions of the convention. It is well understood that the rights granted to the coastal state are extensive. They include not only

the exploration, exploitation, conservation, and management of natural resources in the seabed, subsoil, and water column within the EEZ but also the jurisdiction of the coastal state over the installation and use of artificial islands, installations, and structures, the supervision of marine scientific research, and the protection of the marine environment from pollution. Undoubtedly, legal rules provide coastal states with unprecedented advantages within the EEZ.

If we may say so, the EEZ is a zone with a unique legal character. It is neither territorial waters nor high seas; it serves as a transitional area between seas where coastal states have full sovereignty, limited only by "innocent passage," and high seas, where no state has jurisdiction and where traditional freedoms—navigation, over flight, laying of cables and pipelines—apply to all states. Thus, the EEZ distinguishes between the exploitation of resources and the exercise of communications. It recognizes the economic interests of coastal states while maintaining the principle of freedom of navigation (Nagm, 1982, p. 36).

Coastal states around the world vary greatly in terms of the wealth of economic resources within their maritime zones, as well as in their capacity to exploit these resources. This variation leads to differing impacts on the political and economic power of each maritime state (Aish, 2004, p. 146).

The delineation of the Exclusive Economic Zone (EEZ) does not pose any geographical or legal issues, as the beginning and end of this zone are clearly defined (Figure 1). Therefore, problems do not arise in open seas, where coastal states facing each other have the right to claim the maximum geographical extent of the EEZ. However, the issue here is that not all states have the same geographical status. Some countries have a geographically advantageous position, while others are geographically disadvantaged. There is also a stark contrast between different states in terms of the total area of their economic zones. Additionally, there is a problem in defining the EEZs between adjacent or opposite coasts in semi-enclosed seas, such as the Eastern Mediterranean region.



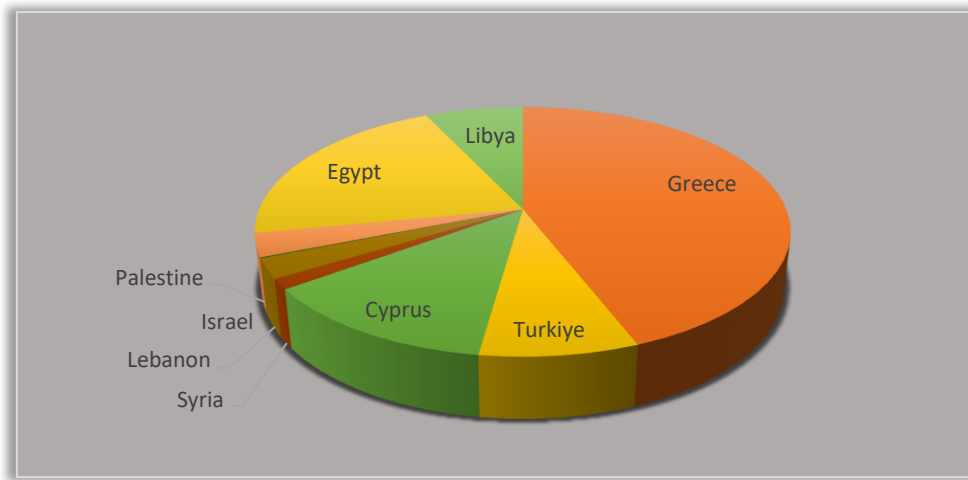
**Source:** Student's work based on [www. Sovereign limits.com](http://www.Sovereignlimits.com), [marineregions.org](http://marineregions.org) using GIS

**Figure 1.** The political maritime influence of the Eastern Mediterranean countries

**Table 1.** Area ratio of the maritime influence of the eastern Mediterranean countries

Country	Area (km <sup>2</sup> )	%
Greece	503121	44.1
Turkey	92799	8.1
Cyprus	144648	12.7
Syria	15396	1.4
Lebanon	29248	2.6
Gaza	1540	0.1
Israel	34571	3.0
Egypt	239536	21.0
Libya	80268	7.0
Total	<b>1141127</b>	100

**Source:** From the student's calculation based on [Figure 1](#) using geographic information systems.



Source: From the student's work based on Table 1.

**Figure 2.** Areas of maritime influence of the countries of the Eastern Mediterranean

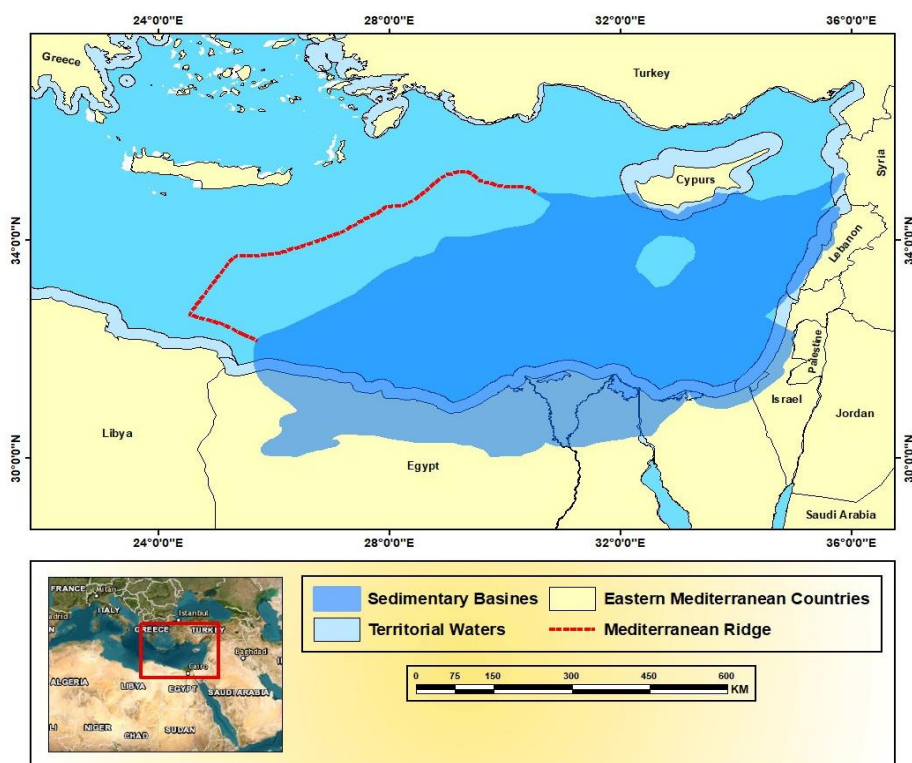
It is evident from the analysis of Figures 1 and 2 and Table 1 Total Area ratio of the maritime influence of the eastern Mediterranean countries 1141127 km<sup>2</sup>, that Greece is the largest country in the Eastern Mediterranean in terms of the area of its Exclusive Economic Zone (EEZ). This is due to its location on two water bodies: the Mediterranean Sea and the Aegean Sea. As a result, its economic zone expands significantly, occupying an area of 503,121 km<sup>2</sup>, which constitutes 44.1% of the total area of the Eastern Mediterranean area. Of this, 232,332 km<sup>2</sup> (47.7%) is from the Mediterranean Sea and 263,251 km<sup>2</sup> (52.3%) is from the Aegean Sea. Egypt ranks second in terms of the area of its maritime economic zone, with an area of 239,536 km<sup>2</sup> (21%), followed by Cyprus with an area of 144,648 km<sup>2</sup> (12.7%). Turkey (92,799 km<sup>2</sup>, 8.1%) and Libya (80,268 km<sup>2</sup>, 7%) share a medium-sized economic area, followed by the other Eastern Mediterranean countries with smaller economic areas: Israel (34,571 km<sup>2</sup>, 3%), Lebanon (29,248 km<sup>2</sup>, 2.6%), Syria (15,396

km<sup>2</sup>, 1.4%), and the Gaza coast (1,540 km<sup>2</sup>, 0.1%) in terms of maritime area.

### Geological Characteristics of the Eastern Mediterranean

Geological surveys of the Eastern Mediterranean region were conducted by the U.S. Geological Survey in 2010. The results indicated that the deposits in the southern section of the Eastern Mediterranean, south of Cyprus to the east and the submerged mountainous edge to the west, contain significant reserves of natural gas (Figure 3). The sedimentary layers in the Eastern Mediterranean represent the primary environment for the formation of natural gas, as they contain porous sedimentary rocks and organic materials that were subjected to tectonic factors, which led to the creation of natural gas traps. The gas is found in areas beneath the seabed, where its importance lies in providing a clear picture of the sedimentary layers from different geological eras. It shows its source and reservoir rocks (Abdel Karim, 2021, p. 208).





**Source:** The student's work based on the USGS 2010 map using geographic information systems

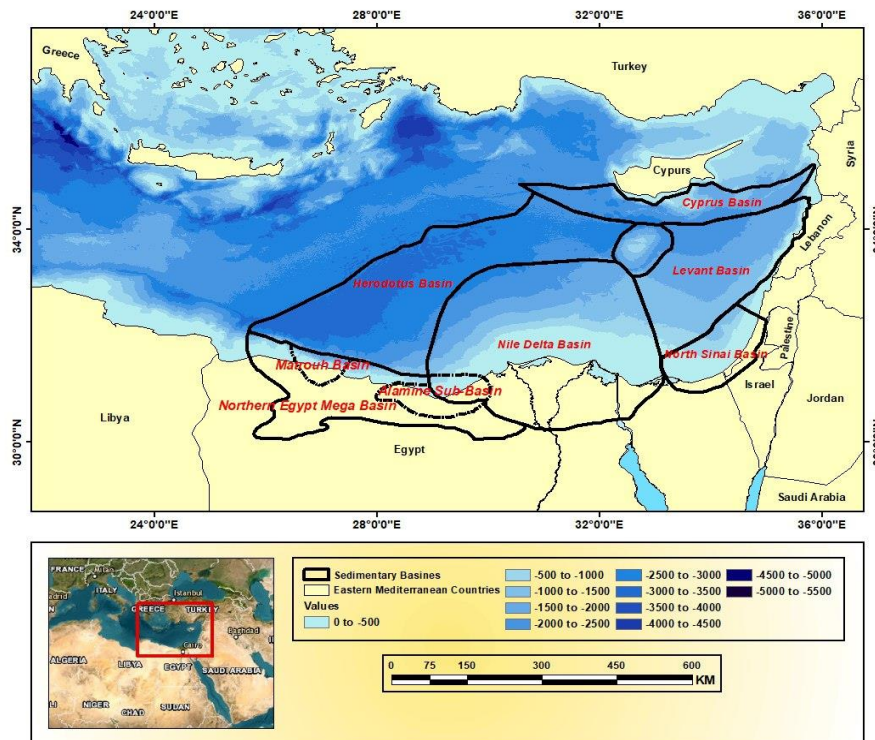
**Figure 3.** The Eastern Mediterranean Gas Range

The southern section of the Eastern Mediterranean is generally covered by a sedimentary area, which includes a land area (108,688.1 km<sup>2</sup>, 22.9%) and a maritime area (365,025.2 km<sup>2</sup>, 77.1%), with a total area of 473,713.3 km<sup>2</sup>. The maritime area represents 41.5% of the Eastern Mediterranean area. Under the 1982 United Nations Convention on the Law of the Sea, coastal states bordering the Eastern Mediterranean area have the right to explore and exploit economic resources such as gas and oil on the continental shelf and within the exclusive economic zone. Some explorations have resulted in the discovery of gas reserves in these areas (Figure 3), leading to an intensification of ongoing conflicts and the creation of new areas

of tension. As a result, the competition among countries in the Eastern Mediterranean region has become explicitly geopolitical.

### Sedimentary Areas

The U.S. geological Survey has divided the sedimentary area of the Eastern Mediterranean into a group of areas (Figure 4), which vary in their shape, area, and gas reserves. In 2003, Egypt reached an agreement with Cyprus, and in 2020 with Greece, to define their political jurisdictions on a map that was deposited with the United Nations, allowing each country to exploit its marine resources without border disputes.



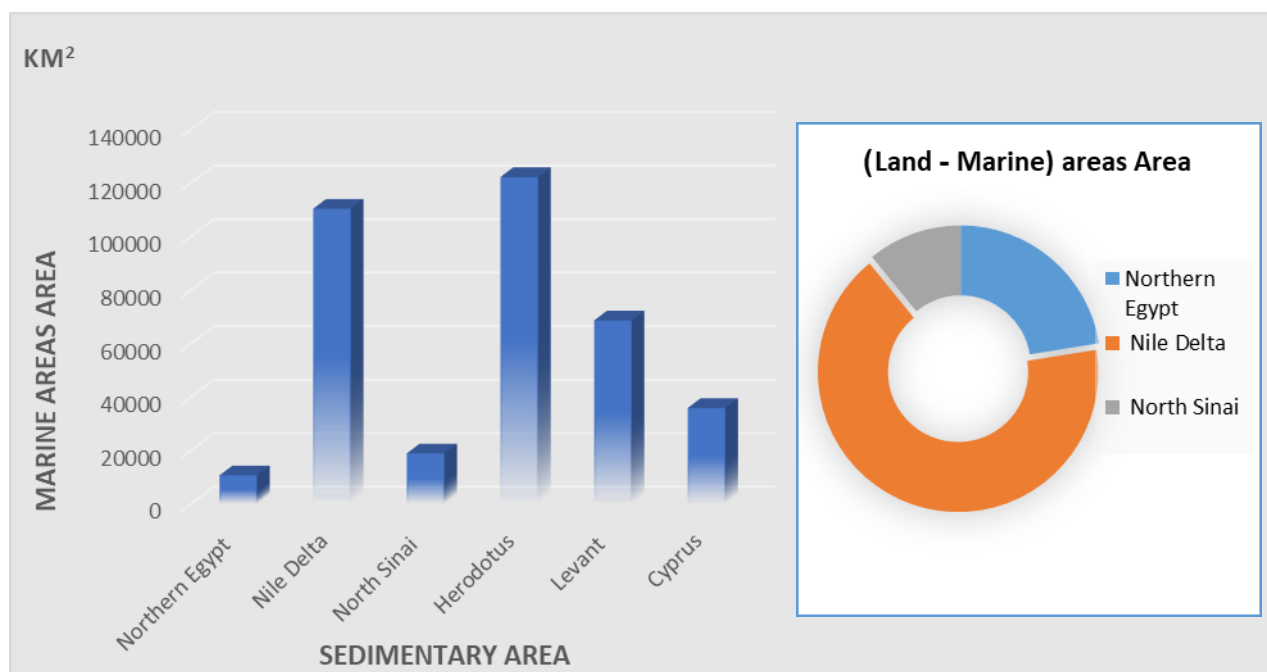
**Source:** The student's work based on the USGS 2010 map using geographic information systems

**Figure 4.** Gas areas of the Eastern Mediterranean countries

**Table 2.** Area (km<sup>2</sup>) and morphological characteristics of the gas areas in the Eastern Mediterranean

Area	land marine km <sup>2</sup>	Marine km <sup>2</sup>	%	Length km	Width km
Northern Egypt	67144	11232.5	16.7	212	498
Nile Delta	156208.5	110178.5	70.5	196.9	372.4
North Saini	25517.6	18771	73.6	79.6	198.8
Herodotus	-	120659.4	100	519.3	325.8
Levant	-	68437.9	100	409.8	181.9
Cyprus	-	35745.9	100	99.8	477.7
Total	-	365025.2	-	-	-

**Source:** From the student's calculation based on Figure 4 using geographic information systems



Source: From the student's work based on Table 2.

**Figure 5.** Area of depositional areas

Based on the analysis of Figures 4 and 5, and Table 2, these areas can be classified into two main types: land-sea areas and exclusive sea Areas. Their characteristics are as follows:

#### **First: Land-Sea Areas**

**These areas are primarily concentrated along the northern coast of Egypt and can be described from west to east as follows:**

##### **1. North Egypt Area**

The North Egypt Area is located in the northern part of the Western Desert and extends from Ras El-Salloum in the west to the Nile Delta Area in the east. It is bordered to the north by the Herodotus Area and has a longitudinal shape along the coast, stretching 212 km, with a maximum width of 498 km. The area encompasses both land and sea and ends at the continental shelf (Figure 4). The total area of the

area is 67,144 km<sup>2</sup>, accounting for 14.2% of the total volume of the sedimentary areas. The land portion constitutes the majority of the area (55,911.5 km<sup>2</sup>, 83.3%), while the sea portion covers 11,232.5 km<sup>2</sup>, or 16.7%. Within it, there are two smaller areas (Table 3). One of them is east of the El Alamein Area, with an area of 16,213.46 km<sup>2</sup>, 30.7% of the area of the main area. It combines land (10,789.36 km<sup>2</sup> - 67.5%) and sea (5424.1 km<sup>2</sup> - 33.5%). Its coastal extension is 34 km and its width is 252 km. The other is western (Matrouh Area), with an area of 6561.3 km<sup>2</sup>, or 12.5% of the main area, and the largest percentage of that area is offshore (3882.9 km<sup>2</sup>), or 59.2%, and its length (28 km) is less than its width (97 km). Gas has not yet been extracted from the continental shelf, but the current exploitation is from land.



**Table 3.** Areal characteristics (km<sup>2</sup>) of the two secondary areas in the North Egypt Area

Area	Total area	Land	%	Marine area	%
El Alamein	16213.46	10601.78	65.4	5611.68	34.6
Matrouh	6561.3	2892.53	44.1	3668.77	55.9

**Source:** From the student's calculation based on [Figure 4](#) using geographic information systems.

## 2. Nile Delta Area

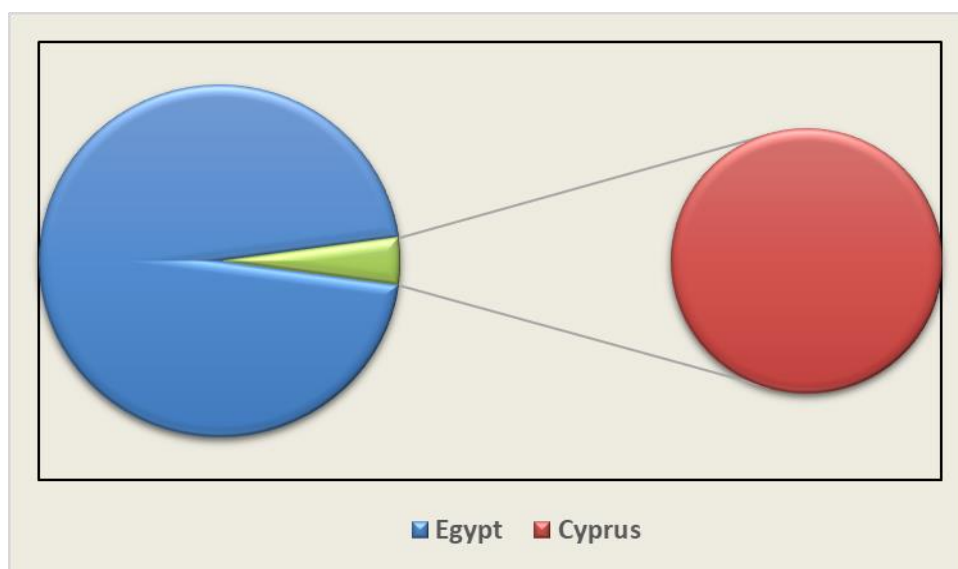
The Nile Delta Area is situated between the North Egypt Area to the west, the North Sinai Area to the east, and the Levantine and Herodotus Areas ([Figure 3](#)). Its total area is 156,208.5 km<sup>2</sup>, comprising both land (46,030 km<sup>2</sup>, 29.5%) and sea (110,178.5 km<sup>2</sup>, 70.5%). The Nile Delta Area accounts for 32.97% of the total area of the sedimentary areas. The maritime

area of the Nile Delta represents 30.2% of the gas-containing marine area in the Eastern Mediterranean. Its longitudinal extent (358.3 km) is close to its latitudinal extent (372.4 km). Of the maritime area, Egypt controls 105,450.5 km<sup>2</sup>, or 95.7%, within the exclusive economic zone ([Table 4](#)), while the remaining area (4,728 km<sup>2</sup>, or 4.3%) falls under Cyprus's political jurisdiction ([Figure 6](#)).

**Table 4.** The area of maritime influence of the states of Egypt and Cyprus in the Nile Delta Area

Land km <sup>2</sup>	Cyprus		Egypt	
	%	area km <sup>2</sup>	%	area km <sup>2</sup>
110187.5	4.29	4728	95.71	105450.5

**Source:** From the student's calculation based on [Figure 3](#) using geographic information systems.



**Source:** From the student's work based on [Table 4](#).

**Figure 6.** Area of maritime influence of the states of Egypt and Cyprus in the Nile Delta Area

It is the largest gas area owned by Egypt, from which the largest quantity of natural gas is extracted. The U.S. Geological Survey issued an

assessment of it in May 2010, estimating that it contains about 6,320 billion cubic meters of technically recoverable, undiscovered natural

gas, as well as 7.6 gigabytes of oil and natural gas liquids. This is far more than Egypt's current confirmed oil and gas reserves, making it the largest resource in the Mediterranean Sea (Source: IEMed Mediterranean Yearbook 2012] (<https://www.iemed.org-IEMed>)

### 3. North Sinai Area

The North Sinai Area is located in the northeastern corner of Egypt. It is bordered to the west by the Nile Delta Area and to the north by the Levantine Area. This area is shared between Egypt, the Gaza Strip, and Israel

(Figure 3). Its total area is 25,517.6 km<sup>2</sup>, and it is a land-sea area, with the majority of its area being maritime (18,771 km<sup>2</sup>, 73.7%). The area accounts for 5.4% of the total sedimentary areas and 5.1% of the gas sedimentary area. The maritime area constitutes about three-quarters of the land area and even more in some countries sharing the area (Table 5). Each country's share of the maritime area varies, with Israel controlling nearly half of the area (49.5%), followed by Egypt with 40%, and the Gaza Strip with 10.5% (Table 6 and Figure 7).

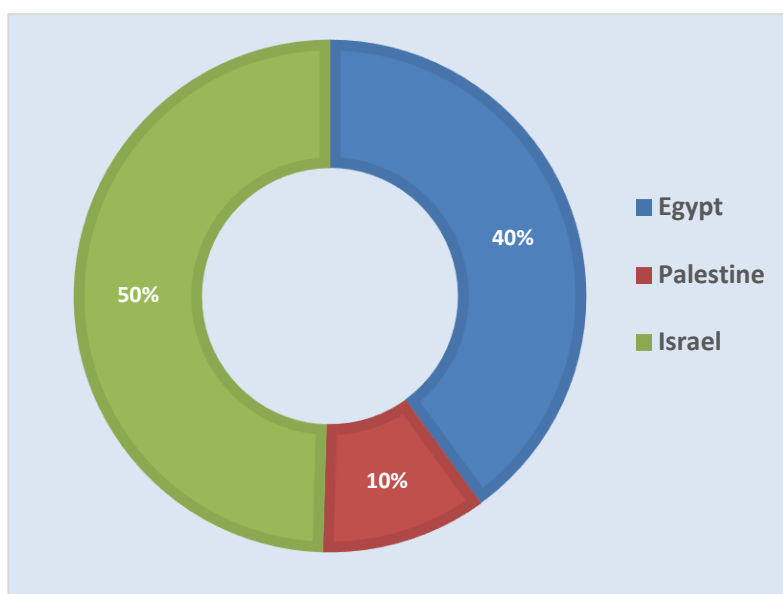
**Table 5.** Areal properties (km<sup>2</sup>) of the North Sinai Area countries

Country	Total area	Land area	%	Marine area	%
Egypt	10415.4	2665.8	25.4	7749.6	74.6
Gaza	2925	897.1	22.8	2027.9	77.2
Israel	12175	2574	21.1	9601	78.9
Total	25515.4	6136.9	24	19378.5	76

Source: From the student's calculation based on Figure 3 using geographic information systems.

**Table 6.** Marine cadastral characteristics (km<sup>2</sup>) of the North Sinai Area countries

Country	Marine area	%
Egypt	7749.6	40
Gaza	2027.9	10.5
Israel	9601	49.5
Total	19378.5	100



Source: From the student's work based on Table 6.

**Figure 7.** Cadastral characteristics (km<sup>2</sup>) of the marine countries of the North Sinai Area

## Second: Exclusive Sea Areas

### 1. Herodotus Area

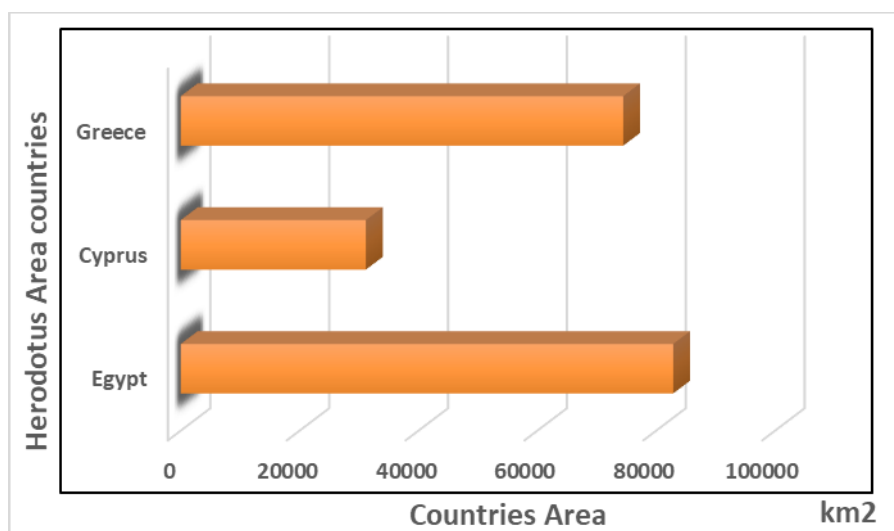
The Herodotus Area extends from the northern part of the Egypt Area with a broad base measuring 354.9 km and curves eastward due to the submerged mountainous edge in the northwestern section, narrowing at its end (94.9 km). It reaches a maximum length of about 519.3 km and encircles the Nile Delta Area from the west and north to the Eratosthenes Seamount south of Cyprus. The total area of the Herodotus Area is 120,659.4 km<sup>2</sup>, which represents 25.5% of the total area of the sedimentary areas and 33.1% of the total gas-bearing maritime area. Egypt's share within its exclusive economic zone is approximately 81,971.4 km<sup>2</sup>, which

accounts for 67.9% of the area's total area (Table 7). The remaining area is distributed between Cyprus (31,178.5 km<sup>2</sup>, 25.8%) and Greece (7,509.5 km<sup>2</sup>, 6.2%) (Figure 8). The deepest point in the area is -3,200 meters. Technical studies conducted by a specialized team from Egypt in the western region of the Herodotus Area have revealed promising opportunities for a petroleum system within the geological structures from the Jurassic to the Pliocene eras. It has been confirmed that there are extractable reserves estimated at approximately 315 trillion cubic feet of natural gas, confirming that the western Mediterranean region is Egypt's future for natural gas and petroleum (Abdel Karim, 2021, p. 212).

**Table 7.** Common marine cadastral characteristics (km<sup>2</sup>) of the Herodotus Area

Greece		Cyprus		Egypt		Total area
%	area	%	area	%	area	
6.22	7509.5	25.84	31178.5	67.94	81971.4	120659.4

**Source:** From the student's calculation based on Figure 3 using geographic information systems.



**Figure 8.** Common marine cadastral characteristics (km<sup>2</sup>) of the Herodotus Area

### 2. Levant Area

The Levant Area is shared by four countries: Egypt, Israel, Lebanon, and Cyprus. It has a cone-like shape, with its base in the east (438.7 km) starting from the Asian mainland and narrowing to 150.8 km at its western end near the Eratosthenes Seamount (Figure 4). The area's

maximum length is 409.8 km. It is bordered to the south by the North Sinai Area and to the north by the Cyprus Area. The total area of the Levant Area is 68,437.9 km<sup>2</sup>, accounting for 14.5% of the total sedimentary areas and 18.7% of the gas-bearing maritime area. Egypt's share within its exclusive economic zone is

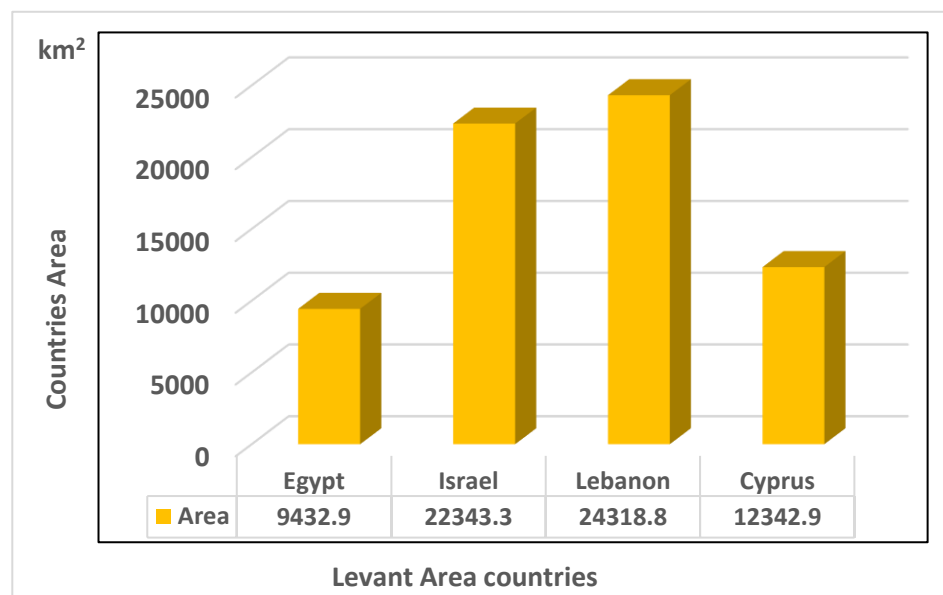
approximately 9,432.9 km<sup>2</sup>, or 13.8%. Israel controls 22,343.3 km<sup>2</sup> (32.7%), Lebanon 24,318.8 km<sup>2</sup> (35.3%), and Cyprus 12,342.9 km<sup>2</sup> (18%) (Table 8 and Figure 9). The area is located in waters with depths ranging from 1,000 to 3,000 meters (Abdel Karim, 2021, p. 211). The U.S. Geological Survey issued an assessment in March 2010 regarding the potential undiscovered oil and gas resources in

the Levant Area in the Eastern Mediterranean. According to the study, the mean estimate of technically recoverable, undiscovered oil resources in the Levant Area is about 5.3 billion barrels. However, what makes the area particularly significant is the estimated large volume of undiscovered natural gas resources, which amounts to approximately 3,450 billion cubic meters.

**Table 8.** Areal characteristics (km<sup>2</sup>) common to the Levant Area countries

Country	Area	%
Egypt	9432.9	13.8
Israel	22343.3	32.7
Lebanon	24318.8	35.5
Cyprus	12342.9	18
Total	68437.9	100

**Source:** From the student's calculation based on Figure 3 using geographic information systems.



**Source:** From the student's work based on Figure 8.

**Figure 9.** Common marine cadastral characteristics (km<sup>2</sup>) of the Herodotus Area

### 3. Cyprus Area

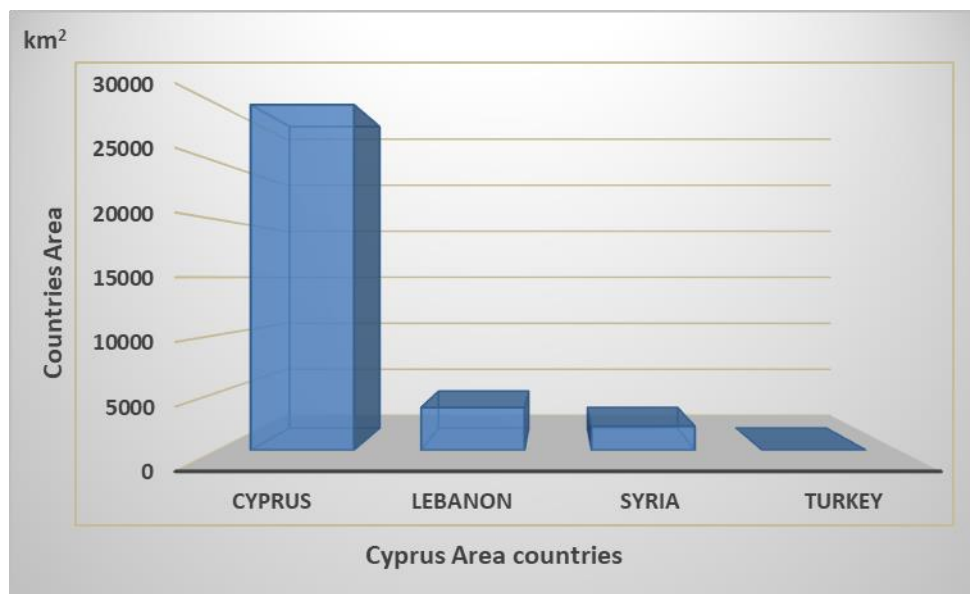
The Cyprus Area is located south of the island of Cyprus and is bordered by the Levant Area to the southeast, the Herodotus Area, and the submerged mountainous edge to the southwest. The area has a length of 519 km and a maximum width of 85.3 km. It covers an area of 35,745.9 km<sup>2</sup>, accounting for 7.5% of the total sedimentary areas and 9.8% of the gas-bearing

maritime area. Several countries have overlapping maritime claims in the area, with Cyprus having the largest share at 29,950.7 km<sup>2</sup> (83.8%), followed by Lebanon 3,697.8 km<sup>2</sup> (10%), Syria 2,075 km<sup>2</sup> (5.8%), and Turkey with a small portion of its exclusive economic zone amounting to 21.7 km<sup>2</sup> (0.1%) (Table 9 and Figure 10).

**Table 9.** Areal characteristics (km<sup>2</sup>) common to the countries of the Cyprus Area

Country	area	%
Cyprus	29950.7	83.8
Lebanon	3697.8	10.3
Syria	2075.7	5.8
Turkey	21.7	0.1
Total	35745.9	100

Source: from the student's work.



Source: From the student's work based on Table 9.

**Figure 10.** Areal characteristics (km<sup>2</sup>) common to the countries of the Cyprus Area

## Reserves

In 2010, the U.S. Geological Survey estimated that there are approximately 122 trillion cubic feet of undiscovered gas resources in the Eastern Mediterranean Area off the shores of Syria, Lebanon, Israel, Gaza, and Cyprus, along with nearly 107 billion barrels of oil. These significant discoveries have led to regional conflicts and disputes, sparking ongoing controversies and attracting international powers to balance between regional energy stakeholders. U.S. Energy Information Administration (EIA) (.gov)

Pressure has been mounting among the countries located above the Eastern Mediterranean Area, particularly to the south (Libya, Egypt, Gaza), to the east (Israel,

Lebanon, Syria), to the north (Turkey, Greece), and centrally Cyprus, which is divided into Turkish-controlled Northern Cyprus (recognized only by Turkey) and Greek-controlled Southern Cyprus. Following the gas field discoveries led by Noble Energy in 2009 off the coast of Israel, and with subsequent discoveries, the area's countries began commissioning foreign companies for exploration and drilling.

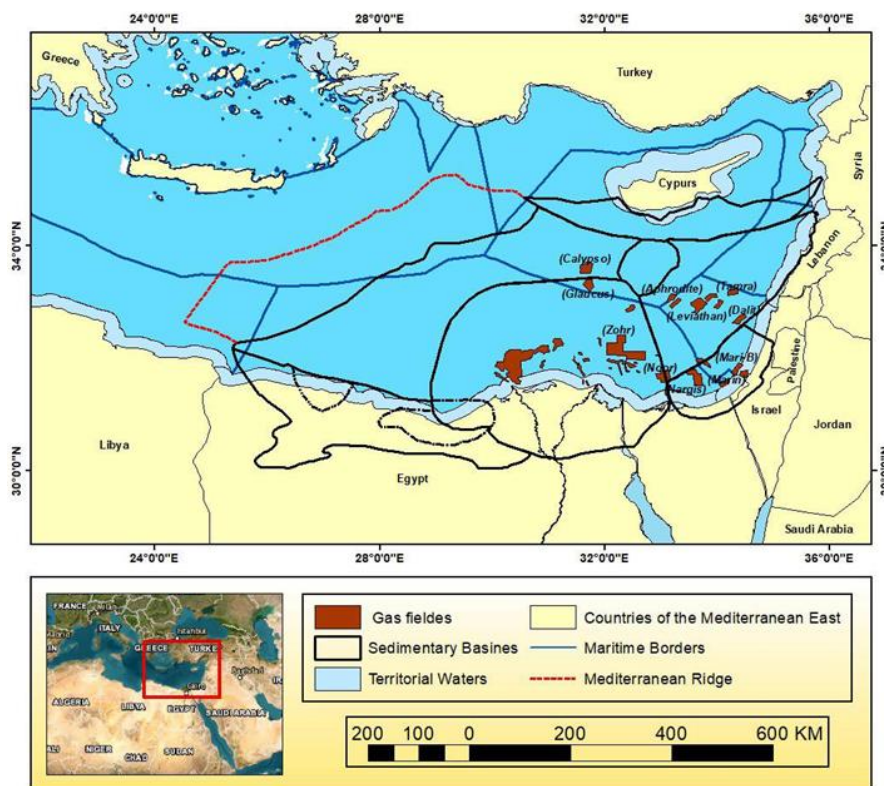
The Eastern Mediterranean region is estimated to hold 2,766 billion cubic meters of reserves, with the largest share belonging to Egyptian fields (38.4%), followed closely by Israeli fields (38%), and Cypriot fields (23.6%). The largest reserve field is the Egyptian Zohr field, followed by the Israeli Leviathan and Tamar fields, with other fields holding smaller varying percentages.



**Table 10.** Natural gas depositional area reserves from offshore fields in 2022

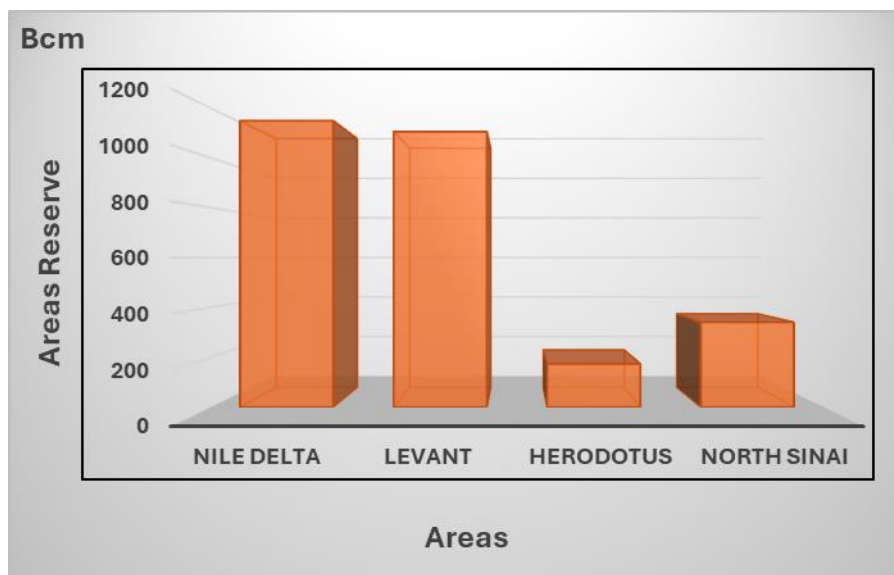
Area name	Field name	Year of discovery	Year of production	Reserve billion/ m³	of area %		Area of % total
Nile Delta area	Zohr	2015	2019	845	73.62		41.49
	Nawras	2015	2015	90	7.84		
	Baltim	2016		2019	28.3	2.47	
	Glacous	2019		-	142-227	16.07	
	Total				1147.8	100	
Levant area	tamar	2009		2013	280	25.36	39.91
	dalit	2009		-	8	0.72	
	Leviathan	2010		2016	622	56.34	
	aphrodit	2011		2017	129	11.68	
	tanin	2012		-			
	karish	2013		2022	28-42	3.17	
	hermes	2022		-	7-15	1	
	zeus	2022		-	10-12	1	
	Athens	2022		-	8	0.72	
	Total				1104	100	
Herodotus area	Calypso	2018		-	170-227	58.3	12.31
	Coronos	2022		-	71	20.8	
	Zeus	2022		-	75-58	20.8	
Total				340.5	100		
North Sinai area	Mary B	1999		2004	45	25.86	6.29
	Gaza marine	2000		2004	30	17.24	
	Narcissus	2021		2025	99	56.90	
Total					174	100	
Total reserve of area					2776.3	-	100

**Source:** U.S. Energy Information Administration. Energy Information Administration



Source: Based on [www.naturalgasworld.com](http://www.naturalgasworld.com)

**Figure 11.** Marine fields in the eastern Mediterranean



Source: From the student's work based on [Table 10](#).

**Figure 12.** Natural gas depositional area reserves from offshore fields 2022

It is evident from the analysis of Table 10 and Figure 11 that the largest gas-bearing sedimentary area in the Eastern Mediterranean is the Nile Delta Area, with a total reserve of

1,147.5 billion cubic meters, accounting for 41.5% of the total gas reserves in the areas. The Zohr field is the largest field in the Delta Area, with a reserve of 845 billion cubic meters,

representing 73.6% of the area's total reserves. It is followed by the Cypriot Glaucus field with a reserve of 184.5 billion cubic meters, or 16.1%, then the Egyptian Nour field with a reserve of 90 billion cubic meters, representing 7.8% of the total area reserves. The smallest field in the Nile Delta Area is the Belayim field with a modest reserve of 28 billion cubic meters, accounting for 2.3% of the total.

The Levant Area ranks second in terms of natural gas reserves, with a total of 1,104 billion cubic meters, or 39.9% of the total sedimentary area reserves. The largest field in this area is the Israeli Leviathan field, with a reserve of 622 billion cubic meters, representing 56.3%. It is followed by the Tamar field with a reserve of 280 billion cubic meters, or 25.4% of the total Levant Area reserves, then the Cypriot Aphrodite field with a reserve of 129 billion cubic meters, or 11.7%. The Israeli Karish and Dalit fields follow with reserves of 3.3% and 7.5%, respectively. Recently discovered Israeli fields (Hermes, Zeus, and Athena) rank last in terms of gas reserves.

The Herodotus Area ranks third and includes three Cypriot fields with an average reserve of 340.5 billion cubic meters, accounting for 12.3% of the total gas reserves in the sedimentary areas.

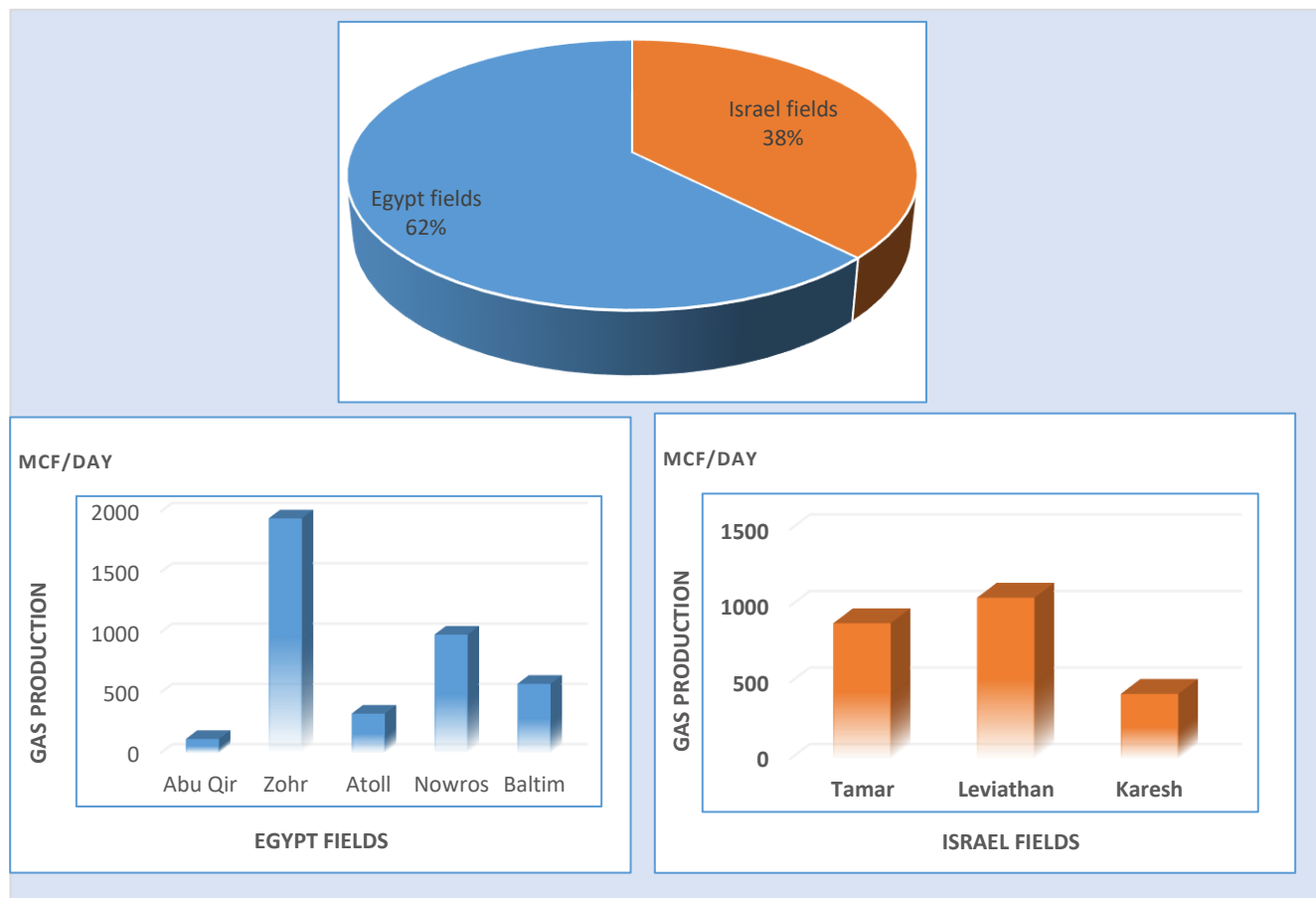
The North Sinai Area ranks last despite having three fields, due to the small size of its gas reserves. The largest of these fields is the Egyptian Narges field with 99 billion cubic meters, or 56.9% of the area's total reserves, followed by the Israeli Mari B field with 45 billion cubic meters, or 25.9%, and the Gaza Marine field with a reserve of 30 billion cubic meters, or 17%.

Foreign companies, mostly American, Italian, and French, have undertaken production operations from these fields. These discoveries have led to increased regional tension and competition among global companies eager to capitalize on their investments, complicating the situation and escalating disputes among countries with significant resources that have not yet delineated their maritime boundaries according to international law (Maite, 2012, pp. 33). This has led to violations of exclusive economic zones and consequently to conflicts and wars. It can be said that not all of the aforementioned fields have begun production yet, as production has been limited to some Egyptian and Israeli fields only. The following section will address the major gas fields currently in production in the Eastern Mediterranean Area:

**Table 11.** Producing fields in the eastern Mediterranean areas

Field name	Country name	Production volume MCF/ day	of % country production	of area % production
Abo Qier	Egypt	115	2.92	1.83
zohr		1943	49.38	30.84
Atoll		325	8.26	5.16
Nawras		980	24.90	15.55
baltim		572	14.54	9.08
<b>Total</b>		<b>3935</b>	<b>100</b>	<b>62.64</b>
Tamar	Israel	887	37.49	14.08
Lavithan		1054	44.55	16.73
Karish		425	17.96	6.74
<b>Total</b>		<b>2366</b>	<b>100</b>	<b>37.54</b>
<b>Total Area</b>		<b>6301</b>	<b>-</b>	<b>100</b>

Source: www-offshore—technology 2022.



Source: From the student's work based on Table 11.

**Figure 13.** Natural gas production from eastern Mediterranean fields in 2022

The analysis of Table 11 reveals that the gas production volume from the southern section of the Eastern Mediterranean for 2022 reached 6,301 million cubic feet per day, solely for Egypt and Israel among the basin countries. Egypt's share exceeded half of the total production for that year 3,935 million cubic feet per day, representing 62.5%. The Zohr field was the most productive 1,943 million cubic feet per day, accounting for 30.8%, followed by the Nooros field (980 million cubic feet per day, 24.9%, and the Abu Qir field 115 million cubic feet per day, 2.2%.

As for Israel, its production reached 2,366 million cubic feet per day, representing 37.5% of the total production. Its largest field was the Leviathan field 1,054 million cubic feet per day, 44.5%, followed by the Tamar field 887 million cubic feet per day, 37.5%, with the Karish field coming in last 425 million cubic feet per day, 17.9%

The Eastern Mediterranean basin countries can be divided into three categories: gas-producing countries from the Mediterranean (Egypt and Israel), gas-producing countries without Mediterranean resources (Egypt - Israel), and non-gas-producing countries (Egypt - Libya - Syria - Turkey). We will discuss the production of these countries as follows

### **Gas-Producing Countries in the Eastern Mediterranean Area**

#### **1. Egypt's Production, Consumption, and Export:**

Gas exploration in Egypt began in the early 1960s, resulting in the discovery of several fields, including the Abu Qir Field, which is the oldest gas-producing area in the Mediterranean. The Abu Qir Field is located 17 km into the Mediterranean Sea in Abu Qir Bay. By 2022, Abu Qir was the smallest producer in Egypt, contributing only 2.9% of the total gas production.

Egypt experienced a boom in gas production starting in 1997 with deepwater discoveries in the West Delta. However, political instability in 2011 led to a shift from being an exporter to an importer of gas to meet domestic demand. With the ascent of President Abdel Fattah el-Sisi in 2014, energy policies encouraged foreign companies to resume exploration, leading to the discovery of the Zohr Field, Egypt's largest, which represents 49.4% of Egypt's gas production and is located in the Shorouk Block in the Mediterranean.

Additionally, the Atoll Field was discovered by BP in March 2015 and ranks fourth in Egyptian production with an 8.3% share. It is located north of Damietta and began production in 2018.

In 2022, production was 325 million cubic feet per day. The Noor gas field, owned jointly by Eni and BP (50/50), was discovered in July 2015 and is the second-largest gas field in Egypt, accounting for 24.9% of the country's total production. Production began in September of the same year, and Eni announced that the field had reached a production rate of 980 million cubic feet per day. At that time, this level of production was the highest ever recorded by a field operated by Eni in Egypt over the past fifty years. Finally, in 2016, the Baltim gas field was discovered, located 12 km offshore in the Mediterranean Sea at a depth of 25 meters, with a production capacity of 572 million cubic feet per day, making it the third-largest field in Egypt, accounting for 14.5% of the total production.

As a result of these discoveries, particularly the giant Zohr field, Egypt became a regional power and attracted international attention. Egypt was able to end its natural gas imports and enhance its export potential, making this development a focal point in the broader context of regional gas policies in the Eastern Mediterranean. However, in 2023, Egypt's total natural gas production declined by 11.46% compared to 2022. Energy problems in Egypt worsened as authorities had to cut electricity in response to high gas demand. Additionally, gas discoveries in the country were disappointing, with the Zohr field's gas supply being much

smaller than initially reported. There was also a withdrawal of foreign investments in the past four years, hindering production growth. The Gaza conflict further damaged Egypt's energy sector, as Israel's decision to close the Tamar field during the war caused serious issues for Egypt, which relied on it for gas exports. This resulted in reduced gas supplies for the Egyptian economy, and Egypt was unable to export liquefied gas to Europe, worsening the country's economic situation. Egypt has recently signed expensive contracts to import liquefied natural gas, leading to mounting debts to foreign oil and gas companies. Therefore, Egypt needs to develop plans for its discovered gas fields to restore its economic position and address energy problems, such as power outages, while also meeting domestic gas needs.

### **Israeli Production, Consumption, and Export**

Noble Energy began operations in the Eastern Mediterranean in 1998 and started supplying natural gas to the Israeli markets from the Mari-B field, located 25 km off the coast of Israel, in 2004. Until 2003, Israel imported over 96% of the energy it consumed. However, the start of domestic gas production had a pivotal impact on reducing the country's energy imports. In 2009, a new discovery was made: the Tamar gas field, located 90 km west of Haifa's coast at a depth of 1700 meters (Bufman, 2014, p. 3). This marked a significant turning point in the Israeli economy from the start of production at Tamar, enhancing Israel's strategic position in the region. By April 2013, Tamar began supplying natural gas to the Israeli market, providing Israel with approximately 887 million cubic feet per day, accounting for 37.5% of Israeli production in 2022. This made it the second-largest gas producer in Israel. However, this production was not sufficient to meet domestic demand, leading Israel to import liquefied natural gas and gas from Egypt via the Arish-Ashkelon pipeline, also known as the East Mediterranean Gas Pipeline.

In 2010, Noble Energy and its partners discovered the Leviathan field, located 30 kilometers west of Tamar. This was the largest natural gas discovery worldwide during that decade. Production began in 2016, making



Leviathan the top gas producer in Israel with a production of 1054 million cubic feet per day, representing 44.6% of its production in 2022.

In 2013, Israel announced a new discovery: the Karish oil and gas field. Exploration of the field began by Noble Energy, and it is located in Israeli territorial waters, 100 km from the Israeli coast and approximately 75 km from Haifa (Ministry of Energy and Infrastructure, [www.energy.gov.il](http://www.energy.gov.il)). Production started in 2022, making it the smallest producer with a capacity of 425 million cubic feet per day, or 18% of Israel's total natural gas production.

This field was disputed between Israel and Lebanon, as it is near the border between Israeli and Lebanese territories. According to the Lebanese Ministry of Energy, the field is about 4 km from its border with Israel, specifically in Block 8, and 7 km from Block 9, both of which are part of Lebanese territorial waters. The field is located 15-17 km from the furthest point, posing a risk to Lebanese resources if Israel begins production. Israel could potentially use horizontal drilling to extract hydrocarbons from within Lebanon's exclusive economic zone, depleting adjacent or connected Lebanese reserves ([www.al-monitor.com](http://www.al-monitor.com), 2021). These discoveries have bolstered Israel's long-term energy security but have also introduced new security challenges, particularly in defending vital offshore facilities.

Production from the Tamar field between 2013 and 2019 led to an increase in Israel's gas production, allowing the country to achieve self-sufficiency. Local production exceeded consumption, turning Israel into a net gas exporter and permitting the export of 40% of production in 2021 (Ministry of Energy and Infrastructure, [energy-sea.gov.il](http://energy-sea.gov.il)).

### **Secondly - Gas-Producing Countries Outside the Mediterranean Sea\***

There are some countries in the eastern area of the Mediterranean that produce natural gas, but their production is limited to land only. These countries, in order, are:

- **Egypt:** Egypt's natural gas production is not limited to the Mediterranean area but extends to several other regions, which has increased Egypt's regional power. The Egyptian Ministry of Petroleum and Mineral Resources has stated that Egypt's gas production is distributed among several areas as follows: the Mediterranean Sea, which accounts for the largest share of Egypt's natural gas production at 62%, followed by the Nile Delta at 19%, the Western Desert at 18%, and the Gulf of Suez at 1%. This is managed by 20 companies, including Petropal, Khalda, Pharaonic, Badr el-Din, and Badr el-Din. Key foreign companies operating in Egypt include Eni (Italy), Apache (USA), BP (UK), and Shell (Netherlands)[source](<https://www.petroleum.gov.eg>).

**Table 12.** Distribution of Egyptian gas production

Area	%
Mediterranean economic region	62
Nile Delta	19
Western desert	18
Suez bay	1

Source: <https://www.petroleum.gov.eg>

- **Libya:** Libya is a country rich in energy resources. Due to its military and political divisions, it has been somewhat removed from the ongoing conflict over natural gas in the Eastern Mediterranean. Libya ranks third in gas production in the region, with production

reaching 418 billion cubic feet annually in 2022. Libya's local gas production relies on land-based sources, and the country's ongoing divisions limit the potential for significant production growth.

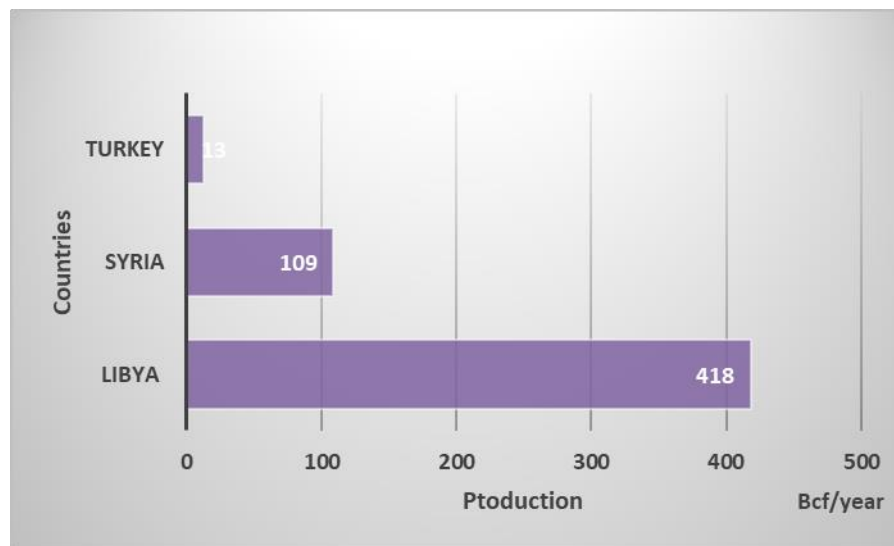
- **Syria:** Syria ranks fourth in gas production in the region, with production entirely from land-based sources, reaching 109 billion cubic feet annually in 2022. Syria's energy potential is uncertain due to halted exploration activities caused by ongoing political and military conflicts, as well as international sanctions. The escalating civil war since 2011 has thwarted Syria's plans to explore its share in the Eastern Mediterranean, and the chaos is likely to keep Syria's maritime area off the regional hydrocarbon map for the foreseeable future.

- **Turkey:** Turkey has a very minimal domestic natural gas production, totaling 13 billion cubic feet annually in 2022. Most of Turkey's gas production comes from land-based sources in the Thrace region west of Istanbul and shallow coastal fields in the Black Sea. Currently, Turkey's limited production is a reason for its conflicts with most of its Eastern Mediterranean neighbors, but recent offshore gas discoveries in the Black Sea may offer significant future potential for the country. [U.S. Energy Information Administration]

**Table 13.** Gas-producing countries outside the Mediterranean

Country	Production volume BCF/ YEAR
Libya	418
Syria	109
Turkey	13

**Source:** US Energy Information Administration. Energy Information Administration



**Source:** From the student's work based on [Table 13](#).

**Figure 14.** Gas-producing countries outside the Mediterranean

### Third - Non-Gas-Producing Countries in the Eastern Mediterranean:

- **Greece:** Greece has very minimal gas production, if any. In 2022, Greece had no natural gas production. Despite lacking natural gas resources, Greece's location makes it a natural bridge between the energy-rich Eastern

Mediterranean and energy-consuming Europe. The country is viewed as a hub for bringing Eastern Mediterranean gas to European markets.

- **Cyprus:** Cyprus has significant gas reserves in the Eastern Mediterranean area but has not begun production. It has been 12 years since the discovery of the Aphrodite gas field, the largest

offshore gas field in Cyprus, followed by other discoveries between 2018 and 2022 by some of the world's largest energy companies. Cyprus also benefits from the Nile Delta extending into its southern waters and the rich hydrocarbon area of the Levant extending into its eastern waters (exclusive economic zone). However, Cyprus has not produced or consumed any natural gas yet due to political obstacles. These issues are exacerbated by regional conflicts, particularly with Turkey, which views the Cypriot EEZ as overlapping with its own continental shelf. In response to agreements Cyprus made with neighboring countries, Turkish authorities in Northern Cyprus designated their own EEZ in 2011, leading to overlapping claims between Greek and Turkish Cypriots.

- **Palestine:** In 1999, British Gas obtained a license from the Palestinian Authority to explore offshore Palestinian waters between Israeli and Egyptian waters. In 2000, the British company drilled two successful wells 36 kilometers off the Gaza Strip, leading to the discovery of the Gaza and Mariam gas fields, with estimated reserves of 30 billion cubic meters. After Hamas took control of the Palestinian Authority, exploitation of Palestinian gas ceased, and negotiations with Israel on developing and exploiting the fields, supported by the U.S. in 2013, failed due to Israeli obstruction. Thus, the Palestinian gas fields remain untapped. It is worth noting that Israel is exploiting Palestinian land and resources, including natural gas, which is labeled as "Israeli" gas, while Palestinians are deprived of their rights.

- **Lebanon:** Lebanon has not conducted any hydrocarbon exploration on its territory. However, given that Lebanon's marine geology extends from Israel, after significant gas discoveries in the area, a detailed 3D seismic survey was conducted by the UK-based company Spectrum ASA in September 2012. This survey estimated Lebanon's gas reserves at 700 billion cubic meters, higher than Cyprus's potential. A new 3D seismic project is currently underway in the "Phase 2" maritime area. Despite some progress in Lebanon's gas and oil extraction record, political and security disturbances, maritime disputes with Israel, lack

of experience in deep-water exploration, and infrastructure deficiencies hinder progress. Additionally, Lebanon faces a severe financial crisis, and foreign lenders are reluctant to fund exploration activities.

From a regional geopolitical perspective, these crises have led to a realignment of economic and geopolitical situations, strengthening oil and gas-exporting countries while further marginalizing resource-poor countries. Energy-importing countries with low to middle incomes rely on oil and gas-exporting countries for support, undermining their independence in foreign policy as they must comply with their financiers' needs.

## Conclusion

The geological surveys of the Eastern Mediterranean by the U.S. Geological Survey in 2010 revealed a massive natural gas reserve in the southern part of the Eastern Mediterranean, south of Cyprus and the submerged mountain range to the west. The region was divided into major areas (Delta, Levant, Herodotus, Cyprus) and minor areas (Alamein, Matruh, North Sinai), prompting countries in the southern area (Egypt) and eastern area (Gaza, Israel, Lebanon, Syria) to vie for control and exploitation of this crucial resource, leading to several countries delineating their economic zones through treaties.

Thus, "Israel" seeks normalization with regional countries to stabilize its political relationships with Arab neighbors and secure its energy needs, especially in southern Lebanon, and improve its relations with Egypt, Jordan, and the Palestinian Authority to boost its gas exports to European markets. Meanwhile, disputes over ownership among area countries could exacerbate tensions between neighboring states like Turkey and Cyprus, and between Lebanon and "Israel," impacting regional security and stability.

Only Egypt and Israel have economically exploited this resource, with Egypt being ahead by forty years (1967) in utilizing gas from the area through various discoveries. Israel entered this field in 2009, with continued discoveries and production from several fields in both countries. Notably, the Egyptian Zohr field

produces 1.9 billion cubic feet per day, accounting for 30.8% of the Eastern Mediterranean gas production, while the Israeli Leviathan field produces 1 billion cubic feet per day, accounting for 16.7% of the region's production. Lebanon, Syria, Cyprus, and Gaza remain excluded from exploiting this resource due to political instability or the Israeli-Palestinian conflict.

### Recommendations

- \*Enhancing the efficiency\* of the existing wells in Egypt (Delta Field) and Israel (Sham Field) by increasing production through the addition of new wells to boost their economic resources.
- \*Egypt should drill\* a series of wells in the basins of North Sinai, Herodotus, and Matrouh, which have not yet been exploited. Israel should also utilize its share in the North Sinai Basin.
- \*Lebanon, Syria (Sham Basin), and the Gaza Strip (North Sinai Basin)\* must receive their share of this important economic resource after achieving political stability.
- \*Cyprus should exploit\* its economic resource of gas from its southern region.

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