



# OFFSHORE OIL AND GAS DRILLING ENVIRONMENTAL AND ECONOMIC EFFECTS IN THE EASTERN MEDITERRANEAN SEA

A Fletcher MALD Capstone project

## Abstract

With the discovery of oil and gas fields in the Eastern Mediterranean Sea, regional policy makers should take a holistic approach and consider how these industries' potential environmental damages could impact other aspects of the regional economy.

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## INTRODUCTION

For hundreds of thousands of years, beneath the Eastern Mediterranean Sea, organic matter decayed under pressure to form natural gas and oil. These stayed untouched until the 2010s, when drilling technology advanced to a point where wells could now reach deep enough to these fields. Many investors and policy makers are excited about the opportunity that this presents. However, industries in the region, such as fishing and tourism, rely on the Mediterranean Sea having a healthy ecosystem. Oil and gas drilling can threaten that. Without considering the environmental effects offshore oil and gas drilling can have in the Eastern Mediterranean, and how that will impact the region economically, any benefit these wells give will be wiped out by losses in other sectors. For the people of the Eastern Mediterranean, this means more social and economic hardship in the decades to come.

## OVERVIEW OF THE EASTERN MEDITERRANEAN SEA

### The Ecosystem of the Eastern Mediterranean Sea

The Mediterranean Sea is an interesting body of water. It has housed empires such as the Greeks, Persians, and the Romans. Its Eastern edges were part of the fertile crescent, the birthplace of agriculture. Its featured predominantly in the Abrahamic religions, and witnessed the rise of democracy. It is a meeting point of cultures, the intersection of Europe, Africa, and Asia, with some geographers holding that these three continents actually form one large continent with the Mediterranean its focal point.

In scientific terms, the Sea is unique in that it covers a huge basin, over 2.5 million square kilometers, with rivers from the Rhone to the Don filling it, yet hardly empties the waters it contains. Until the construction of the Suez Canal in the mid-20<sup>th</sup> Century, the waters of the Black Sea, the Aegean, and the Adriatic would flow into the Mediterranean with only the Strait

of Gibraltar connecting it to the rest of the world ocean. This translates to water staying within the basin for hundreds of years, circulating from the surface to its seabed, which, with an average depth of 1,500 meters, makes it one of the deepest bodies of water that isn't technically an ocean. Calypso Deep, part of the Hellenic Trench near Greece, is over five kilometers below the waves.

Ancient sailors told of sea monsters living in the Mediterranean. Today we call them Sperm Whales, bottlenose dolphins, mako sharks, and giant devil rays. Other major species include important seafoods such as tuna, squid and octopi, and sardines. The fishing industry is tied to the history and culture of the region, its mark left on national dishes, epic poems, and biblical parables.

Out of all this biodiversity, history, and bathymetry, the Mediterranean is threatened. The Mediterranean is very polluted, with the drainage basin bringing in agricultural runoff and municipal waste. Sewage has been a historical problem since the Ancient era. Today it is even more pronounced with increased industrialization and urbanization. The Suez Canal invites species from both the Red and Mediterranean Sea to mix, putting the ecosystem off balance. The warming waters of the Mediterranean allows jellyfish (imported from the Red Sea via the Suez Canal) to proliferate, "to the bane of Israeli beachgoers," as an article in Haaretz put it (Rinat 2019). The article also mentions the poisonous lionfish spreading in the Mediterranean. The increased shipping traffic from the Canal harms marine mammals due to ship strikes and increased noise (Schwartzstein 2019). And of course, due to lack of science-based management, the Sea is heavily overfished (Mrowiec 2018). With the Sea already so damaged, the addition of a full-fledged oil and gas industry could push this already fragile ecosystem over the edge.

## History of Fossil Fuel Extraction in the Eastern Mediterranean Sea

Oil was first discovered in the Eastern Mediterranean Sea in the 1960s, however the absence of technology allowing further exploration and exploitation of these deep resources made it only a small industry. With technical advancement, it became more viable. And yet, the estimated supplies were considered minimal, so not worth building up drilling infrastructure. In 2010 this all changed with the discovery that the Leviathan gas field was much larger than previously believed. This coincided with the discovery of the Zohr Field in 2015, a large natural gas field off the coast of Israel. A revolution had begun.

For Israel, this is very important because oil and gas has been a form of diplomatic leverage for its neighbors. A joke, retold by Gideon Tadmor, an Israeli businessman, in a documentary on the subject by France 24, said that “Moses took forty years to cross the border between Egypt and Israel & Palestine due to the fact that he was looking for the only place in the Middle East where there’s no oil and gas,” (France 24 English 2017). The discovery of the



Figure 1 Overview of oil and gas fields in the Levant Basin, France 24 English 2017

Levantine Basin oil and gas fields completely changes not only the energy landscape of the region, but also the geopolitical.

### Current Projects

Currently, these oil fields are being coordinated by the Eastern Mediterranean Countries of Egypt, Cyprus, Greece, Israel, Italy, Jordan and the Palestinian territories through the Eastern Mediterranean Gas Forum (Emam 2019). Turkey, Lebanon, Libya, and Syria are notably not included. France, with economic interest in the region, has asked to also become a member, while the United States has asked to become a permanent observer (Ismail 2020). This shows the international interest in the region. Companies that have a stake in current projects include the Italy-based Eni, United States-based Exxon, French-based Total, and British-based BP. The foreign coordination of these projects shows how the economic possibilities go far outside the region.

Egypt is the first country that began offshore drilling operations in the Eastern Mediterranean. They have also constructed two onshore natural gas liquefaction plants along their coastline to help facilitate this industry. These plants process natural gas from Egypt's, and is planned to process Israel's gas as well. The Israeli deal is estimated to bring in over 85 billion cubic meters of gas through 2035, in a plan that is estimated to cost Egypt close to 20 billion USD. It has constructed pipelines to Jordan, and, in 2018, became a net exporter of natural gas (Saba 2020). Clearly, Egypt is aggressively pursuing natural gas extraction. Without a proper consideration of how these short-term gains could affect Egypt's environment and greater economy, it stands to lose in the long-term.

In late November of 2019, Turkey signed an agreement with Libya delineating their maritime borders (coincidentally, this was a month before Turkey began air operations to support

the Libyan government in their civil war) (Hacaoglu and Kozok 2019). The lines now cut into Cypriot, Greek, and Egyptian maritime borders (see Figure 3). This angered Greece and Egypt, but was a particular rebuke to Cyprus, as Turkish ships began exploration off the Turkish-claimed parts of the island. In the eyes of the Turkish government, however, the other states' claims are delegitimate as they do not take into account Turkey's (and Northern Cyprus') claims in the Sea, as they define them as coinciding with the Northern Cypriot state, which many countries, including Cyprus, Greece, and Egypt do not recognize (Casin 2019). The European Union and Israel, who recognize Cyprus' sovereignty over the entirety of the Island, condemned

Turkey's drilling exploration in what they see as Cyprus' maritime borders (AFP and TOI Staff 2019). Importantly, its hard not to see this as part of the ongoing tensions between Turkey and its NATO allies, worsened after Turkey had recently bought missile systems from Russia.



Figure 2 Natural Gas Infrastructure Eastern Mediterranean Sea (Papadimitriou 2020)

The potential of the fields are muted by the relative cheapness of oil and gas from Russia. These are easily transported via pipelines running through Eastern Europe to the target markets across the continent. The ongoing geopolitical tensions between Europe and Russia causes the interest in sourcing

Europe’s energy needs from elsewhere to grow, however. The construction of the “EastMed” pipeline makes this proposal even more palatable for European businesses. Connecting the “Energy Triangle” of Cyprus, Israel, and Greece, the pipeline will bring natural gas from the Triangle through Greece into Europe. Backed by the United States government to counter Russian interests, it has upset Turkey, another one of the US’ allies. A spokesperson for the Turkish Foreign Ministry, in a statement, has said, “The most economical and safe route for the transmission [of natural gas] to consumer markets in Europe, including our country, is Turkey,” (Carpenter 2020). The cost of the project is estimated to be 7 billion USD and be completed by 2025, however the EU has stated it is no longer publicly investing in fossil fuels, so the cost burden will be put on private investors (Papadimitriou 2020) (Koutantou 2020). Turkey is also planning a pipeline between Libya and Turkey, with a similar goal of export to Europe.

### Geopolitical Effects

With historically tense relations between the countries of the region, many hoped that the opening of these fields would lead to cooperation among these states. It was the reasoning behind the reopening of the embassy of Israel in Turkey. However, that is complicated by some key issues.

First, and most obviously, there is Turkey and Cyprus. Turkey is the sole state that recognizes the Turkish Republic of Northern Cyprus, while in the South, and with the backing of the UN, is Cyprus, which claims the whole

**Maritime Disputes in the Eastern Mediterranean**



Figure 3 Contested EEZ's in the Eastern Mediterranean (Stratfor 2019)



island. This translates to disputed maritime boundaries, with Turkey proceeding as if the borders of Northern Cyprus are recognized under international law. Turkey has begun exploring oil and gas drilling in Turkey's and Northern Cyprus' waters (on behalf of Northern Cyprus), with Turkish naval vessels operating within visual range of the exploration ships, to dissuade any attempt of other countries challenging their sovereignty. Additionally, Cyprus sits on where a proposed pipeline between the Levant Basin and Europe would go.

Cyprus, for its part, recognized that in order to not be caught by Ankara's will, they will have to play Turkey's ally, the United States. In 2017, as reported by France 24, Cyprus prioritized Exxon Mobil for their exploration in their EEZ, since at the time the United States' Secretary of State was former Exxon Mobil CEO Rex Tillerson (France 24 English 2017).

Lebanon, facing corruption and internal strife, still is technically at war with, and disputes a maritime border, with Israel. With limited maritime interests outside of fishing, this was relatively a non-issue. Until the discovery of gas fields in the disputed border. Hezbollah, with the backing of Iran, say they are prepared to defend Lebanese maritime interests against Israeli incursions (France 24 English 2017). An agreement between the two states is necessary for future offshore drilling and for lasting peace. As of October 2020, there are plans between the two states to hold talks to find a solution to this issue (Hubbard and Rasgon 2020).

Egypt, who is very eager to both use and export offshore hydrocarbons, has built infrastructure to process these products. They're eagerly working with Israel, who just a few decades ago Egypt fought a brutal war against. This situation is complicated by an insurgency in the Sinai Peninsula, and Egypt believes building an overland pipeline between the two countries is too dangerous, as pipelines are easy targets for sabotage. So, Egypt sees the Mediterranean Sea

as the only route to continue the energy exchange between the two countries. Currently, Egypt buys Israeli gas, shipped in undersea pipelines, to liquefy it for easy shipping abroad.

The Syrian Civil War, raging since 2014, may seem like a primarily land-based conflict. However, a proposed pipeline from Qatar to join the Levantine oil and gas pipelines on their route to Europe, has many worried that those interests are created by ulterior motives of the many sides of this conflict and their backers. This plan is opposed to an Iranian plan for another pipeline that crosses Iraq and Syria to get to European markets. The Assad Regime is backed by Russia, who has an interest in preventing new competition for their energy products being sold in Europe. These multiple factors bring multiple parties into the Syrian Civil War and the connection with Eastern Mediterranean oil and gas. All of this has translated to the maritime space in 2019, when there was an attack on a Syrian undersea pipeline, which some speculate was an act backed by Iran (Zwijnenburg 2019).

Russian fossil fuel is extremely cheap, especially compared to the expensive Eastern Mediterranean hydrocarbons. This gives Russia leverage in any negotiation, a position Russia wants to hold on to. This brings in the United States, who wants to promote Eastern Mediterranean oil and gas extraction as a counter to Russia, so Europe is not reliant on Russia for their energy needs. The geopolitical tensions in the region are, to put it lightly, a global affair.

## ECONOMIC BENEFITS

### Energy Export

As said before, one of the biggest allures of building up the offshore oil and gas industry is Europe's need for fossil fuels. Europe's advanced economy, dependence of fossil fuels, and free trade market means that it cannot fully fulfill its energy needs through renewables and oil and gas from Romania and the North Sea. As of 2016, over half of Europe's Energy

consumption came natural gas and oil, and half of all of Europe's energy is imported (Directorate-General for Energy of the European Commission 2018). Currently, Russia supplies over a third of Europe's gas (Kesseba and Lagos 2019). With sour relations between Europe and Russia, many European companies and governments are looking for alternative sources of gas. Unfortunately, with cheap Russian gas and Europe's (albeit slow) move to a low-carbon economy, it is unlikely that Europe will be as great of a market opportunity as planned for speculators in the Eastern Mediterranean.

Another potential export market is in East Asia. This century, the region has accounted for 70% of energy consumption growth (Matsuo, et al. 2013). Oil and gas underpin most of this growth, with natural gas consumption growing by 85% over the next twenty years in the region (IEA 2019). China, particularly, with its large developing population, has to source its oil abroad, creating a economic and geopolitical football. North America, Russia, Iran, and Malaysia are some of China's major oil and gas suppliers. Egypt's LNG plants allows for transport of gas by ship and creates an opportunity to bring gas from the region to China. South Korea and Japan, allied with the United States and having tensions with Russia and China, also are possibly trade partners for hydrocarbon resources for the Eastern Mediterranean.

### Energy Independence

There is another market that should not be overlooked. According to the American Energy Information Administration, current gas and oil resources in the Eastern Mediterranean will only satisfy demands for a few more decades, but the new extraction of offshore resources could provide the region with energy for decades (US Energy Information Administration 2013). This is certainly a huge benefit of building up offshore energy capabilities, especially as the region is faced with a growing population. Israel, with limited onshore supplies has often had to

find hydrocarbons from its neighbors, all of whom have been in conflict with Israel at one point since 1948. Having its own offshore oil and gas platforms seems like an easy alternative.

However, this does not consider the possibility of growing capacity for wind, solar, and other forms of renewable energy instead.

Since energy independence is important for economic, social, and security reasons, it is an understandable policy goal. Instead of focusing on gas or oil, renewables could be used, to encourage independence and lower carbon emissions. Right now, non-hydro renewables comprise hardly 1% of the energy mix in the region, due to assorted political, economic, and physical challenges (Tagliapietra 2016). There is a lot of potential in the region for solar and wind energy due to geography. And while there are some initiatives to explore these, the political will to do so is lacking, and the lobbying effort by foreign and domestic companies to push for natural gas and petroleum industries across the region.

### Economic Diversification

Many of the countries that lay along the Eastern Mediterranean Sea do not have robust fossil fuel industries. This makes the possibility of diversifying their economies very enticing. With disruptions from geopolitics, global trade, and pandemics, it makes sense to have an economy that is broad to prevent one disruption from completely gutting a country's economy. Of course, oil and gas is very volatile. Any development plan by these countries has to take that into consideration, in addition to the possible environmental damage that these industries cause.

## ECONOMIC RISK

### Fishing

The fishing industry in the Eastern Mediterranean Sea is an ancient tradition, with most of the cuisines in the region incorporating seafood in many dishes. Although the fisheries are not

what they used to be, artisanal fishing still provides an economic benefit to many, especially in the Levant. The sardine and anchovy industry in particular accounts for a large amount of the catch, and for a large part of the food culture of the region. However, the intricacies of the ecosystem of the Mediterranean may become further vulnerable by the introduction of offshore drilling for oil and gas.

According to statistics from the UN's Food and Agriculture Organization, the Mediterranean Sea has over 86,000 fishing vessels, with just under a third in the Eastern Mediterranean. This makes the Eastern Mediterranean statistical region the heaviest fished part of the Mediterranean. Additionally, most of these vessels (around 80%) are small, non-industrial or artisanal boats (FAO 2018). These small vessels are a huge employment sector for many in the region. This is not including jobs in port, at seafood processing facilities, or other related industries.

One benefit of opening up the Eastern Mediterranean to offshore oil and gas drilling that is often repeated is that it will give coastal communities new employment sectors (Badgley 2014). However, offshore drilling tends not to support that many jobs, and the industry often hires highly skilled engineers from Europe and North America over locals. Fishing tends to involve far more jobseekers, avoids the resource curse, and improves a region's food security (Badgley 2014). So, while oil and gas drilling may provide large amounts of cash to a government, at the local level the benefits are more obscured. All of this means that income inequality will ultimately go up.

The BP Oil Spill in the Gulf of Mexico at their Deepwater Horizon rig caused the loss of the already stressed population of bluefin tuna, leading to environmental groups to sue the National Marine Fisheries Service. At that point, tuna populations were estimated to be 80%

overfished (Kilduff 2010). The oil spill put the ecosystem to the point of collapse, with many effects still being felt a decade later. Socially, after spills in Alaska and the Gulf of Mexico, “spikes in divorce, depression, anxiety, and PTSD were evident for years,” according to a quote by the President of the Fishing Partnership Support Services (The Standard Times 2018).

During the opening of the Suez Canal, species from the Red and Mediterranean seas crossed the Canal, to great ecological damage. Climate change is rising the temperature of the Mediterranean, causing it to be more susceptible to the species of the Red Sea, with the many endemic species of the Mediterranean pushed to an ever increasingly dangerous point (Rinat 2019). This includes shrimp, clams, snails, and fish. The effect is doubled with the Suez Canal being dredged deeper, allowing species that live in deeper waters, as well as larger organisms of already introduced species to cross the maritime boundary.

Offshore drilling also produces a navigation hazard for fisherman. More traffic in a region makes fishing, especially with long trawls and other equipment, more complicated, and dangerous. Safety regulations are typically put in that fishing vessels must stay a certain amount of meters away from platforms. This means that there are now less places to fish, and oil platforms do not act as marine protected areas because of their activities and occasional leaks (Badgley 2014). So, less fish habitat with more dense fishing grounds leads to even more overfishing.

Accidents at sea causes damage through both the direct impact of lowered fish stocks and closing of navigation in an area. But there’s also indirect impacts, such as the public perception that the fishery may be contaminated, created lowered demand (European Parliament 2013). In other words, this adds up to a cascading effect to the ruin of the fishing industry.

## Tourism

With names like Ibiza, Monaco, and Barcelona, the Mediterranean annually invites scores of tourists to its waters, its history, cuisine, and beaches. People from around the world are enticed to enjoy its weather and culture. Strategic development plans for Mediterranean countries add the tourism industry as a huge driver of economic power. It is estimated the Mediterranean Sea invites over 200 million tourists a year (Schwartzstein 2019).

The Middle East hosts many unique species of wildlife that brings in visitors to the region's nature parks, hoping to get a glimpse of creatures such as the Asiatic Cheetah (MEE Staff 2019). These cheetahs are unfortunately one of the most endangered species of big cat on Earth. In the water, marine mammals, which tourists hope to catch a glimpse of, are particularly vulnerable to the seismic testing performed while exploring for oil and gas (The Standard Times 2018).

Tourism is a difficult industry to plan because it is subject to many variables. Domestic or foreign tourists. Seasonality. The economic class of the tourists. Of course, the tourism industry can be easily impacted by geopolitical events, such as flare ups in the Israeli-Palestinian conflict or the COVID-19 pandemic. Then there is the question of encouraging demand – which has to be a mix of attractions (history, culture, natural landscape, etc.), hotel infrastructure, airports and public transit, and just sheer popularity among people who want to take a vacation. A national airline offering free or heavily discounted layovers can help, as can a popular movie being set in a location. However this can easily be ruined by an oil spill or climate change – related disaster.

## Stranded Assets

A smaller part of climate change economics that worries investors and economists are stranded assets. Oil and gas require significant investment, usually on debt payments (which has

serious implications for financial sector when the oil price dropped from Russia-Saudi price wars due to the lowered demand from COVID-19). If the world moves past fossil fuels to more climate friendly options, these investments will be made unprofitable after the money was poured into it. With wells and refineries left unusable, this is called a “stranded asset.” This is a major concern for investors, and its becoming more and more obvious that in deciding to finance new fossil fuel projects if it’ll be worth it, considering that the world, most likely, will lower the demand for these products in response to climate change. In the Eastern Mediterranean, it has to be considered if it makes sense to installing the offshore extraction industry if the world will move past these in ten to twenty years. The two natural gas liquefaction plants in Egypt, for example, cost between five and ten billion USD each to build (France 24 English 2017). Egypt faces severe weather, energy, and food issues due to climate change and a growing population, and it is quite possible their heavy investment may prove fruitless.

#### Economic Issues with Natural Gas and Oil Extraction

In 1959, Dutch petroleum explorers discovered a large swath of natural gas off their coast in the North Sea. While this brought in large amounts of money to the country, it came at the cost of other sectors. The increased exports of natural gas caused the Dutch currency, Guilder, to go up in value. This then caused other Dutch exports, particularly manufactured goods, to become more expensive on world markets, causing a large contraction in that sector. This phenomenon, now called “Dutch Disease,” has been recorded many times over. Whenever a country experiences a boom, their currency increases in value, making other exports more expensive and harming other industrial sectors, who now can’t compete in a world market with their currency being too expensive. While not inevitable, it is a problem that countries have to prepare for when engaging in any new resource export endeavor.



Another economic conundrum caused by resource extraction is the resource curse. Many states that are resource rich often have trouble economically developing. There's a variety of reasons for this. Sometimes its that the resource sector only provides a small amount of employment, and not enough to have positive feedback for the rest of the economy. Other times it is due to resource-related conflict, or neocolonial practices by foreign companies. The volatility of commodity markets can also lead to an intense boom and bust cycle. Without proper planning and diversification, a state can become reliant on the income from the resource. With severe variability in the gas and oil sector, it can be quite difficult to plan if a product will be prosperous or not. In Spring 2020, oil markets collapsed, creating uncertainty for firms worldwide. The causes and effects from the "curse" are very numerous, but if the region does not install proper institutions to confront this possibility, the economic benefit could be cancelled out, even when not considering environmental factors.

When a country becomes reliant on the resource export market, it is known as a "rentier state" and often has the issues of the resource curse. Succumbing to the boom and bust cycle, and severe income inequality, can lead to oligarchical power and dictatorship. Due to this, many rentier states have issues related to accountability and democratization. This inevitably means fewer civil freedoms and human rights for the citizens. In the Eastern Mediterranean, already rocked by the Arab Spring, the Syrian Civil War, the Greek Financial Collapse, and the ever increasing hold on power by Recep Erdogan in Turkey, the quest for democracy and stability could become even more difficult.

## ENVIRONMENTAL RISKS

### Oil Spills

Thanks to major incidents such as the *Exxon Valdez* and the *Deepwater Horizon*, the threat of an oil spill is a common anxiety related to these projects. Heavy fuel oil could spill from a torn tanker hull, a well that malfunctions, or a damaged pipeline. Thanks to the physics of natural gas, which during a leak typically just dissipates to the atmosphere, but petroleum is heavy and sticks to its surfaces. Depending on the type of oil that is spilled, it can stick to the seafloor, float to the surface, or wash up on the beach. All of these pose serious health and safety risks to humans and the environment. Economically they can disrupt industries for weeks to months, cause loss of product and infrastructure, and create a public relations disaster for the involved organizations.

Oil spills can kill marine organisms and birds by coating their skin, fur, and feathers, which can ruin their ability to fly, float, swim, and regulate temperature. The oil can ruin their sense of smell and sight making it difficult or impossible to find prey, their nest, or their young. In attempting to clean themselves these animals can ingest the oil, often leading to death. Additionally, the refined fuels such as gasoline and diesel typically harm wildlife from its toxicity whereas heavy oils, the crude which would come from the offshore facilities in the Mediterranean, tend to kill through covering the animals as described above. The heavy oils also stay in the environment longer. If the oil ignites, such as in the *Deepwater Horizon* spill or during the Persian Gulf War, not only is the fire dangerous but the smoke can create huge amounts of air pollution to the surrounding area.

The major difference between offshore and onshore oil spills is that the water has the potential to spread the oil far. In the Eastern Mediterranean, this means the currents could carry the oil around the region. As shown in Figure 4, a spill in the region would most likely follow a counterclockwise path. So an incident in Egypt would eventually lead to oil washing up in the Aegean, after being spread throughout the Sinai, the Levant, along Turkey and Cyprus, and then into the Greek Isles. With such an enclosed sea, it is very likely the effects would be seen for years. In some cases, oil can affect an ecosystem for decades. Its important to note, with about a

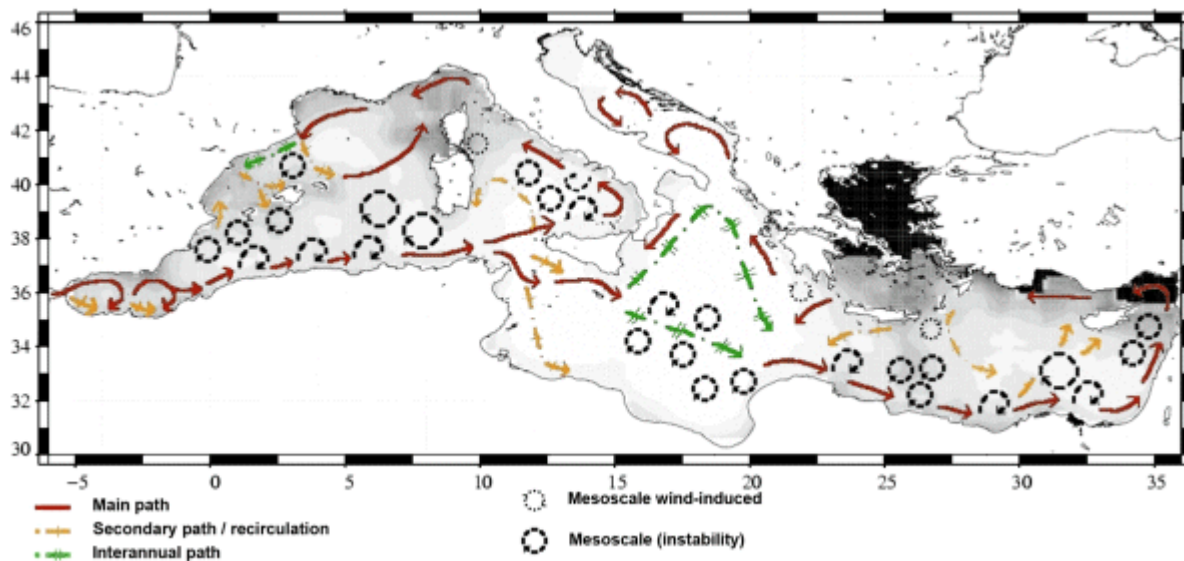


Figure 4 Currents of the Mediterranean Sea (AVISO+ 2006)

third of the world’s shipping passing through the Mediterranean, the economic effect of a major spill halting marine navigation could be devastating (Greenpeace International 2011).

While oil sometimes seeps naturally to the surface, the sudden influx from a spill can easily overwhelm an ecosystem. Most spills occur during an accident on a ship or oil rig, or can also happen from poor maintenance of a pipeline. Of course, there is always the chance for an intentional spill as well. The tense geopolitics of the region could mean that an attack on a large, stationary rig or pipeline, or slow-moving tanker, could cripple a country economically as well as distract resources from elsewhere as it attempts to contain and clean up a spill. In 2019, a Saudi

oil site was bombed by a drone, presumably by Yemeni rebels. This attack showed how vulnerable oil infrastructure is, and why Turkey maintains a naval vessel while its hydrocarbon exploration vessel, *Yavuz*, sails in Cypriot waters. Another incident in 2019 off the Syria coast showed the Baniyas oil terminal was most likely sabotaged – possibly by Iran (Zwijnenburg 2019). With geopolitical tensions still high in the region, the threat of an oil spill is considerably higher than elsewhere around the world.

### Natural Gas Dangers

In February of 2020, one of Israel's offshore gas platforms had a power failure for about two hours. For safety, the platform had to begin burning off natural gas, both wasting gas and polluting the local air (Winer 2020). Natural gas, being a volatile chemical, can ignite relatively easily, creating an explosive danger as well as spewing more greenhouse gases into the atmosphere. Pipelines and LNG facilities have to have high standards of maintenance to protect against this, and still accidents happen. Any leak in a system can cause gas to slip out, and possibly collect in an area, creating a dangerous fire hazard.

### Climate Change

There is a host of literature on the reasons why the Earth is warming and what that will mean for the planet. From biodiversity loss to rising oceans, from an increase in extreme storms and longer periods of drought. Economically, this will lead to significant changes. Agriculture systems, cities, markets, and human quality of life will change, and from most models, towards a net loss. In the Eastern Mediterranean, characterized by warm, dry weather, climate change will complicate the many issues currently facing the region through drought and other concerns (Lange 2019). A growing urban population will become more food-stressed and use more energy to cool down their buildings. Water sources will dry up for longer parts of the year, making the

job of water managers more difficult. These oil and gas projects in the region will make all of these effects more severe as their products add to the greenhouse gases behind climate change.

The Eastern Mediterranean has had a historical struggle with fresh water, especially in North Africa and the Levant. In Arabia, cultures developed around wells. Egypt has always been concentrated around the Nile River, with its twice annual flooding. Today, Israel is making strides in desalination along its coastline. As the Earth warms, precipitation in the region will decrease, and, depending on the severity of the warming, maybe as much as 30% or more, while aquifers may decrease by as much as 70% (Lange 2019). This is made obvious by the slow evaporation of the Dead Sea, which is shrinking each year (Broom 2019). In Basra, in Southern Iraq, canals are depleted while farmers have less and less to water their crops (MEE Staff 2019).

This is compounded by urban areas in the Middle East, which are set to grow this century far faster than rural areas. This means a number of matters will be complicated. Water has to come through a modern infrastructure system, including pipes, treatment, and later, sewage. This puts stress on natural aquifers, as cities need water to either be pumped in large amounts or desalinated along the coast, an energy-rich process. Additionally, due to the added energy, and cement, loss of green space, and glass, the urban heat island effects cause cities to be significantly warmer than the surrounding area. Then, even more energy will be required to cool everything down, and possibly, lead to more cases and deaths from heat exhaustion or heat stroke.

Other areas of the region experience flooding due to stronger storms and rising sea levels (Broom 2019). Jeddah in Saudi Arabia had faced serious floods in 2019, bringing the city to a standstill. The intense, seasonal storms come in to replenish the arid region's aquifers (Wheeling 2018). They can be hard to predict, which can be hard for residents to prepare for these storms.

Climate change causes these storms to be rarer, creating heat stress, at the same time the weather that causes these events to be much stronger when their conditions do arise. This means storms are rarer, more intense, and harder to deal with for the people that face them.

Meanwhile, Alexandria in Egypt is slowly sinking into the sea. This is due to not only the melting of the ice caps in the Earth's polar regions, but also due to the Mediterranean warming, causing the water to expand, and erosion. Climate change will critically impact the relationship the region has to water.

Sandstorms, a common occurrence in the region that causes serious health effects, are starting to become even more common and more severe (MEE Staff 2019). Sand and Dust Storms (SDS) are natural phenomenon in which winds take particles from the soil and bring them into the troposphere (the lowest part of our atmosphere). These winds then carry the particles, causing the air to literally fill up with sand and dust causing low visibility and damage to the surrounding area. This can mean billions of damage, loss of infrastructure, and serious health problems to humans and animals in the surrounding area.

Between increased need for water treatment and fresh water, plus cooling cities down with air conditioning, demand for energy will skyrocket alongside water demand. Manfred Lange refers to this as the "Water-Energy Nexus," (Lange 2019). Lange's article on the topic focuses on the need for more energy to process fresh water for consumption, due to piping infrastructure, treatment, and possibility of desalination plants. The article does mention how fossil fuel extraction requires large amounts of water, which, if the oil and gas fields in the Eastern Mediterranean are exploited, will not only increase the water needs in the stressed region but also in turn require more energy needs. This may detract from future hopes of a profitable fossil fuel industry in the region.

As stated previously, biodiversity is severely threatened in the Middle East (MEE Staff 2019). In fact, it looks like the only type of animal to benefit from climate change is jellyfish, which is not part of any fishery. Between desertification and warming, more acidic oceans, the ecosystems of the Eastern Mediterranean Sea could change dramatically in the coming decades, leading to species populations plummeting across the region.

It should be noted that the Eastern Mediterranean has huge potential in solar generation, and offshore wind as well. These sources could be competitive with the oil and gas extracted from the offshore platforms, both in terms of domestic energy security, but there is also a possible regional market for renewable energy should transmission technology get better. If the region focused on renewable energy sources instead of extracting oil and gas, not only will a market expand, the detrimental effects of climate change could be lowered, leading to actually a net positive socioeconomic scenario as compared with the planned oil and gas extractions.

### [How the oil and gas industry in the Eastern Mediterranean Sea Factor into Climate Change](#)

Calculating the actual greenhouse gas contribution of oil and gas production in the Eastern Mediterranean requires that we look at all aspects of the lifecycle of the drilling fields, from construction, extraction, transport, to the end use of the product. This is difficult to determine, since it depends on the methods used to extract, the quality of the fossil fuel being extracted, and how it is used. In an article from scientists at Stanford University they explain that in Algeria, where oil is light and has a large water content, it requires more energy to process the oil and there is a practice to flare often, creating a large carbon footprint for the extraction process. This is as opposed to the heavy crude oil in Saudi Arabia, whose oil has little water content and, generally speaking, rarely flares during the processing of fossil fuels, so there's a smaller carbon footprint (Masnadi, et al. 2018). Flaring, the process of burning excess unrefined

hydrocarbons, can be very polluting at the point of burning. Other examples from the study include that getting oil from tar sands or gas from fracking also being particularly carbon intensive. In Norway, regulators made flaring illegal, leading to a drop of emissions in the extraction process by an estimated 43%.

To show the variation in the lifecycle of fossil fuels, the same Stanford study mentions that, when it comes to transportation, “producing, transporting, and refining crude oil into fuels such as gasoline and diesel accounts for ~15 to 40% of the “well-to-wheels” life-cycle greenhouse gas (GHG) emissions of transport fuel,” (Masnadi, et al. 2018). So not only will further extraction of fossil fuel in the Eastern Mediterranean Sea lead to global emissions going up from the use of these products, wherever that may be, but also the individual country’s carbon footprint due to the addition of this offshore industry, making it difficult for them to reach their nationally determined contributions, as written by the Paris Agreement on Climate Change. What the Stanford study did find, was that despite the wide variation in the carbon footprint of oil production, the best averaged out estimate would be 10.3 g of CO<sub>2</sub> per megajoule of crude oil.

Then of course is the physical burning of fossil fuels. According to estimates published by the United States Environmental Protection Agency, oil and gas vary in the CO<sub>2</sub> that they emit during combustion. Oil emits about 8-10 kilograms of CO<sub>2</sub> per gallon, or 30-37.8 kg per liter and natural gas emits about 0.05 kg of CO<sub>2</sub> per square cubic foot, or 1.775 kg of CO<sub>2</sub> per cubic meter (Center for Corporate Climate Leadership 2018). It is also noted that although natural gas may seem like a low CO<sub>2</sub> alternative fuel, it does produce large amounts of methane compared to the other fuels, which has a far more intense (about four fold) greenhouse effect than CO<sub>2</sub>.

According to a 2010 report from the US Geological Survey, estimates of the offshore fields in the Eastern Mediterranean Sea are 1.7 billion barrels of oil and 122 trillion cubic feet of



natural gas in the Levant Basin (US Energy Information Administration 2013). This has the potential to power the region for twenty years. Obviously, this has serious climate implications. The EPA calculates that each barrel of oil can be accounted for 0.43 metric tons of CO<sub>2</sub>, so this field, if it was completely used up, would be about 731 million metric tons of CO<sub>2</sub> from its oil fields. The natural gas reserves could be 6.7 trillion metric tons of CO<sub>2</sub>. (US Environmental Protection Agency 2020). For context, the global CO<sub>2</sub> emissions, from the energy sector alone, were 33 gigatonnes, or 33 million metric tons, in 2019 (International Energy Agency 2020).

### Climate Economics

Because of the threat that climate change poses, economists have come up with the “social cost of carbon,” or SCC. SCC is a concept of putting a price on carbon emissions, when you consider the damage that future emissions might cause. This is key for certain policies, such as the long-wanted-among-economists carbon tax. However, putting a price tag on each kiloton of greenhouse gas is a messy mix of science, economics, and social policy.

An important part of determining SCC is the discount rate. Discount rates are a calculation of finding out the future value of something. For example, a dollar purchased today will be worth so many dollars in 2050. In climate economics, this translates to how it is calculated that, when considering environmental degradation, how the value of something will go down in the future. The calculation of the discount rate, say \$50 today will be worth \$40 in the future, is an important factor in finding the social cost of carbon.

The United States government began integrating SCC into air pollution calculations under President George W. Bush, although it is stemmed from an executive order for cost and benefits calculations in all new government regulations from Ronald Reagan. This was expanded for various applications including consumer goods during Barack Obama’s administration

(Ladislaw 2013). Part of the Obama-era updates including increasing the SCC due to better modeling standards. This includes everything from health risks to loss in agriculture due to climate change.

The amount to price the SCC changes depending on what variables are included as well as the discount rate that is applied. The current trend is to say \$50 per ton of carbon (Environmental Defense Fund 2020). Some experts think this is far too low. Also, the SCC changes depending on where it is calculated. In a heavily polluting country, it will be much higher than in a low-carbon one. The SCC is also not unilaterally used. The European Union nor the United Kingdom do not use it due to its imperfect calculation, but it is popular to use it in some decisions by private investors in Europe.

## POLICY RECOMMENDATION

Judging by the different inputs of this analysis, it is clear that the oil and gas drilling in the Eastern Mediterranean Sea will do more harm than good, both for the economy of the region and for its environment. Although it may be enticing for the European export market and the possibility for energy independence, the endeavor is too risky when taking into consideration the environmental damage that it will cause. A fully mature extraction industry in the Eastern Mediterranean Sea would not lead to further economic development in the region, especially since it is most likely the SCC will be high in the region.

The two major benefits of the offshore drilling industry in the Eastern Mediterranean are energy independence and the export industry. The discovered fields have large amounts of energy that can be used within the region. The petroleum and natural gas stocks can be used to fulfill the transportation and electricity sectors across Egypt, Israel, and Lebanon for decades. This is important due to limited supply of these resources in the Levant, despite it being

surrounded by large reserves in Syria, Iraq, Arabia, and North Africa. The potential of this should not be downplayed. With large populations that are becoming more urban, the energy needs of the region will only grow in the future.

The geography in the Eastern Mediterranean is close to European markets, so it is logical to build a pipeline to the continent, in order to counter North Sea and, especially, Russian gas and oil. This could bring economic diversification to the region, but even that is very speculative at this point. Oil and gas from Russia is currently inexpensive to produce, whereas offshore drilling in the Eastern Mediterranean, by most estimates, will be far more expensive. There is also the possibility that due to the plan to go through either Turkey or Cyprus with a pipeline, that the geopolitical situation gets far more intense. Lastly, current energy policies through 2050 plan for lower fossil fuel consumption across Europe. The total demand for the European market could very well drop, leaving the investments across the Eastern Mediterranean economically unviable.

There are many drawbacks from the offshore drilling industry. The major ones are issues related to resource-based economies, threats from oil spills, and increasing the rate of global warming. While oil spills and the resource curse are easily trackable as a source of difficulty in a country, climate change, a global phenomenon, is caused by factors around the world but it is clear that oil and gas drilling do contribute a large amount to it. This means that the environmental planning could overlook greenhouse gas emissions for these projects. That is why any decision by policy makers regarding going forward with offshore drilling in the Eastern Mediterranean should take a holistic view and consider all environmental and economic factors.

Easily the most visible threat posed from offshore oil drilling is the possibility of an oil spill or other accident. Oil spills pose a huge threat to the area's ecosystem. They can ruin

beaches, crash fish stocks, and bring shipping navigation to a halt. Oil spills bring negative PR to a firm and brings large amount of public opposition to new projects. Natural Gas is not immune to this either. Being a hydrocarbon, it is very flammable. Pipelines, tanks, and LNG ships can cause extensive explosive damage if an accident such as an electrical malfunction or loose cigarette butt being tossed aside incorrectly should occur. This is also why any fossil fuel infrastructure is a good target for an attack in a war or civil strife.

The threat of the resource curse is also very real. Transferring to a resource-based economy or relying too much on the exports from the fossil fuels, could lead to poor economic and political situations. Often, in these situations income inequality goes up, causing democracy and civil rights goes down. This is especially true if there isn't enough investment in other parts of the economy or in social services, to help build the parts of society that live outside of the relatively small in population hydrocarbon industry. Many parts of the Eastern Mediterranean already lack proper economic development, so mismanagement could easily lead to worse conditions in the region because of the growth of the offshore drilling industry.

Probably the biggest threat to the planet, economically included, is climate change. In the Eastern Mediterranean, it will disrupt multiple aspects of daily life, and by all measures, make it harder. Drilling in the region will add to global warming and increase the region's footprint. Judging by the potential profit and the current social cost of carbon, it seems from a climate perspective that this endeavor is not a good decision to move forward. At best, it can only be worth it by having a very limited amount of drilling for a short time period.

When it comes to the argument of economic development and fighting climate change, it is often read as mutually exclusive. Traditionally, environmentalism was something for developed economies to take part in. More and more it is becoming obvious that is extremely

flawed logic. To focus on short term economic gains will lead a country to be liable to long term losses as its environment is degraded. The Eastern Mediterranean region now faces that choice, in a time of unprecedented climatic change. Unchecked proliferation of the offshore oil and gas industry in the region will lead to multiple social, economic, and environmental damages that will not be worth the benefits from drilling.

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