

New technologies for Eastern Mediterranean offshore gas exploration

Environmental risks and policies for their mitigation

This study examines the evolution of technologies in the offshore exploration and production of hydrocarbons in the Eastern Mediterranean, and their future environmental impact for the region. It reviews the existing literature and draws upon the expert opinion of various business, policy and academic insiders, and finds that the main risks come from accidental discharges at sea from well blowouts, chemical releases and the associated greenhouse gas emissions. It also finds that new technologies propel this stage of natural gas development towards increasing digitalisation, better designs for safety equipment, and increased automation.

Policy options

Given this setting, the policy options outlined below are aligned with these technological developments and the geopolitical realities of the region. They are grouped in three main categories: i. Policies targeting environmental protection directly; ii. Policies targeting data sharing and collaboration; and iii. Policies targeting the reduction of greenhouse gas (GHG) emissions.

The following passages adhere to these broad guidelines:

- Timescale: Short: Up to 2 years; Medium: 2-5 years; Long: Over 5 years.
- Cost (per annum): Low: Up to US\$50 million; Medium: US\$50-250 million; High: Over US\$250 million.

Policy option 1: Reducing environmental risk

This first measure concerns updated legislation and measures around the safe deployment of critical safety equipment, the devices that were ineffectual during the 2010 BP DeepWater Horizon (DWH) disaster. It is argued that a concerted effort between the countries of the Eastern Mediterranean rim can lead to the adoption of test protocols in a future update of Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations, which would be compatible with the independent verification system for EU countries. New stack designs adhering to this regulation can be engineered to reduce the time required for the required tests, thus reducing costs. New designs can also allow the stacks to pass the tests in deep waters, where there is still significant uncertainty regarding the applicability of current solutions. Greater automation means AUVs or ROVs can be equipped to speed up the test, increase the clarity of results, and significantly reduce human error. Digitalisation and data sharing play a horizontal role in management of the tests, speedy analysis and replicability.

In addition, baseline environmental surveys and continuous monitoring, and strategic environmental assessments (SEAs), are required to significantly improve the environmental profiling of the region. Baseline surveys should be carried out throughout the entire region, adhering to rigorous international standards, and comprehensive surveys should be carried out within the planning area in, and outside of the influence of typical impacts. These baseline surveys should

include high-resolution mapping, seafloor imagery, and physico-chemical and biological sampling to completely characterise the marine environment, its floral and faunal community and ensure proper species identification. In a similar approach to the way climate scientists monitor the atmosphere for changes, monitoring equipment should be installed across the region to assess the environmental health of the Eastern Mediterranean marine environment on a continuous basis. A continuous and seamless time-series of data from an adequately dense grid should be available that can be examined against any environmentally risky event related to exploration. Moreover, SEAs can be extremely valuable as national/regional tools to identify development options that can achieve sustainable use and national/regional conservation goals.

The following table provides an overview of the policy measure proposed within this group:

Reducing environmental risks			
Policy	Critical safety equipment	Baseline surveys and environmental monitoring	Strategic environmental assessments
Potential costs	High	Moderate	Low
Potential benefits	Very high	Very high	Medium
Time horizon	Short to medium	Short to long	Short

Policy option 2: Data sharing and collaboration

The second group of policy options advocates for better standardisation and open-access platforms of environmental and safety data. This will bring the countries of the region towards a path of convergence, and can culminate in the creation of a joint regional policy and technology research centre, which can help coordinate these efforts and be the first step for all related assessments.

The first measure is the collection, storage and sharing of detailed data from the continuous monitoring activities (see above), about the marine environment, the seabed and the undersea formations and data available from seismic surveys, among others. This dataset would be accessible via an open-access platform. The recipients could be scientists, managers and environmental services within governments. It would reduce costs considerably and simplify the process of environmental mapping and monitoring, while facilitating collaboration, adherence to common standards and practices among all stakeholders, as well as the promotion of relevant research.

The fusion of operational with information technology calls for a common set of standards that meets stringent operational rules but also allows for information sharing across organisations. These standards should ideally be set by a common body of standardisation organisations of the countries in the region, which would need to be created. Despite the fact that the industry has a long history of sharing data for industry-wide improvements of safety standards, it does not exhibit a similar attitude to cooperation in robotics and digital platforms. The development of common standards (through the relevant authorities and stakeholders), is considered of great importance.

A culmination of such measures could be the establishment of an Eastern Mediterranean technology and policy research centre. Such a centre would:

- Conduct high quality research on matters of environmental monitoring and impact assessment;
- Share research findings and disseminate them through the correct channels, including workshops, conferences and public lectures;
- Maintain open-access databases using data from environmental monitoring (see above);

- Provide advice on technical issues and on policy options with an emphasis on environmental protection;
- Coordinate between national research and development centres, academia and private companies and forge regional alliances for conducting and disseminating research of common interest. This centre will in effect act as a knowledge hub and a dissemination centre for all the technologies and policies described.

The table below presents an assessment of the policy options within this group:

Data sharing and collaboration			
Policy	Open-access platforms for environmental data	Standards and regulations for robotics and digital platforms	Create Eastern Mediterranean technology policy and research centre
Potential costs	Low	Medium	Medium
Potential benefits	Medium to high	Medium	Very high
Time horizon	Short	Medium to high	Short to medium

Policy option 3: Reductions of GHG emissions

The third policy options group addresses the increasingly alarming levels of GHG emissions in the gas exploration and production phase, through three policy measures, described below.

The first is to promote the interconnectedness of energy systems to achieve efficiency gains throughout the upstream gas chain. This will allow for market integration, security of supply, provide a platform for competitiveness and innovation, and adhere to the general European objective of convergence towards integration. Above all else however, it can provide significant efficiency improvements in the connected energy system through balance loading, and allow the absorption of larger percentages of stochastic energy sources, such as mainstream renewables (solar, wind etc.). This can be achieved through EU legislation on energy, in line with the current national binding agreements for GHG emissions, and part of the future (e.g. 2050) vision for the EU energy system.

Secondly, special efforts should be made through a policy framework for the monitoring, controlling and eventual reduction of fugitive methane emissions, a very potent GHG. The extent of gaseous leaks from oil and gas infrastructure remains disputed and insufficiently measured worldwide, and scientists are only just now beginning to grapple with the magnitude of the issue. Addressing it has to start from useful data on these leaks. The right infrastructure and technologies have to be developed to monitor a) on-site and on-platform leaks; and b) background coastal emissions levels. This proposal aligns with the creation of the technology and policy centre for hydrocarbons in the Eastern Mediterranean, as described above. This centre could coordinate the testing and operation of the equipment required.

Lastly, it is argued that the industry should take the lead in investigating the feasibility of carbon capture and storage (CSS) for the area, because of the enormous potential for future GHG reductions. However, this has to be pursued with caution: there have been reports of solid and marine acidification from CO₂ dissolving, and if CSS is not combined with some sort of CO₂ utilisation (e.g. enhanced oil recovery – EOR – conversion of CO₂ to chemicals and fuels, mineral carbonation), the potential reduction in GHG emissions is significantly reduced. In addition, oil and gas companies see CSS as a technological solution that can do away with the need for mitigation measures, which is contrary to the policies and vision the EU has set for its energy future.

The following is an assessment of the three policy measures proposed in this group:

Reductions of GHG emissions			
Policy	Promote interconnectedness	Reduce fugitive methane emissions	Offshore exploration with carbon capture and storage
Potential costs	High	Medium	Very high
Potential benefits	Medium	High	Very high
Time horizon	Long	Short to medium	Medium to long

Conclusions

This study finds that systematic collection and sharing of environmental information for the Eastern Mediterranean is distinctly lacking. This is an enormously important point for an environmentally fragile marine area that has not yet experienced the extent of exploitation seen in other areas. Systematic, complete and highest calibre mapping of the area's status (through baseline surveys and SEAs), to be followed by continuous monitoring of relevant data (e.g. salinity, PH, biodiversity, chemical compounds release etc.) is considered essential. Correctly recording, cataloguing, sorting, safekeeping and sharing this information on open-access platforms, is also vital for the benefit of the research community, policy-makers and oil and gas explorers operating in the Eastern Mediterranean.

This confluence of tasks is best suited to a properly tasked scientific research and policy centre located in the Eastern Mediterranean, which will act as a hub and perform research, collect and disseminate information, advise governments, monitor the environmental health of the sea, and influence national and regional policy on hydrocarbon exploration matters. Such a centre would accelerate and simplify the operations of all relevant stakeholders and would make sure that the right actions are taken to minimise the risks from any impending oil and gas exploration activities in the region.

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