

European Union – EuropeAid/137502/DH/SER/LB

Technical Assistance to Support the Government of Lebanon's Preparation of Exploiting and Producing Offshore Oil and Gas Resources

Strategic Environmental Assessment (SEA) for Exploration and Production Activities Offshore Lebanon

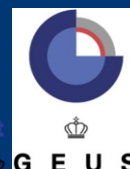
SEA Report
Non-Technical Summary (NTS)

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Republic of Lebanon
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Strategic Environmental Assessment (SEA) for Exploration and Production Activities Offshore Lebanon

SEA Report – Non Technical Summary

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NON-TECHNICAL SUMMARY (NTS)

I. INTRODUCTION

Within the framework of the first offshore oil and gas licensing round in Lebanon, the Minister of Energy and Water (MOEW), following the recommendation of the Lebanese Petroleum Administration (LPA) and in consultation with the Ministry of Environment (MoE), launched the update of the Strategic Environmental Assessment (SEA) for exploration and production activities for offshore petroleum resources in Lebanon. Previously, the first SEA study for the offshore E&P activities in Lebanon was undertaken in early 2012.

In April 2012, the Lebanese government issued the SEA Decree No. 8213, stipulating the procedures for conducting SEA studies for policies, plans and programs in Lebanon. According to Article 2 of the decree, "SEA is a planning and management method for avoiding or, at minimum, reducing sources of pollution and depletion of natural resources by way of assessing environmental impacts of policy, program, plan, study, investment or organization proposals that tackle a Lebanese region or an activity sector, identifying necessary mitigation measures and enhancing positive outcomes on the environment and natural resources, prior to their acceptance or refusal". It is important to note that while the definition of the SEA in the SEA Decree focuses on the impacts on the environment and natural resources, the impact assessment also considers social and economic impacts (Refer to Annex 3 of Decree 8213/2012). The SEA however does not attempt to assess whether the sector is promising or not from an economic point of view or to demonstrate that negative and positive impacts are balanced, but rather, the SEA aims to ensure that impacts and their sources are identified, and that effective measures to manage these impacts are in place early on prior to the start of petroleum activities.

The SEA Study Update is conducted under the European Union (EU) financed PROMARE Technical Assistance Project ("Technical assistance to support the Government of Lebanon's preparation of exploiting and producing offshore oil and gas resources") and is implemented by the international GFA Consulting Group and its consortium partners, and led by its local partner, Earth Link and Advanced Resources Development (ELARD).

The objectives of this SEA study update are to:

- Inform the exploration activities in the awarded blocks (4 & 9) and subsequent exploration activities arising from future licensing rounds taking into consideration environmental criteria;
- Inform the next licensing rounds with respect to blocks to be opened taking into consideration environmental criteria;
- Inform the Development and Production Plans (PDP) taking into consideration environmental criteria;



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- Ensure consistency of E&P activities with other national, regional, sectorial plan/strategies /policies and international commitments;
- Engage stakeholders including interested public in a participatory approach and build trust;
- Advise on the need for transboundary notification and consultation;
- Advise on filling existing gaps in environmental and social requirements;
- Provide environmental management and monitoring frameworks for the sector; and
- Streamline the EIA process for E&P activities that will be subject to an EIA study.

II. BACKGROUND ON THE OFFSHORE OIL AND GAS SECTOR IN LEBANON

In 2010, the Offshore Petroleum Resources Law (OPRL) – Law 132 dated 24/8/2010 - was endorsed by the Lebanese parliament establishing the overall legal framework for offshore petroleum Exploration and Production (E&P) activities in the Lebanese offshore Exclusive Economic Zone (EEZ). Subsequently, the Council of Ministers (CoM) established the Lebanese Petroleum Administration (LPA) mandates and modus operandi through Decree No. 7968 in April 2012. The LPA board members were appointed through Decree No. 9438 in December 2012. The Petroleum Activities Regulations (PAR) were issued by Decree No. 10289 in April 2013 to further implement the OPRL provisions.

As required by Article 7 of the OPRL, a Strategic Environmental Assessment (SEA) study was conducted for offshore E&P activities in Lebanon between 2011 and 2012 before opening the first licensing round in 2013. In 2013, Lebanon completed a first pre-qualification round to enable prequalified companies meeting technical, financial, legal and QHSE criteria to participate in the 1st offshore licensing round. However, the bid round was postponed until January 2017 when two pending decrees were approved by the Council of Ministers, namely Decrees No. 42 and 43. Decree number 42/2017 delineates the division of the Lebanese Maritime Waters into ten (10) Blocks (Figure 1) which will be open for bidding in a gradual manner throughout the licensing rounds. Additionally, the decree accounts for a buffer zone (of 3 nm within the territorial waters) where petroleum activities are not allowed unless the Council of Ministers issue a decree to permit otherwise. Decree No. 43/2017 established the tender protocol and the model Exploration and Production Agreement (EPA) (Annex 2 of the Decree).





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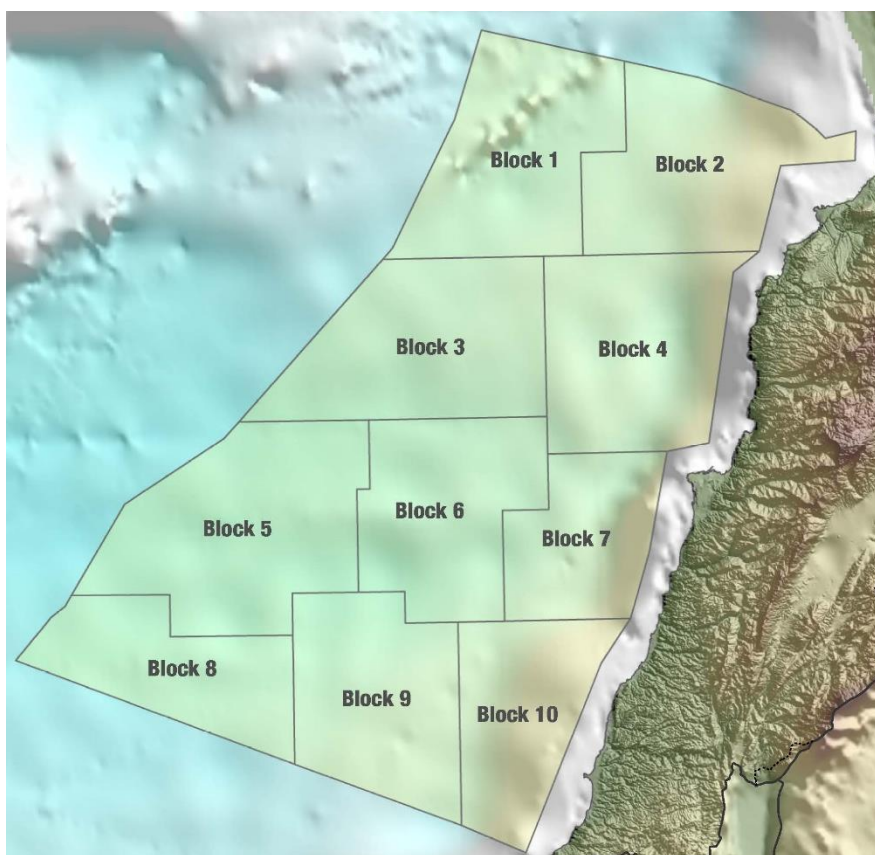


Figure I Lebanon's Offshore Blocks

The first licensing round was successfully completed (where 5 blocks were open for bidding (Blocks 1, 4, 8, 9 and 10)) with the signature of the first two (2) Exploration and Production Agreements (EPA) for Blocks 4 and 9 on December 14, 2017 with a consortium of three international oil companies (IOCs) (Total SA, ENI International BV and JSC Novatek). On the 17th of May 2018, the CoM approved the recommendation of the LPA to undertake the preparation for a second offshore licensing round which was launched early 2019. Blocks 1, 2, 5, 8 and 10 are opened for bidding during the second licensing round with bidding deadline set for January 2020.



III. SCENARIOS FOR EXPLORATION AND PRODUCTION ACTIVITIES OFFSHORE LEBANON

Once an EPA is signed for a specific Block, oil companies have the legal right to initiate E&P activities. These typically include:

- ✓ **Reconnaissance activities:** pre-drilling seismic surveys and geological and geophysical investigations to identify drilling targets; such activities can last a few weeks up to 1 months per survey
- ✓ **Exploration activities:** drilling of exploration and appraisal / testing wells to confirm the presence of hydrocarbons (in this case named a discovery), and if confirmed, evaluate the size and commerciality of the discovery; drilling of an exploratory well could last a few months (approximately from 2 to 4 months)
- ✓ **Development and Production activities:** if a commercial discovery is made, these activities include drilling of production and injection wells and establishment of the necessary infrastructure (such as pipelines and processing facilities) to convey the discovered hydrocarbons to their intended markets along with other required infrastructure (including waste management and utilities) to support the production phase; the development phase typically lasts between 2 years (in mature fields) up to about 5 years in new areas where infrastructure is not available; the production phase is then the longest phase in the lifetime of a discovery (up to 30 years)
- ✓ **Decommissioning:** once the quantities of hydrocarbons in place in a reservoir are no longer commercially exploitable, the production facilities are decommissioned including well/platform abandonment and site restoration, as needed.

The extent and types of E&P activities are highly dependent on the size of commercial discoveries (if any), types and quality of hydrocarbons found (e.g. gas and/or liquids), market demand for these hydrocarbons, and their market price (among other factors). Therefore even though Lebanon has awarded exclusive petroleum licenses for Blocks 4 and 9, it is practically impossible to anticipate how the sector will evolve and accordingly what would the associated benefits and impacts be until commercial discoveries are actually made and developed.

Accordingly various assumptions have been made to develop hypothetical scenarios that would cover a wide range of activities, and can therefore be used to assess the significance of impacts under each scenario and develop mitigation and monitoring measures to be adopted by oil companies and the government as the sector develops further.

A total of four (4) scenarios are considered in this SEA update:

- ✓ Scenario 0 – “Do Nothing” Scenario: this scenario is hypothetical and considers that there are no offshore E&P activities conducted in Lebanon; it is the reference scenario or Business As Usual (BAU) scenario; it considers the likely trends of environmental and socio-economic conditions without the E&P activities in Lebanon, for comparative purposes;
- ✓ Scenario 1 – “No commercial discoveries” Scenario: this scenario considers that reconnaissance and exploration activities are conducted offshore Lebanon, however no commercial discoveries are made, and therefore development and production activities are not initiated;
- ✓ Scenario 2 – “Low Development” Scenario: this scenario considers that exploration activities lead to a modest commercial discovery that satisfies the national demand for natural gas for electricity generation (Gas to Power) but is not sufficient for other uses (e.g. industrial use) nor for export;
- ✓ Scenario 3 – “High Development” Scenario: this scenario considers that exploration activities lead to significant commercial discoveries leading to a high emphasis on exports and potential use of the resources for value-addition (in addition to Gas to Power).

IV. LEGAL AND POLICY FRAMEWORKS

The SEA update includes an analysis of the compatibility of the E&P activities with international treaties and conventions signed and ratified by Lebanon, with existing and planned laws, decrees and decisions, as well as with other policies, plans, strategies or programs of relevance to such activities. The objective of this analysis is to ensure that gaps in legislation to address environmental and socio-economic aspects of the sector are identified, possible areas of non-compatibility but also synergies with other policies are highlighted and recommendations are made to be addressed at the early stages of the sector development.

International Conventions, Treaties and Agreements

Lebanon has ratified most conventions related to the protection of the environment and the maritime domain including the Barcelona Convention and various protocols (but did not sign the 'Offshore Protocol related to the Protection of Mediterranean Sea against Pollution from Exploration and Exploitation of the Continental Shelf, Seabed and Subsoil'), the MARPOL 73/78 and its annexes that regulate wastes and discharges from vessels (except for Annex VI on air emissions from vessels) and the ACCOBAMS convention on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic.

These international agreements provide a strong regulatory framework to manage many of the expected environmental impacts of the sector.

National Legislation

The Lebanese corpus of legislation also provides a strong basis for the control and management of impacts from E&P activities. There are however several gaps, and recommendations are made in the SEA to bridge these gaps.

Policies, Plans, Strategies and Programs

When analyzing compatibility of offshore E&P activities with other Lebanese policies, the following is to be noted:

- ✓ Lebanon has committed to support achieving the UN Sustainable Development Goals (SDGs); it is important that E&P activities integrate from the onset SDG goals and targets to ensure alignment to the largest possible extent; this has been achieved in this SEA by using the SDGs as guidance in developing SEA objectives, targets and indicators
- ✓ Lebanon's Nationally Determined Contribution under UNFCCC (2015): Lebanon has committed towards the international community to an unconditional GHG emission reduction of 15% compared to 2011 emissions; While E&P activities could lead to the discovery of gas resources that can be used by the power sector, and would therefore support the NDC targets, such activities also lead to GHG emissions; the SEA provides recommendations in terms of development options to be adopted and mitigation measures to reduce the risk of compromising Lebanon's unconditional targets
- ✓ The National Renewable Energy Action Plan, 2016/2020 (MoEW): development of E&P activities is not incompatible with the government's plans to increase the share of renewables in its energy mix; on the contrary, if significant commercial findings are made, associated revenues can be used to invest in renewable energy projects
- ✓ Lebanon's National Biodiversity and Action Plan (NBSAP) 2030: the SEA has integrated relevant NBSAP objectives as part of the SEA objectives, targets and indicators

Environmental Governance

Sound environmental governance and regulation of the offshore Oil & Gas sector shall give assurance to:

- Prevent and reduce as far as possible the occurrence of major accidents and limit their consequences on people, environment and assets;
- Preserve and protect the environment and communities, in particular the marine environment and coastal economies against pollution;
- Conservation of Lebanon's natural resources;

Lebanon has a unique opportunity to create a fit for purpose HSE governance system for a nascent industry in Lebanon. In order to achieve this, the HSE Governance Framework shall:

1. Ensure the establishment of a well-defined mandate for regulating, monitoring and enforcing the HSE matters throughout the sector's life cycle
2. Clearly define the roles and responsibilities, commitments and liabilities of all involved stakeholders in the sector.
3. Integrate Health, Safety and Environmental aspects within the sector's management, including Major Accident to the Environment, rather than adopt an aspect approach.
4. Ensure that the HSE regulator is independent from economic regulator (resources management). This can be achieved through structural or functional arrangements.

The petroleum regulations clearly identify MOEW-LPA as the main regulator of the sector, where the integrated approach to HSE is, to a great extent, achieved in the mandated role of the Quality, Health, Safety and Environment (QHSE) department within LPA which supervises and oversees the implementation and compliance of HSE aspects, while also recognizing the need for coordination with other relevant entities at multiple instances. Meanwhile, the independence between HSE and economic management and regulations is not assured in the current governance arrangements.

V. EXISTING ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

To be able to assess the possible environmental and socio-economic impacts from offshore E&P activities in Lebanon, it is important to first understand their existing conditions and their likely evolution without any E&P activities. It is then possible, provided there is sufficient information available, to assess whether such conditions will be improved (positive impacts) or deteriorated (negative impacts) due to E&P activities and to propose measures to enhance positive and avoid/minimize negative impacts.

This section provides a summary of the analysis of existing conditions in Lebanon.



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Geographic and Biological Features

On the margins of land masses, marine waters are very shallow and overlay an underwater extension of continental lands called the continental shelf. On global scale, the slopes generally range from 0 m depth from the shore to depth ranging between 100-200 m. At the outer edge of the shelf, there is an abrupt steeping of the sea floor to become the continental slope with different depth ranges for different parts of the world. The continental slope then descends precipitously until the bottom becomes the flat, extensive sediment covered plain. The area beyond the continental slope is referred to in this SEA as the deep-sea plain. In Lebanon, the continental slope reaches a depth of approximately 1,600-1,700m before the sea floor stretches into the deep-sea plain with approximate depth ranges from 1,600m to 2,100m (Figure II).

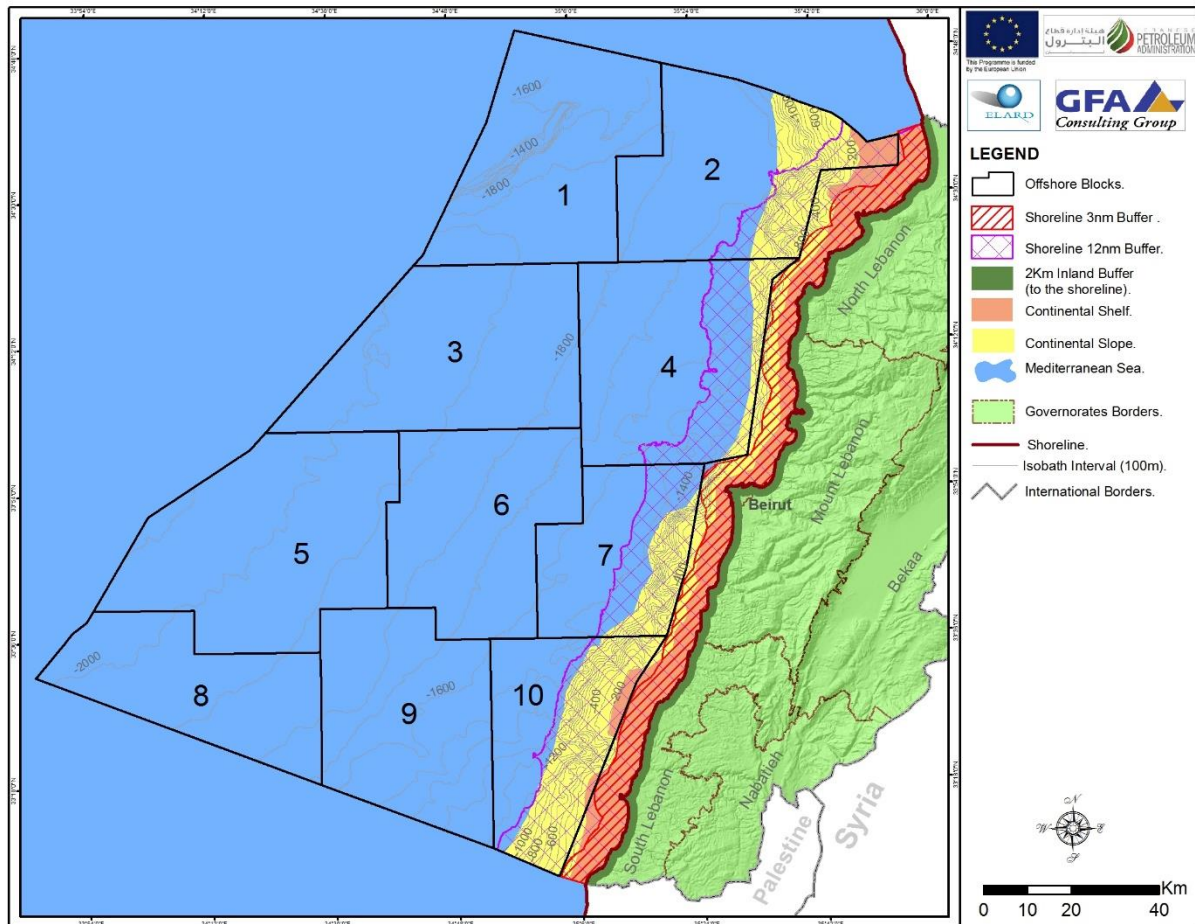


Figure II Geographic features of the sea basin off the coast of Lebanon and the Ten Offshore Blocks





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Continental shelves are one of the most productive parts of marine environments. Given the extensive anthropogenic pressures exerted on the Lebanese coastal zone (due to urbanization, industrial activities, shipping, fishing, tourism, etc.) including the continental shelf, it is imperative that all precautionary measures be taken to protect and conserve this biome due to its importance to human food security and overall marine ecosystem productivity and equilibrium.

In parallel, the continental slopes present highly localized biodiversity (localized on the slopes) which is fundamental to the production of valuable fisheries, energy, and mineral resources, and performs critical ecological services (nutrient cycling, carbon sequestration, nursery and habitat support).

Even though minimal research activities have taken place on the continental slope and its canyons off the Lebanese coast, serious conservation actions are required to preserve the functions and services provided by these deep-sea environments that science is just starting to understand. Recent surveys in Lebanese Canyons down to a depth of 1,000 m undertaken by IUCN and partners through the OCEANA project with the Ministry of Environment and CNRS confirm the ecological importance of these habitats.

As for the **deep-sea plains**, knowledge of the biodiversity remains extremely low. They are characterized by the absence of light (absence of photosynthesis), mild to non-existent currents and very specialized biodiversity that can survive in dark, cold, high-pressure environments. Even though more research is being carried out in the Mediterranean, there is no 'total biodiversity' census (i.e., the biodiversity of all forms of life) of any deep-sea region. Scientists nevertheless highlight the presence of clear differences in knowledge of the deep-sea Mediterranean biota due to the fragmented spatial coverage of investigations, which is short of reflecting "*the true species richness*".

Bathymetry

The Lebanese continental shelf is relatively narrow, and is considered, as for all continental shelves around the world, the most productive part of Lebanese waters where most fishing activities are concentrated. It can be divided into 3 main parts:

- ✓ the widest part (18 Km) between Enfeh and Akkar;
- ✓ between Enfeh and Ras Beirut where the coastal plain is very narrow or almost non-existent (in this part, the continental shelf does not extend to more than 3 Km; and
- ✓ from Ras Beirut till Naquoura where the continental shelf widens up again reaching 7 Km.

Between Beirut and Batroun, the shelf is extremely narrow and the margin exhibits its steepest slope, with the water depth dropping from 100 to 1,500 m in less than 5 km in some areas.

The bathymetry of shallower waters (0-200 meters depth) between the coast and up to 10 km seaward is in the surveying process. Once complete this will connect the inland



geomorphology with the seabed relief already mapped during the bathymetric cruise SHALIMAR survey by Ifremer and other subsequent hydrographic campaigns.

Deep canyons characterize the continental slope of the Lebanese coast. Almost 518 large submarine canyons have been identified in the Mediterranean Sea and are considered as key structures for its ecosystem functioning.

Ecologically and Biologically Significant Areas (EBSAs)

Within this context, efforts at the Convention of Biological Diversity (CBD) to define and protect the **Ecologically and Biologically Significant Areas (EBSAs)** for the Mediterranean is underway. Accordingly, an EBSA for the East Mediterranean under the title of East Levantine Canyons Area - ELCA is proposed (<https://www.cbd.int/meetings/EBSAWS-2014-03>).

The ELCA is featured by its deep canyons all along the Lebanese and Syrian coasts, several hydrothermal vents, submarine freshwater springs in addition to its being of particular importance biologically.

Important Biodiversity Areas and Cultural Sites

Important Biodiversity Areas and cultural sites including existing Marine Protected Areas (MPAs), proposed MPAs based on Lebanon's Marine Protected Areas Strategy prepared by the Ministry of Environment and IUCN, OCEANA's deepwater survey studies and sites prioritization conducted by the Environmental Resources Monitoring (ERML) project are located along the Lebanese coast. There are currently two Coastal Nature reserves (Palm Islands in the North and Tyre Coast Nature Reserve in the South, noting that the latter extends by Law to the entirety of the territorial waters facing the reserve), fourteen (14) proposed Marine Protected Areas and four deep water sites proposed for conservation. There are also nine (9) coastal sites identified by the MoE as coastal sites of special significance and protected by national legislation, mainly consisting of river estuaries.

Marine Biodiversity

The knowledge of the marine biodiversity in Lebanon is relatively limited, and while some information has been recorded throughout the years in coastal waters, very limited information exists about the deep sea environment. Existing information indicates the presence of a rich marine biodiversity that is under threat due to human pressure, including coastal pollution from discharge of untreated wastewater, coastal dumps and industrial facilities, increased maritime transport, and climate change.

Seawater and Sediments Quality

Data about seawater and sediments quality are also very limited in Lebanon. Coastal water quality and sediments suffer from various sources of pollution. Little is known about their quality in deeper waters.



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Air Quality and Climate Change

Available monitoring data, mainly from studies and from results of the Ministry of Environment's Air Quality Monitoring Network (AQMN), indicate that certain contaminants, particularly NO₂, particulate matters and ozone are already subject to exceedances to standards.

Main contributors to air pollution in Lebanon are electricity generation, transport, and industry. A large fraction of these emissions are concentrated in main coastal cities including Beirut, Zouk Mikael, Jiyeh, and Chekka.

On-going plans to avail imported natural gas to coastal power plants in Lebanon could significantly reduce sources of air pollution and help improve air quality in coastal cities. Further enforcement of environmental compliance would also contribute to reducing air pollution from the industrial sector. Major public transport infrastructure and initiatives to promote hybrid and electric cars in Lebanon would further reduce emissions from transport sector.

In terms of Greenhouse Gas (GHG) emissions, it was estimated that in 2013, Lebanon emitted around 26,285 Gg CO₂ equivalent with the most significant GHG being carbon dioxide, primarily produced from the burning of fossil fuels. CO₂ removals from the land use, land use change and forestry category amounted to 3,518.80 Gg CO₂, bringing Lebanon's net emissions down to 22,766 Gg CO₂ equivalent. The main contributor to GHG emissions is the energy sector with 56% of GHG emissions, followed by transport (23%), industrial processes (10%) and waste sector (7%).

Lebanon aims to reduce GHG emissions by 15% as an unconditional target and 30% as a target conditional to financial and technical support. The Government of Lebanon (GoL) is committed to this under the Nationally Determined Contributions (NDC) submitted under Paris Agreement which Lebanon signed in 2016. The total cumulative **unconditional** reduction in 2030 compared to the BAU scenario is **1,511,675 Gg** while the **conditional** reductions amount to **3,616,075 Gg**. This reduction will originate from the implementation of policies and activities for the power, transport, waste and forestry sectors.

Noise

No measurements of underwater noise currently exist in Lebanon. Gaps in such data should be filled by future environmental monitoring campaigns.

Economy

The Lebanese economy has been witnessing a reduction in growth since 2004 due to local and regional political and security uncertainties. In more recent years, this has been accelerated by the Syrian crisis which increased the pressure on Lebanese resources. GDP growth dropped to 0.9% in 2011. It increased to 2.8% in 2012, slowed again in 2013 with a drop to 2.6% and 2% in 2014 to reach 0.8% in 2015 before increasing again as of 2016. Some key facts are presented below based on the draft Economic Vision Report published by the Ministry of Economy and Trade late 2018.

Overall, real GDP growth between 2010 and 2017 is reported to be 1.3%. GDP in 2016 is reported at 51 Billion USD of which contribution from Agriculture/ Forestry and Fisheries (3%





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GDP), Manufacturing (10% GDP) and Hotels & restaurants (representing tourism sector) (3%) is only 16%. These sectors employ only 26% of labor force (total labor force in 2016 estimated at 1,977,000 persons).

Inflation in 2016 was reported to about 2.6%. Deficit in National Budget in 2016 was 4.9 billion USD.

Based on the economic vision (not yet endorsed by the Lebanese government), if implemented (it does not consider the impacts from the oil and gas sector), economic growth would improve by primarily investing into agriculture, industry, tourism, knowledge economy, financial services and diaspora support. Targets for the year 2025 are to reach 5 to 6 % real GDP growth, 80 billion USD GDP, and an additional 370,000 jobs.

Population, Demographics and Living Conditions

The total Lebanese population estimate is 4.3 Million. The total displaced persons from Syria are around 1.5 Million. The total of Palestine displaced persons is around 495,985. Some additional baseline information cover (2017):

- ✓ Average population growth rate is 1.5%
- ✓ Age segregation: 27.4% of Lebanon's resident population is youth; aged between 15-29 years
- ✓ Life expectancy at Birth: 81.2 years
- ✓ 2,871 schools, one public university and 47 private universities in addition to vocational schools
- ✓ Unemployment rate: 15 to 25% of active population (according to the Economic Vision baseline values); 21.6% are youth
- ✓ Unemployment rates are particularly high for women (18 %) and youth (21.6%)
- ✓ Around 27 to 28.5% of the population were considered poor and were living below 3.884 USD per person per day between 2008 and 2011 with 10% of the population were extremely poor. This has risen by 6% between 2011 and 2015, after the Syrian crisis erupted in 2011.
- ✓ According to the National Poverty Targeting Program (NPTP), every household living below 3.84\$/capita/day is classified as an extreme poor Lebanese household. Until December 2013, a total of 42,703 households were classified as extremely poor.

According to the draft Economic Vision, unemployment rates could decrease to 8% by 2025 and 6% by 2035.

Fisheries Sector

Lebanese fisheries are artisanal or traditional in nature, with the country's coastal waters containing more than 80 fish species being of commercial importance.

Fishing usually occurs to a maximum depth of up to 200 m, while most activities take place at an average depth of 50 m. However if the draft Fisheries Law is adopted by the parliament, commercial fishing would be allowed within the entire Lebanese EEZ.

The number of licensed fishing vessels in 2015 stood at 2193 boats operating from 44 fishing harbors and landing sites along the entire Lebanese coastline.

Fisheries data obtained from the Ministry of Agriculture (MoA) for the year 2017 reveal that the total catch in 2017 was about 3,536 tons. The highest catch was recorded for 2 species:





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Etrumeus teres (640.8 tons per year) and *Engraulis encrasicolus* (548.1 tons per year), followed by 242.7 tons and 219.2 tons per year for *Boops* and *Pagellus acarn* species. Significantly lower catch for other species (less than 200 tons per year) were observed.

As indicated in the Economy section above, the entire agriculture sector (including fisheries) contributes to a modest 3% to the Lebanese GDP. With the new fisheries Law (if adopted), the Lebanese fisheries sector would eventually shift from an artisanal sector to a more industrial one, eventually leading to an increase in the sector's contribution to the Lebanese GDP.

Tourism Sector

Tourism is a priority industry for economic development in the country. Around 1.9 million tourist arrivals to Lebanon were recorded in 2017 which increased since 2012. Tourists originate mostly from Europe (34.5%), Arab countries (30%) and Americas (17.5%).

Tourism infrastructure in terms of accommodation is considered sufficient with an average occupancy rate of Beirut Hotels in 2016 of 59%.

Tourism currently contributes 1.6 billion USD to the national GDP (roughly 3% of total GDP) and according to the draft Economic Vision, tourism contribution to GDP could increase to 3.7 billion USD in 2025 and 5.4 billion USD in 2035. Number of jobs offered by the sector and the total number of tourists could also increase.

Industry

The industrial sector in Lebanon suffers from a lack of competitiveness due to sub-optimal infrastructure and a relatively high cost of energy. There is also a general lack of industrial zones to provide an adequate environment for industries to operate from. GDP contribution from the industrial sector stands at 4.6 billion USD in 2017 (around 10% of GDP) and could increase to 11.7 billion USD by 2035 should the economic vision be implemented. In terms of jobs it currently employs around 185,000 persons, and number of jobs could increase to 250,000 in 2035.

Infrastructure

Lebanon suffers from a very poor infrastructure, ranking 113th out of 137 countries in terms of quality of infrastructure (WEF, Global competitiveness report, 2017-2018). Only 15% roads are considered to be in good condition, with high traffic congestion on main highways and a general lack of public transportation. Demand exceeds capacity at the Beirut International Airport with a 6 million traveler's capacity versus an 8 million travelers' demand. Ports face a high dwell time with dwell time at Beirut Port being 13 days and an inefficient integration between different ports and roads.

However plans to improve infrastructure are currently underway. These include the expansion of Beirut International Airport and the Khalde – Okaybe expressway, public transport infrastructure (Bus Rapid Transit (BRT), feeder buses project, the coastal railway between Beirut and Tripoli, and Tripoli and the Syrian border). If implemented, these projects could significantly alleviate traffic on main roads and enhance overall Lebanese competitiveness and trading ability with neighboring countries.





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Electricity

The electricity sector in Lebanon relies mainly on thermal power plants, with limited contributions from renewable sources of energy (mainly from hydropower and solar). However contribution from renewable sources of energy is targeted to reach 12% by 2020 and 30% of the energy mix by 2030. Thermal power plants rely primarily on imported liquid fuels to generate electricity. Due to shortages in supply, diesel generators are widely used in Lebanon to fill the supply gap, imposing additional costs to the population and further pressure on air quality.

The Lebanese Oil Installations (Lol) have launched a tender to procure three (3) offshore LNG terminals with Floating Storage and Regasification Units (FSRUs) to import Natural Gas as LNG (import capacity of up to 3.5 million tons of LNG) to be able to gasify the existing and planned power plants. If the project is implemented, natural gas will start feeding power plants in Lebanon. If natural gas discoveries are made in the future in Lebanon, it could then replace imported natural gas with cheaper gas and hence contribute to economic development as well as energy security in the country.

Waste Management

Lebanon suffers from a general lack of adequate waste management infrastructure. Non-hazardous wastes, with a generation rate estimated at 2,263,000 tons per year, are still largely landfilled with a relatively low percentage of waste recovery or recycling (only 15% of generated waste). Hazardous wastes yearly generation is estimated at 50,000 tons. These types of wastes are either stored by waste generators or exported via the Basel Convention, or inadequately disposed of in the environment.

With the recent adoption of the Integrated Solid Waste Management Law by the parliament (Law 80/2018), some improvements in the sector are expected to be achieved. The Ministry of Environment plans to establish three interim storage facilities for hazardous wastes with the support of the private sector.

Health

The bulk of morbidity and health care costs are burdened by Non-Communicable Diseases (NCDs), namely cardiovascular diseases (CVDs), cancers, respiratory conditions and diabetes. Occurrence of NCDs among males is more than females, which has been increasing over the past years.

In terms of mental health, 25.8% of the population experiences at least one mental disorder at some point in their lives while 10.5% experienced more than one.

Education

The Education sector in Lebanon suffers from an outdated curriculum with latest updated from 1997, and a skill gap between the labor force demand and supply. Total number of higher education students enrolled in 2016-2017 included 85,244 students in vocational and technical education, 75,956 students in the Lebanese Public University, and 124,851 students in private universities.



Since the adoption of the Offshore Petroleum Resources Law in 2010, various universities have initiated programs related to petroleum engineering and related studies and have attracted a significant number of students. However graduates of such programs are finding difficulties in obtaining jobs.

VI. STAKEHOLDER ENGAGEMENT AND CONSULTATION

Stakeholder engagement activities conducted as part of the SEA process included:

1. Establishment of a task force that includes:
 - Ministry of Energy and Water (MoEW)/LPA
 - Ministry of Environment (MoE)
 - Ministry of Public Works and Transport (MoPWT)
 - National Centre for Marine Sciences (NCMS)
 - Ministry of Agriculture (MoA)/ Fisheries
 - Ministry of Social Affairs (MoSA)
 - Ministry of Economy and Trade (MoET)

The SEA team held three meetings with the task force that aimed to discuss the progress, provide data and validate the findings of the SEA process, update and ensure consistency with relevant sectors' strategies, policies and plans.

2. Bilateral meetings with several stakeholders for data collection.
3. Multi-stakeholder Consultation Workshop: This workshop was held on April 26, 2018 and was organized to facilitate and maximize the participation of stakeholders from government, local authorities, international organizations, research and academic institutions, civil society and the private sector. The workshop brought together governmental and non-governmental stakeholders including private associations, experts, academics, researchers as well as civil society representing 38 different entities.
4. Public Consultation

The Draft SEA Report was published on LPA website, and written comments were accepted over a period of 7 weeks. In addition, five public consultation sessions were undertaken along the coastal towns in Beirut, Tripoli, Byblos, Saida and Naqoura between April 23rd and 25th, where discussions were undertaken and comments collected from the general public.

Feedback and comments were received from multiple entities including the general public, environmental consultancies, international organizations, NGOs in addition to governmental entities. Feedback and comments from the public consultation process were integrated as applicable into the SEA study.

VII. ASSESSMENT OF IMPACTS FROM E&P ACTIVITIES AND MAIN MITIGATION MEASURES

Air Quality and Climate Change

Significant changes in coastal ambient air quality during reconnaissance, exploration and decommissioning activities are unlikely to occur given the relatively short duration of these activities and limited emissions. Air quality impacts during the production phase would however be more significant given the long-term nature of these activities and relatively high emissions expected to be generated. Actual severity of impacts would depend on the nature of development of the fields, with more significant impacts expected in the "High Development" Scenario (S3).

Main mitigation measures to reduce impacts on air quality are listed below:

- ✓ Ratification of MARPOL Annex 6 by the Lebanese Parliament and its enforcement by the MoPWT; this would reduce emissions from vessels.
- ✓ Ensure enforcement of BAT as required by Law 78/2018 (Air Quality Protection Law) and Decree 10289/2012 (PAR); this requires proper training of MoE and LPA personnel on BAT applicable to the offshore oil and gas industry and the review of BAT demonstration in EIA studies; MoE/LPA shall ensure that BAT is integrated, implemented and properly maintained during operation.
- ✓ Use of Green diesel instead of Marine Gasoil where technically feasible; green diesel has a significantly lower sulfur content.
- ✓ Control and reduction of fugitive emissions in the design, operation and maintenance of production facilities.
- ✓ Explore possibilities for the implementation of Decree 167/2017 that provides incentives for environmental investments and assess its applicability to the offshore E&P sector.
- ✓ Ensure that concepts of energy efficiency are integrated in the design, operations and maintenance of production facilities.

Regarding climate change, and although E&P activities could provide a cheaper source of natural gas, compared to its import, to be used as a source of energy to power plants (and possibly industries), hence contributing to the reduction of Greenhouse Gas (GHG) Emissions in Lebanon, E&P activities generate their own GHG emissions, which should be minimized.

Based on the SEA results, offshore E&P activities are not expected to compromise Lebanon's commitments in terms of GHG emission reductions, except under the High Development Scenario depending on actual export rates and export modality (via pipelines or using LNG). LNG development options would significantly increase Lebanon's GHG emissions and negatively affect Lebanon's commitments towards emissions reductions unless emissions could be further offset.

Mitigation measures to reduce impacts from E&P activities on climate change include (in addition to the above listed measures that would contribute to reducing GHG emissions):



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- ✓ MoEW/LPA, in coordination with MoE, should strictly enforce OPRL and PAR provisions related to flaring and venting.
- ✓ Implementation of the Paris Agreement.
- ✓ Operators should offset a portion of their emissions during production (15% is recommended as a minimum, in line with NDC commitments); such offset could be done by directly financing renewable energy projects and energy efficiency initiatives, reforestation (or enhancement of carbon sinks) and/or contributing in local funds (such as the BDL scheme of NEEREA or any subsequent similar frameworks, including the National Fund for the Environment) or any combination of the above; if development plans lead to excessive GHG emissions negatively affecting Lebanon's national commitments, then offset plans should compensate the additional emissions in a way to ensure meeting the unconditional emissions reduction targets set by the government
- ✓ Consider introduction of renewable energy technologies in exploration and production activities.
- ✓ GHG emissions reduction demonstrations are mandatory as part of EIA studies (demonstrating that GHG emissions were reduced to the maximum extent possible before incremental emissions reduction costs become excessive)
- ✓ GHG emissions should be mandatorily reported by Operators On the longer term, and as production fields become available, carbon capture and sequestration initiatives should be considered as part of development and production plans.

Marine Biological Environment

E&P activities can affect the abundance, status and density of marine biodiversity, including cetaceans, sea turtles, seals, phyto and zooplanktons, and seabirds, and can negatively impact sensitive habitats including the continental shelf and slope, canyons, deep sea, seamounts as well as existing and planned Marine Protected Areas. E&P activities are also a possible source of invasive species. Major sources of potential impacts on the biological environment from E&P activities are:

- ✓ Dredging activities for ports and onshore support facilities (supply bases)
- ✓ Operation of compressed air sources during geophysical surveys (reconnaissance activities)
- ✓ Routine vessels discharges and wastes
- ✓ Routine hydrocarbon, diesel and chemical spills
- ✓ Underwater water noise generated by drilling and production activities
- ✓ Discharge of drill cuttings and fluids (if allowed)
- ✓ Major accidents leading to spills of hydrocarbons and chemicals in the sea
- ✓ Ballast water
- ✓ Installation of subsea systems and construction of subsea pipelines



- ✓ Discharge of produced water in the sea (during production phase)

Significance of potential impacts on marine biodiversity increases as the level of activities increase, with more significant impacts expected to occur under the "High Development" Scenario (S3). Mitigation measures identified to reduce the significance of potential impacts on marine biodiversity from various E&P activities are listed below:

- ✓ Strict compliance with ACCOBAMS during reconnaissance and drilling activities to reduce impacts from underwater noise on marine life; Operators should demonstrate how ACCOBAMS guidelines were taken into consideration in the design and implementation of such activities.
- ✓ Procedures from IAGC/IOGP monitoring and mitigation measures for cetaceans during marine seismic survey geophysical operations should be adopted, which include for example:
 - Procedure for commencement of operations
 - Procedure for interruptions to ongoing operations
 - Procedure for testing source elements
- ✓ Strict compliance with Joint Nature Conservation Committee (JNCC) guidelines for minimizing the risk of injury to marine mammals from geophysical surveys which includes Standard Airgun Mitigation Procedures.
- ✓ Evaluation of time of year restrictions on operations in the EIA to address sensitive life stages of important species in each proposed project area. Conduct activities during non-productive Seasons.
- ✓ Operators to demonstrate that underwater noise levels and high risk areas are reduced to the minimum possible extent during drilling.
- ✓ Minimize cumulative effects from compressed air sources operations through coordination with other States conducting similar activities in the East-Med.
- ✓ Strict adherence to MARPOL requirements.
- ✓ Strict adherence to the Ballast Water Convention.
- ✓ Avoid drilling and production facilities in environmental and socially sensitive areas, including the continental shelf and slope; drilling and production in protected areas are prohibited.
- ✓ Prohibit discharges of drill cuttings and fluids in the sea (prioritize onshore disposal options if available or export); discharges of untreated effluents are strictly forbidden.
- ✓ Dispose of produced water in injection wells when technically feasible; if discharge in the sea is not avoidable, ensure strict standards are adopted for their discharge accompanied with comprehensive eco-toxicological monitoring to monitor the impacts of such discharge on marine biodiversity.

- ✓ Conduct risk assessments in line with international best practice for drilling and production facilities and ensure that safety critical equipment and processes are in place prior to start of activities.
- ✓ Develop a Chemical Management Framework at the national level and Chemical Management Plans for activities.
- ✓ Relevant authorities to ensure that Emergency Response Plans are based on risk assessments in line with international best practices and that ERP resources (human and infrastructure) are in place prior to start of activities.
- ✓ Soils and waste materials from dredging in coastal facilities such as ports and supply bases should not be discharged on the continental shelf.
- ✓ Update the management plan of the Tyre Coast Nature Reserve to define the management approach within the protected zone of the territorial waters as stipulated in the Reserve's establishment law.

Further measures intending to improve preparedness and response include:

- ✓ Government to adopt the decree to implement the National Oil Spill Contingency Plan (NOSCP)
- ✓ Conducting training and exercises e.g. disaster response drills so that the entire team is prepared to work together when a spill occurs.
- ✓ Significant capacity building should be provided to the relevant entities to increase their readiness, response and management capabilities; this includes not only training but also availing of the necessary equipment and infrastructure to be able to act in case of major accidents

Seawater and Sediments

E&P activities can lead to the increase in pollutant's concentrations in sediments and a change in the chemicals characteristics of seawater. E&P activities can also lead to sedimentation on the seabed which could lead to the burial of species, clogging of valves of the filter feeders and overall disturbance of biota. Sources of such impacts are similar to those that can cause impacts on marine biodiversity. Mitigation measures proposed to minimize impacts on marine biodiversity also apply to seawater and sediments.

Coastal Environment

Offshore E&P activities can negatively affect coastal areas and can also have onshore impacts due to the need to have onshore support facilities (supply base, transportation of materials) but also in the case of hydrocarbon, diesel or chemicals spills related to either routine or accidental events. During the production phase, there could be a need to install onshore processing facilities and coastal pipelines to convey hydrocarbons. Accordingly impacts on the coastal environment are expected to be highest in the "High Development" scenario.

Mitigation measures to minimize the impacts on the coastal environment and the percent area of sensitive coastal habitats affected by the sector include (in addition to the relevant measures already listed above):

- ✓ Optimize quantities of chemicals transported to and from drilling and production facilities to minimize the need for transport by support vessels
- ✓ Onshore facilities to be selected in line with the National Land Use Master Plan

Noise

E&P activities have the potential also to increase ambient noise levels in coastal areas. This can be attributed to vessels and trucks movement, helicopter travel, onshore support and processing facilities (during production phase). Given that a 3 nautical mile buffer zone from the coast is stipulated in the blocks delineation decree (Decree No. 42/2017), it is unlikely that drilling and production activities offshore could affect coastal areas.

Mitigation measures to limit increase of ambient noise levels near coastal receptors include:

- ✓ Select locations of onshore facilities in line with the National Land Use Master Plan (petroleum related facilities should be located in areas designated as industrial and not in residential areas)
- ✓ Noise sources at onshore facilities should be enclosed if deemed necessary following noise modeling studies
- ✓ The combined sound pressure level of equipment at onshore facilities shall not exceed 85 dBA at a distance of 1 m from the equipment at all directions.
- ✓ Frequency of helicopter trips should be scheduled in a way to avoid significant noise impacts to nearby receptors at the point of take-off and landing.

Fisheries

There is a general concern that E&P activities could lead to short term behavioral reactions in fish and aquatic stock, which would cause temporarily moving away from sound source and would also restrict the total area where fishing activities can be conducted (due to safety areas required around petroleum facilities), and accordingly lead to loss of fishermen income.

Mitigation measures to reduce significance of impacts on fisheries include (in addition to applicable measures listed above):

- ✓ Ensure a robust baseline of fish catch is available and monitored to assess possible impacts directly related to E&P activities
- ✓ Prior to conducting a seismic survey, operators work cooperatively with local fishing communities and regulatory bodies to avoid sensitive spawning grounds and mitigate any potential economic losses to fisherman
- ✓ Maintain exclusion zones around survey vessels and the towed streamer arrays to avoid interruption of commercial fishing operations.

- ✓ During development drilling, potential impacts of back-to-back drilling of wells shall be assessed.

Tourism, Landscape and Visual Amenity

There is a general misconception that oil and gas and tourism cannot co-exist. This is mainly due to the fact that general population perceives the oil and gas sector as a polluting one, leading to the deterioration of the quality of beaches, visual intrusion due to the establishment of oil platforms, and also as a source of possible major accidents which could lead to major hydrocarbon and chemical spills that could reach coastal areas and negatively affect tourism. While the above impacts are possible, as described in the above sections, they can also be mitigated, as also explained in the earlier sections.

In addition to the above mitigation measures to control pollution and avoid major accidents, the following measures are recommended:

- ✓ Drilling rigs/platforms should be positioned as far out from the coastline as possible, however still practicable for the operator.
- ✓ Operators should avoid, as practicable, positioning drilling rigs/platforms in visual areas of most valuable tourism/landscape and visual amenity locations.
- ✓ Master Plans and Detail Urban Plans to be prepared in coastal areas, where not available, as a measure to sustainably plan potential petroleum induced growth.

Economy

The development scenarios of oil and gas industry are highly uncertain. The future of this sector in Lebanon depends on a range of factors that are volatile and beyond Lebanon's control. The uncertainties can be described at various levels extending from the offshore geology to the availability of markets and the development solutions and infrastructure put in place among others. Two factors carry the top risk and importance and incorporate several other sub-factors: the technically recoverable volumes of hydrocarbon resources in offshore Lebanon and the sale prices of these hydrocarbons at the dates of extraction.

In any case, E&P activities could affect the following economic indicators, depending, of course, on the level of discoveries and development options:

- ✓ Contribution to Gross Domestic Product (GDP): if commercial reserves are found (Scenarios 2 or 3) and developed, this would add to the projected GDP around year 2029; the actual contribution to GDP cannot be estimated but could become important in case significant discoveries are made and are exported; in this case E&P activities would also contribute to GDP growth
- ✓ Job creation: E&P activities are cyclic in nature; important job creation (but temporary) could be achieved in case of discoveries and particularly during development phases, when significant investments are made to develop the needed infrastructure to bring hydrocarbons to market; during production phases, direct job creation is rather limited; under a high development scenario (S3), not more than 6000 permanent jobs are expected to be generated; although this might be relatively limited when compared

to the potential job creation of other sectors like tourism and industry, nevertheless, it is a positive contribution to the job market.

- ✓ Balance of payments: if commercial discoveries are made and developed, it would have positive impacts on the balance of payments; this is because it would at least reduce the need for the import of hydrocarbons for electricity generation and under a high development scenario, would also lead to exports, further contributing to the national balance of payments
- ✓ Debt to GDP: a major economic problem in Lebanon is its significant debt to GDP, currently at 145%, one of the highest in the world; if discoveries are made, E&P activities would support an increase in the GDP, and hence a reduction in the Debt to GDP; however it is important to note that if revenues are actually generated from E&P activities, an effective revenue management mechanism is needed where it is generally not recommended that such revenues be used fully to repay debt; a more sustainable practice is to invest part of the revenues in productive sectors, which in turn would bring fiscal revenues to the government.
- ✓ Inflation: if discoveries are made, E&P activities could actually lead to an increase in inflation if adequate economic measures are not established; this is due to general market speculation, leading to the increase in prices in the market; however an effective revenue management mechanism can control such inflation
- ✓ Corruption: the E&P sector in Lebanon has already established strong safeguards to control corruption in the sector; this includes the recently adopted Transparency Law for the offshore oil and gas sector and the provision of a Sovereign Wealth Fund to manage revenues from the sector;

Resource extraction could also lead to the so-called resource curse whereby other economic sectors are negatively affected by the oil and gas activities, leading to a shift of employees from non-oil to oil related activities, neglect of non-oil sectors, increase in prices leading to inflation and overall reduction in the purchase power of local residents. Other possible negative impacts include:

- ✓ Migration of skilled labor and talents to the oil and gas sector
- ✓ Inflating wages and thus increasing production cost
- ✓ Increasing the exchange rate of local currency
- ✓ Reduction of the export competitiveness of non-oil sources of livelihood

In order to maximize the positive economic impacts from the sector and minimize the likelihood of the negative impacts surfacing in Lebanon, the following mitigation measures are recommended:

- ✓ Develop a robust revenue management mechanism; establishment of a Sovereign Wealth Fund is stipulated in the OPRL; design of the SWF should be carefully done, preferably in a highly participatory manner, to ensure it can lead to a sustainable use of possible resources generated from the sector;

- ✓ Develop a local content and local supply development strategy to operationalize the existing policies;
- ✓ Promote transparency and accountability to mitigate social and economic risks and particularly the risk of corruption in the sector which could negatively affect the economic growth and prevent the country to reach its optimal goals behind the oil and gas sector; the adoption of Transparency Law in the Offshore Oil and Gas sector (Law 84/2018) is an excellent step in this direction; it is important to ensure enforcement of this Law throughout all phases of the sector;
- ✓ LPA should establish a communication strategy to manage expectations from the sector and promote stakeholder engagement and promote the beneficial impacts effectively;

Social Conditions

If commercial discoveries are made, development of the petroleum sector could improve living conditions due to several reasons – most notably the following:

- ✓ Development of the petroleum sector will spur overall economic development of Lebanon. Increased employment, even if not expected to be major, will improve income of families of workers within the sector, supporting industries as well as in other sectors under secondary impact. This is further supported by aggressive local content policies in Lebanon requiring 80% of workforce in the sector to be Lebanese and encouraging the use of Lebanese suppliers.
- ✓ Availability of natural gas can lead to stable power supply, reduced need for power generators hence reduced cost of energy in Lebanon. Subsequently, this process will improve overall living conditions.
- ✓ Development of the petroleum sector will allow Lebanon to establish a sovereign wealth fund. If well-designed, it could lead to further improvement of living conditions in Lebanon.
- ✓ Development of the petroleum sector will (partially financed by the petroleum sector itself, partially by Lebanese Government and partially by sovereign wealth fund) spur development in Lebanon. Subsequently, this process will improve overall living conditions and improve health of Lebanese society.

It is also important to note that petroleum regulations require that the **Right Holder shall compensate** the physical or legal person affected by any demonstrable disturbance or damage. The same applies with regard to liability and claims if the vessel(s) or craft(s), equipment, catch or harvest of a physical or legal person is polluted, damaged or lost due to Petroleum Activities.

It is important that the petroleum sector establishes appropriate modality for compensations, as this will create a well guided, predictable and secure workspace for further potential negotiations with this specific target group, as well as limit “exposure” of the petroleum sector towards potential law suits from impacted target groups.

Mitigation measures to enhance positive social impacts from the sector and reduce negative impacts include:

- ✓ Ensure transparent and realistic communication between the petroleum sector and Lebanese society, including a clear and effective grievance mechanism.
- ✓ To deliver accurate expectations to the general population, responsible authorities must raise the awareness on the topic.
- ✓ All potential limitations to other industries (e.g. fisheries) must be well communicated to impacted target groups and compensated. Promote Corporate Social Responsibility (CSR) practices in the sector.
- ✓ Ensure transparent governance and operation of the sovereign wealth fund.

Health

Individual activities of the petroleum sector will in different phases potentially have negative impacts on the health of the Lebanese society. This could be due to airborne health effects due to air emissions from the sector and waterborne and food chain related health effects due to discharges into the sea as well as possible releases due to accidental events.

Mitigation measures to reduce negative health impacts have been addressed under mitigation measures to reduce air pollution, discharges to the sea, and to prevent major accidents since air and marine pollution would be major pathways for diseases or health impacts. Additional mitigation measures include:

- ✓ Ensure the healthcare sector is able to accommodate health conditions related to the sector (such as psychological or mental impacts due to sustained work offshore, etc.)
- ✓ Ensure that a robust health surveillance system is maintained to monitor possible health impacts from the sector as it develops and allow corrective measures to be made in a timely manner

Education

Development of a new sector always brings increased need for adequately educated and qualified work force and subsequently increases the demand for special profiles provided by the education sector.

This can be beneficial for all involved as long as the educational sector is able to educate enough students to meet the demand of the petroleum sector (especially relevant for scenario 3). If not, gaps need to be filled with suitably educated and skilled workforce from abroad – which is clearly not a preferred option.

On the other hand, an important threat comes from unrealistic expectations of the general public and uncoordinated admittance to sector relevant educational programs. This can lead to a mass production or a major lack of highly specialized work force by the educational sector, which cannot be employed due to limited needs of the developing petroleum sector and subsequently create social and labor market problems.

Mitigation measures to enhance positive impacts from the sector and reduce negative impacts include:

- ✓ To provide accurate expectations of the general population, responsible authorities must raise the awareness on the actual potential for job creation of the sector.
- ✓ Responsible authorities should prepare a strategy linked to development of sector specific educational programs.
- ✓ Sector developers (authorities, operators) can cooperate with educational institutions to guide the type, number and quality of relevant educational programs to avoid flooding the market, while taking into consideration possibility of regional and international markets. Additional educational programs could focus on other disciplines such as ecotoxicology, human health risk assessment, fisheries science...etc.
- ✓ Sector developers can develop scholarship and/or internship program for students of sector specific educational programs and R&D projects.

Cultural Heritage

Coastal and marine heritage could be affected in case development activities (such as pipelines) physically intersect such heritage features. They could also be affected in case of major spills that could reach coastal areas where archaeological sites are present. On the other hand, E&P activities could help identify and discover new underwater heritage during surveys.

Mitigation measures to enhance positive impacts from the sector and reduce negative impacts include:

- ✓ Before conducting any sea floor disturbing activities, work sites shall be surveyed by marine archaeologists to identify any underwater archaeological sites and shipwrecks. Specifications required for such surveys to be defined by DGA and LPA; Based on findings, buffer zones might be required around the identified sites.
- ✓ A marine archaeologist shall be present on-vessel during Environmental and Natural Resource Surveys (NRSS)
- ✓ In case of discoveries, the formal procedure for protection of archaeological sites must be followed, according to existing legislation, or as specified by DGA.

Infrastructure

Impacts linked to submerged infrastructure are linked to the physical interaction with equipment on the sea bed. These can be avoided if corridors of existing submerged infrastructure are taken into account in the planning and design phases and preliminary investigations of the sea-bottom are carried out before Exploration and production activities.

On the other hand, impacts are linked to existing capacities of Lebanese infrastructure. It is important to understand that, currently, Lebanon's existing infrastructure faces many challenges and the development of the petroleum sector could bring additional pressure – less so in Scenarios 1 and 2 (due to rather limited development of the petroleum sector),

however more important in Scenario 3 where pressures will come not only from petroleum sector, but also from other economic sectors developing in parallel with it.

In particular, transport infrastructure could be negatively impacted in case of significant discoveries due to increased pressure on existing infrastructure, particularly transport related ones. At the same time, hazardous waste management facilities could be developed to serve the sector and in parallel serve other sectors that generate hazardous wastes.

Mitigation measures to enhance positive impacts from the sector and reduce negative impacts include:

- ✓ Before conducting any sea floor disturbing activities, work sites shall be surveyed to identify any underwater submerged infrastructure.
- ✓ Oil-based revenues to support development of public infrastructure.
- ✓ Assess existing infrastructure services to specify its adequacy to cater increased demand and use. If new infrastructure services are to be established, an infrastructure plan should be prepared and the planning process shall be conducted in collaboration with other sectors in the coastal region, such as tourism to optimize the use of the new infrastructure to achieve benefits to other sectors as well.
- ✓ Since oil and gas E&P will lead to higher use of road networks, thus more traffic, supply bases should be preferably assigned in secondary areas that do not already suffer from major traffic problems like Beirut City (particularly for the production phase). Some project need to consider detailed traffic assessment studies.
- ✓ If discoveries are made, establishment of national hazardous waste infrastructure should be promoted by the government.

Shipping

Development of the petroleum sector could lead to interference with assigned shipping lanes/routes. As actual locations of petroleum activities are at this stage still not known, it is even more important to take existing shipping lanes/routes into account in the planning phase.

With ongoing exploration activities, there will be an increase in the demand for shipping for importing required material and equipment, as well as transporting them offshore. This could spur further development of this sector in Lebanon and create new employment opportunities. However, such beneficial impacts depend on the scenario and only become tangible in Scenario 3.

As increased shipping activities occur in the sea, the risk of incidents and collisions increases. Such risks could be low in Scenario 1, however in Scenarios 2 and 3 the risks of colliding ships and severity of any collision accident becomes higher. This is why it is important that such events are also taken into account when response strategies are developed.

Mitigation measures to enhance positive impacts from the sector and reduce negative impacts include:



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- ✓ Reinstatement of the VTMS (vessel traffic management system) to control and monitor all vessel movement.
- ✓ Require ships, as applicable, in Lebanese waters to install vessel monitoring systems (VMS) for proper monitoring to avoid any collisions and accidents
- ✓ Coordination with the concerned governmental agencies to ensure offshore developments do not interfere with shipping routes

VIII. CUMULATIVE IMPACTS

Cumulative impacts occur as a result of a number of activities, discharges and emissions combining or overlapping, potentially creating a significant impact. Potential cumulative impacts could arise as a result of impacts resulting from O&G activities interacting or combining with those from other activities taking place in Lebanon. Significance of all below stated cumulative impacts depends greatly on different E&P scenarios and are most relevant in case of the Scenario 3. Most important possible cumulative impacts include:

- Cumulative noise of seismic and drilling activities with other users of the sea:

Other users of the sea may include merchant shipping, fishing and marine scientific research. With a 500 m exclusion zone in place around each drilling rig, the interaction of underwater drilling noise with those noises generated by other users of the sea is unlikely to cause a significant cumulative effect, due to the transitory and temporary nature of the various other activities. In addition, any other vessel in the vicinity, with the exception of those vessels servicing the rig itself, will be passing, and any cumulative effect will be of short duration. Existing and proposed mitigation measures presented in the SEA Report shall be followed.

- Air Quality

Other sources of atmospheric emissions include power generation, vessels movement and traffic, industrial emissions, merchant shipping and fishing vessels. It is very important that ambient air quality in coastal areas in Lebanon be improved through the gasification of the electricity sector and improvement of public transport to enhance ambient air quality and allow E&P activities to develop without causing significant negative impacts to air quality

- Seawater quality

Sources of discharges to sea include routine discharges of fishing and shipping vessels shall be compliant with MARPOL regulations. Mitigation measures presented in the SEA report shall be followed. In addition, monitoring of water quality and seabed sediments' quality shall be conducted to make sure that set policies are being followed.



- Marine transportation

Additional marine transportation caused during different phases of E&P activities will increase vessel activity in offshore Lebanon which mainly includes merchant shipping, fishing and marine scientific research.

A system for mandatory response of vessels and Vessel Traffic services (VTS) shall be provided for the supervision and management of marine transportation.

- Improved living conditions

It is expected that development of the petroleum sector in case of scenarios 2 and 3 will spur overall economic development of Lebanon, enable new employment opportunities, reduce poverty, ensure stable domestic power supply, reduce the cost of energy, eliminate air pollution linked to power generators (especially in densely populated areas), support local development and subsequently improve living conditions in Lebanon.

IX. POTENTIAL TRANSBOUNDARY IMPACTS

Countries that might be significantly affected from E&P activities offshore Lebanon are mainly Syria and Cyprus. Thus, the SEA recommends informing and consulting these countries through official channels to validate mitigation measures and discuss regional cooperation opportunities.

In general, the following activities have the potential to cause transboundary impacts:

- Noise from seismic activities will be limited in scale and of short duration; however, noise may have impacts on marine mammals in the neighboring country within a range of a several hundred meters of a typical airgun array, particularly if they swim beneath the array. Details on impacts from noise from reconnaissance activities and mitigation measures are presented in the SEA Report.
- Noise from drilling activities could affect marine fauna in neighboring countries.
- Accidental oil/chemical spills are the main concern of transboundary impacts. Any oil/chemical spill likely to have impacts in waters of a neighboring country shall be communicated, through appropriate channels, to the relevant authorities.
- The possibility of transboundary impacts from a gas blowout would be reservoir specific. Atmospheric emissions could potentially have transboundary effects, although they would be dependent on the type and volume of gas released into the atmosphere in addition to the accident location.
- Disposal of discharges from drilling activities is likely to have impacts in waters of downstream neighboring country.

Existing and proposed mitigation measures provided in the SEA Report related to the above-mentioned impacts shall be implemented to mitigate such impacts at the national and transboundary level.

Environmental Regional Cooperation (with countries in good relations with Lebanon, and through appropriate channels) is required to reduce the likelihood and mitigate the consequences of any possible transboundary impact. Potential Areas for Environmental Regional Cooperation include:

- Cooperation in the area of emergency response and the preparation of joint contingency plan with competent institutions in the adjoining countries.
- Environmental Policies of Joint Interest (discharge of muds and cuttings, produced water, protection of cetaceans and marine habitats);
- Communications with neighboring countries before commencing seismic surveys to avoid cumulative impacts from simultaneous operations;
- Environmental training and sharing of know-how and expertise.

X. SEA POLICY RECOMMENDATIONS

In addition to the various mitigation measures recommended in the SEA, various policy recommendations are made to inform the sustainable development of the oil and gas sector.

Sector Development Policies

- ✓ **Blocks Environmental Sensitivity:** Based on the baseline review conducted under this SEA, nearshore blocks are the most environmentally sensitive blocks. This is because the continental slope is part of a considerable portion of the areas of these blocks. It is recommended that, if these blocks are to be licensed, in-depth baseline surveys (including eco-toxicological studies) and stricter controls shall be adopted, as applicable.
- ✓ **EIA for Plan for Development and Production:** Based on the nature of stages of the field development, it is recommended that an EIA is submitted at the conceptual design and preliminary engineering stages then updated EIAs at the preliminary and final design and construction phases.
- ✓ **Gas export:** As a general policy, an LNG export option is to be avoided, given its high impact on the carbon footprint of Lebanon jeopardizing meeting national commitments towards GHG emissions reduction and not being in line with the global need to mitigate the effects of climate change. Export through pipelines should be considered instead. If LNG option is a preferred option for technical or commercial reasons, emissions should be offset to ensure compliance with Lebanon's international commitments.

- ✓ **Processing Facilities:** The SEA preferred option for multi-phase separation (i.e. separation of water, oil and gas from the extracted hydrocarbons) is to conduct such processing offshore in deep sea. It is recommended that these processes are not brought to shore or to the continental shelf to avoid significant impacts on the marine environment, fisheries and public health particularly given the likely generation of produced water from this process.

Environmental Governance

Despite of its importance, the required independence of the HSE regulator(s) must not become a pursuit of altruism since the only way to remove HSE risks from economic activity is to take land/sea bed out of economic use. The regulator is an enabler of high hazard industries on behalf of the state, and the economic activity is the primary purpose of allowing high hazard industries to operate. Nevertheless, identifying and mitigating the risk is indispensable at the short and long terms.

- ✓ **On the short term:** The principal organizational adaptation will be the creation of functional separation between the HSE decision making and the economic decision making (resource management) at the Petroleum Administration. In such circumstances, every endeavor must be made from the Minister down to ensure at all times the independence and objectivity by preventing conflicts of interest between the HSE regulation on one hand and the considerations of economic regulation and revenue collection on the other hand.
- ✓ **On the long term:** The principal organizational adaptation will be the creation of structural separation that is the complete separation of the HSE regulator from the economic regulator. This is the recognized international best practice model. Such structural separation could take place through various scenarios while taking into consideration the following key issues:
 1. The existing mandated roles & responsibilities of the key HSE regulatory authorities in Lebanon
 2. The existing offshore oil & gas regulatory framework (i.e. OPRL, PAR, LPA Decree, EPA)
 3. Fulfilling all, or to the maximum extent possible, the requirements of the international best practice principles
 4. Ensuring that the occupational health & safety and Major Accident prevention (including Major Accident to the Environment) are regulated by a single entity
 5. Achieving sufficient independence between HSE regulation and economic regulation
 6. Government's constraints regarding mobilization of resources

As a first scenario, an entity responsible for Occupational Health & Safety and Major Accident Prevention (including MATTE) will be established. Such entity could operate in parallel to LPA under the tutelage of the Minister of Energy and Water or under the tutelage of another ministry or be a fully independent regulatory authority. In this scenario, the follow up of all



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environmental matters sits with the Ministry of Environment (MOE). This will entail a close interface between the proposed health and safety regulator and the environmental regulator (MOE) namely on common topics (MATTE, management systems ...etc.). Such a scenario would require active capacity building at the Ministry of Environment on the supervision of the new emerging sector. It may also require organizational arrangements at the Ministry of Environment to better follow up on the sector e.g. the provision of a specific unit.

As a second scenario 2, an entity is established as fully independent regulatory authority that regulates all HSE aspects including day-to-day environmental matters. If need be, such entity could communicate with other ministries e.g. Ministers of Labor and Environment.

In both scenarios, all economic regulations (resource management) remains at LPA under the tutelage of MOEW.

Baseline Surveys

Based on the baseline review and analysis and in light of the identified gaps given the lack of data on the Lebanese offshore, baseline surveys (environmental, social, economic) should be undertaken prior to any petroleum activity in order to develop an understanding of the environmental and socio-economic conditions, identify sensitivities, develop background levels, assess the environment's capacity for restoration and inform the impact assessment.

The scope and scale of these baseline surveys will necessarily vary depending on the associated activity (reconnaissance or drilling or production).

The approach and methodology of baseline surveys should be based on international best practices, such as IOGP, OSPAR Guidelines for Monitoring the Environmental Impact of Offshore Oil and Gas Activities.

Data Management: All currently available data, as well as new emerging data and/or studies linked to any SEA relevant topic, should be continuously collected, verified and stored in appropriate databases, in order to support decision making as well as:

- Support responsible authorities in the monitoring process.
- Support operators in the development of high-quality EIAs, as well as other plans and baseline studies.
- Support transparency and accountability across the sector.



Waste Management Policies

Main policy recommendations related to the management of waste streams that could potentially be generated during the exploration, production and decommissioning phases include:

- ✓ Waste management hierarchy should be respected throughout the lifecycle of the upstream petroleum activities
- ✓ Priority should be given to waste prevention and minimization throughout the entire value chain, without entailing excessive costs. Implementation of the prevention principle should be equally directed toward reduced consumption patterns and better utilization of resources. Waste Management Plans should demonstrate that opportunities for prevention and minimization were used to the highest feasible extent
- ✓ Drilling fluids and cuttings should not be discharged to the sea; ship-to-shore for treatment or shipment outside Lebanon are acceptable options. Any other potential option shall be subject to a detailed environmental assessment.
- ✓ Operators are recommended to use water-based drilling fluids unless safety of the well could be jeopardized
- ✓ Produced water generated offshore should not be brought onshore for handling/treatment or disposal. Produced water should be preferably discharged into injection wells
- ✓ Only in the case that re-injection of produced water offshore is technically not feasible, discharge in the sea is allowed following strict conditions; it is recommended to follow OSPAR's risk based approach to the Management of Produced Water discharges from offshore installations in the marine environment
- ✓ In case discharge to the sea is the only option available, treated produced water cannot be discharged in the continental shelf or continental slope, or near any other sensitive ecosystem
- ✓ If NORM wastes are generated, the Lebanese Atomic Energy Commission (LAEC) should be immediately notified and these wastes should be managed according to the requirements of the LAEC; The Lebanese government should be prepared to have a state-of-the-art radioactive waste handling facility, adequately sited, and capable to store, treat and dispose of radioactive wastes generated by the petroleum sector

Chemical Management Policies

Main policy recommendations related to the management of chemicals include:

- ✓ Relevant authorities to develop a chemical management framework which defines the import, handling, use, storage, transport and disposal of chemicals, particularly those relevant to the oil and gas sector
- ✓ Chemicals storage onshore should be centralized and limited to zones classified for such purposes (e.g. industrial zones)



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- ✓ Eco-toxicity data shall be always available for chemicals intended for use where preference should be given to chemicals registered in international databases such as European Chemical Agency (ECHA) or equivalent
- ✓ Chemicals Management Plans should be developed to be approved prior to the start of any activity involving the use of chemicals in line with EU regulations
- ✓ Continuous efforts should be targeted to substitute chemicals with hazardous characteristics with less hazardous alternatives
- ✓ International Maritime Dangerous Goods (IMDG) Code should be adopted for the transportation of dangerous goods or hazardous materials by vessels
- ✓ For the transport by road of chemicals considered dangerous goods, Lebanese Transport Operators are required to follow national legislations including Decree No. 5606 dated 11 Sep 2019 on the management procedure of hazardous waste and its related Decision No. 999/1 dated 24 Dec 2019 on the transport of hazardous waste, in addition to the rules of European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR and its protocol)
- ✓ Government to consider ratifying the hazardous noxious substances related Convention and Protocols

Requirements for EIA Studies

Environmental impact assessment studies shall be prepared for petroleum activities according to the requirements of the petroleum and environmental legislation, namely: Law No. 132/2010 (OPRL), Decree No. 10289/2013 (PAR), Decree No. 43- Annex 2/2017 (EPA), Law No. 444/2002 and Decree No. 8633 /2012 (EIA).

The current SEA provides a substantial amount of information that will provide a basis for the subsequent EIA studies, however, the assessment is conducted at a high level and shall be subject to detailed assessment during EIA studies as more information becomes available on the techniques to be used (i.e. type of drilling rigs, type of production platforms and the type and usage of extracted hydrocarbons). The following recommendations related to future EIA studies are proposed:

- Conducting pre-activity baseline survey, activity-level monitoring during implementation (based on environmental monitoring plan), and post-activity monitoring to assess pre and post conditions for performance reporting and national reporting, including at least:
 - Surveys of benthic species at work locations.
 - Survey of mammal species, turtles and seals which could be present in the study area during the time of the proposed activity.
 - Defining and mapping birds' migration routes and time of migration, and habitats of marine birds.
 - Survey of underwater shipwrecks and archeological sites.





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- Defining underwater infrastructure corridors and survey of underwater infrastructure.
- Survey of water quality and bottom sea sediments quality.
- Defining important fishing areas within the area of the proposed activity and documenting of spawning and other sensitive life stages of commercially important species.
- Defining and mapping water ways crossing the area of the proposed activity.
- Evaluation of time of year restrictions on operations in the EIA to address sensitive life stages of important species in each proposed project area.
- Considerations relevant to sensitive areas, protected sites and proposed protected sites (please refer to mitigation measures in the SEA Report)
- Conducting social baseline studies, commensurate with the expected significance of social impacts (lower during exploration, higher during development and production) in line with the monitoring framework provided in the SEA Study.
- Conducting specific studies, as applicable:
 - Underwater noise modelling for seismic, drilling and production activities.
 - Conducting air dispersion modelling studies for drilling and production activities.
 - Conducting ambient noise modelling studies for onshore facilities.
 - Conducting dispersion modelling in case of discharge
 - Conducting oil spill modeling
- Mandatory GHG assessment for all production facilities and demonstration of effective integration of BAT in design and implementation of facilities.
- Preparation of needed environmental and social management plans e.g. waste management plan, chemical management plan, chemicals substitution plan, chemicals database, compensation plan, pollution prevention, environmental emergency plan, environmental monitoring...etc.
- The site selection of proposed land-based activities shall be based on an analysis of alternatives, and shall be in compliance with SDATL (National Spatial Land Use Plan).
- Specifying land-based infrastructure that will be used to support the proposed activity (such as ports and airports). The adequacy of existing infrastructure to cater for the requirement of proposed activity shall be assessed.
- Use of Offset mechanism for ecological losses and devaluation after all other opportunities for avoidance and mitigation have been exploited
- Contingency plans: OSCP, gas blow-out, chemical spill, hydrocarbon spill
- Assessment of impacts from Transportation between offshore and supply base
- Assessment of cumulative and transboundary impacts



- It is recommended that future EIA studies demonstrate compliance with the SEA recommendation.

Transparency & Fiscal Policy

The E&P sector in Lebanon has already established strong safeguards to enable transparency and control corruption within the sector; this includes the recently adopted Transparency Law for the offshore oil and gas sector and the provision of a Sovereign Wealth Fund to manage revenues from the sector. However, it is still vital that the Government of Lebanon ensures the enforcement of both set-up mechanisms throughout all phases of the sector.

Potential investment from Sovereign Wealth Fund reserves into productive sectors, infrastructure and social welfare could significantly contribute to enhancing socio-economic conditions in Lebanon, as well as providing investments in "green industries", leading to further improvement of living conditions in Lebanon. Therefore, the design and operational management of the SWF should be carefully done, preferably in a highly participatory and transparent manner, not only to mitigate exposed social and economic risks, but also to ensure long-term and sustainable development of Lebanon.

Management of Expectations

Development of any important economic sector, such as the petroleum sector, brings important impacts on the Lebanese society – both positive and negative. Therefore, it is important for the Government of Lebanon to understand the key drivers of change in social conditions in order to enhance positive impacts and mitigate negative ones.

Since first signs of unrealistic expectations from the petroleum sector were already identified, substantial responsibility lies on the shoulders of responsible authorities to communicate realistic and evidence-based information to the Lebanese society. It is highly recommended that responsible authorities develop and enforce a comprehensive communication strategy, which will:

- Raise the awareness on relevant topics;
- Ensure active and constructive stakeholder engagement;
- Promote beneficial impacts effectively;
- Manage expectations from the sector;
- Promote Corporate Social Responsibility (CSR) practices in the sector.

If developed and appropriately implemented, it could also become an additional and important pillar of transparency and accountability in the sector.

XI. IMPLEMENTATION OF THE SEA

Main recommendations for the effective and efficient implementation of this SEA include:

- ✓ Endorsement of the SEA recommendations and policies through integration into regulations and enactment by legal texts, as applicable.
- ✓ Maintain the SEA Task Force for the purpose of coordinating SEA implementation and environmental management of the sector (SEA Implementation Committee). Details of proposed requirements/modality for the SEA Implementation Committee are presented below.
- ✓ Proper enforcement of legal requirements and existing control measures.
- ✓ Integration of the SEA framework indicators (state indicators) within the monitoring plans of key performance indicators monitored by authorities, as relevant.
- ✓ Operationalization of the systematic monitoring of indicators through envisioning of resources (qualified human resources, equipment, finances)
- ✓ Operationalization of the environmental database on environmental data associated with the offshore oil and gas sector.
- ✓ Establish a Scientific Committee, particularly on marine related issues, to act as an advisor to the LPA on technical matters.
- ✓ It is recommended that this SEA be updated in 5 years from the date of MoE final approval of this SEA. The scope of the update shall be decided by MoE in coordination with MOEW/LPA.

Requirements for SEA Implementation Committee and Possible Modalities

There are several options for the future operational model of the implementation committee:

1. It could remain in a similar operational model as the task force today – a technical body for consultation and cross sectorial coordination, with limited decision-making capacities. However, this would mean that individual ministries would be responsible for the implementation of significant parts of the SEA Implementation plan, while MoE and/or LPA would have to oversee overall implementation and progress.
2. It could be officially named by the Lebanese Government – each ministry/responsible authority would have 1 “focal-point” representative, who would take over the responsibility to represent its ministry in the implementation committee. The implementation committee would remain predominantly technical and coordinating body, where representatives would oversee realization of the SEA Implementation Plan, would jointly seek out best solutions and propose them to decision makers.
3. It could be named as a working body of the SDGs committee and would operate in a similar way, as described in the second option.

In either case it is advisable that:

- Implementation Committee takes over the responsibility to oversee operational realization of the SEA Implementation Plan.
- Implementation Committee convenes on regular basis – for example every 3 or every 6 months.
- LPA and/or MoE take over the leading role in the Task force, as majority of tasks falls under their jurisdiction.
- NGOs and/or other relevant actors are invited to oversee the work of the Task force, thus further contributing to transparency and accountability across the sector.

Capacity Building

Capacity building activities to effectively raise the capacity of stakeholders to implement the requirements of this SEA are proposed:

- Training workshops focusing on improving the understanding of stakeholders about the oil and gas industry, its lifecycle and associated hazards and understanding the requirements of this SEA as well as on core aspects of the offshore oil and gas industry (technologies and BAT, major accident prevention and related safety studies, emergency preparedness and response, chemical management...etc.)
- Training of concerned authorities on the implementation of Environmental Emergency Response e.g. National Oil Spill Contingency Plan and implementing practice drills to ensure effective operationalization. Response teams of operators and the government should include fisheries scientists and marine wildlife experts to ensure that the necessary data collection methods are used to document the effects of emergencies and to supervise wildlife rescue and early rehabilitation activities.
- Provision of necessary monitoring and inspection equipment to stakeholders depending on their needs and related training
- Capacity building and enabling of concerned national entities for oil spill response and management.
- Cross-training of offshore petroleum resources authorities and environmental resource managers so that they share a common vocabulary and vision.
- Training of concerned authorities on monitoring procedures and requirements as well as reporting requirements and the data needed for reporting on different indicators and monitoring results (more importantly for marine environment parameters, GHG and air pollutants)
- Providing training to concerned authorities who will be conducting missions on-board on safety requirements related to offshore O&G activities.



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- Study tours to offshore platforms and oil and gas facilities, so stakeholders (including marine resource managers and marine scientists) acquire practical know-how on how to conduct activities (such as inspections, sampling or audits) at such facilities

XII. CONCLUSIONS

This SEA study has systematically identified potential positive and negative environmental and socio-economic impacts that could be generated from the development of the offshore oil and gas sector in Lebanon.

Significance of both positive and negative impacts depends on the quantities and types of hydrocarbons that could be found offshore Lebanon and how they are developed. In summary:

- ✓ If no discoveries are made, both negative environmental impacts and positive socio-economic impacts would remain low, except in the case of a major accident during exploration drilling; it is therefore very important that focus be directed by regulators towards the prevention of major accidents
- ✓ If modest discoveries are made or if the government decides to develop discoveries solely for the purposes of power generation, both negative environmental impacts and positive socio-economic impacts would remain moderate; several measures are proposed in this SEA to minimize negative impacts and maximize positive ones
- ✓ If significant discoveries are made, negative environmental impacts could be significant if mitigation measures are not implemented; at the same time, positive socio-economic impacts particularly in terms of GDP contribution, reduced imports and increase exports, as well as potential investment from Sovereign Wealth Funds reserves into productive sectors, infrastructure and social welfare could significantly contribute to enhance socio-economic conditions in Lebanon.

It is therefore crucial to strictly implement recommendations from this SEA to ensure that potential negative impacts are effectively managed and positive impacts are enhanced in case discoveries are made and are developed in Lebanon.

