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Policy Paper

Strengthening Environmental Governance of the Oil and Gas Sector in Lebanon

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Executive Summary

In light of potential petroleum production commencing off the coast of Lebanon in the near to medium future, it is necessary to consider the environmental impact and risk of petroleum exploration, development, production, and decommissioning. This paper presents the main environmental risks and impacts associated with offshore oil and gas activities, environmental best practices for offshore environmental management, existing relevant legislation in Lebanon and its adequacy for the new offshore petroleum sector, and conclusions and recommendations to strengthen the existing environmental governance system in Lebanon to adhere to the requirements of the offshore sector. While in many aspects the Lebanese environmental governance system meets international standards, it is recommended that Lebanon review its institutional capacity to regulate the oil and gas sector, legislation be strengthened to cover gaps in environmental regulation of the sector, stakeholder coordination be enhanced to ensure roles and responsibilities are clear, and a clear road map to implement a national oil spill response plan be formulated to address potential environmental crises.

Introduction

Offshore oil and gas activities present environmental challenges due to the remote and harsh operating environment and the vulnerability of marine ecosystems in which they take place. Much of the innovation in the offshore petroleum sector focuses on overcoming these challenges. As Lebanon is a potential emerging offshore oil and gas producer, it must be prepared to address environmental challenges that are intrinsic to the sector.

In many aspects the Lebanese environmental governance system meets international standards. However, there are various gaps that need to be addressed to ensure the Lebanese government is prepared to manage the environmental risks associated with offshore oil and gas activities.

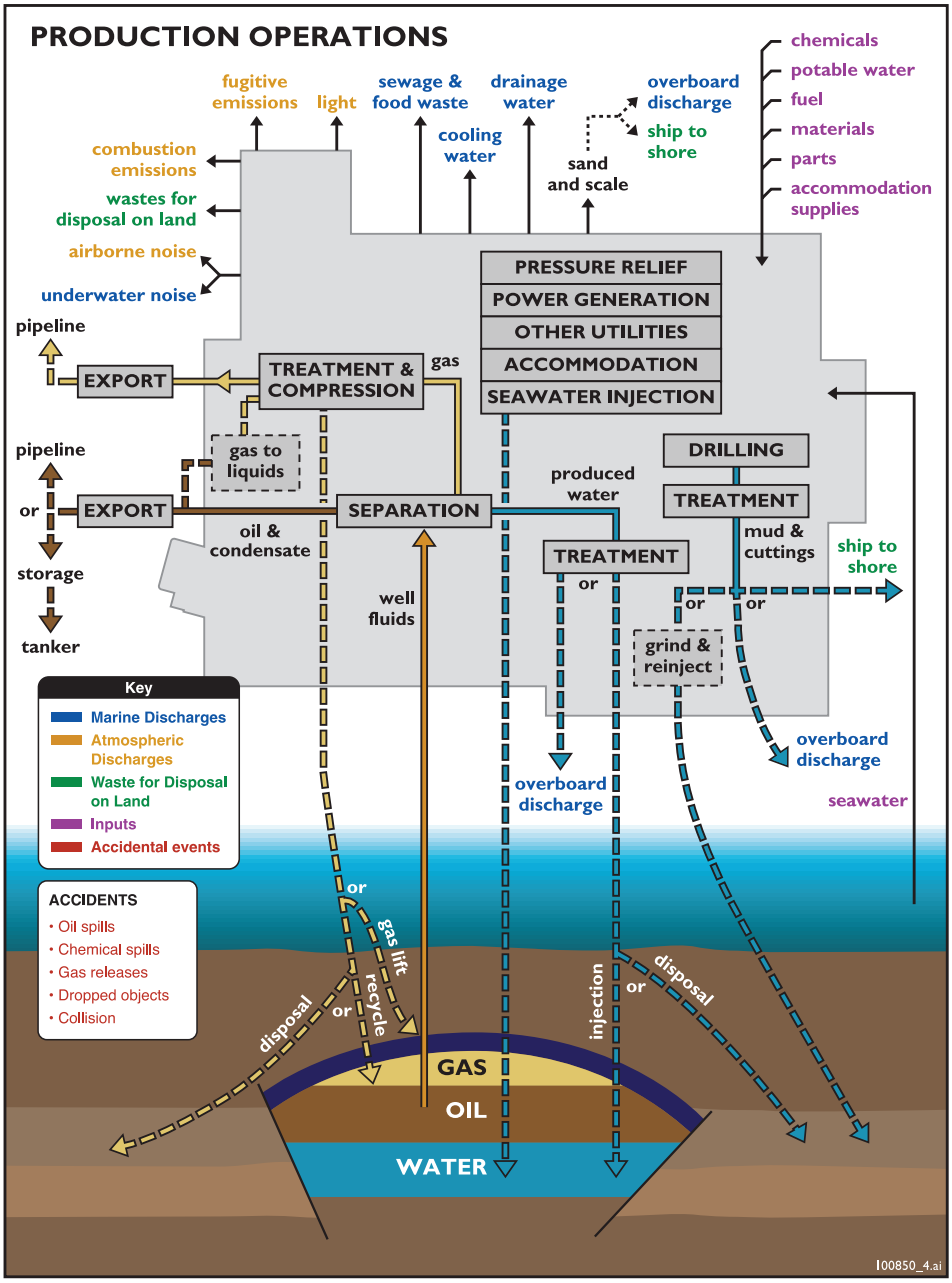
Existing legislation covers the majority of environmental issues related to the oil and gas sector. However, some requirements are not covered, such as the management and disposal of drill cuttings and fluids, produced water, and NORM wastes, which are the main pollutant streams that arise from the offshore petroleum sector. Legislation that covers these issues will need to be issued as decrees and supported by specific guidelines for the oil and gas sector. Also, the limits, conditions, and procedures for issuing different types of environmental permits have yet to be specified. With regard to EIA (environmental impact assessment) studies, it is important to agree on whether an EIA (or at least IEE [initial environmental examination]) will be required for the exploration phase, and particularly for exploratory drilling activities, which can have significant environmental impacts if not properly managed. Mishandling of this issue could lead to major public opposition and delays in the exploration phase.

Most identified gaps can be overcome by completing the environmental legislation framework with additional necessary decrees and decisions that clearly delineate the roles of relevant Lebanese institutions in environmental management and strengthen the capacity of these institutions, in particular that of the Ministry of Environment (MOE).

Pursuant to this, the paper has been divided into five sections and multiple supplementary annexes. Section 2 describes environmental risks associated with exploration and extraction of petroleum in the Lebanese offshore. International best practices in environmental regulation of the oil and gas sector are outlined in section 3. Section 4 offers an overview of the existing environmental governance system in Lebanon. Finally, conclusions and recommendations are presented in section 5.

I Environmental Threats and Risks

Figure 1 **Sources of potential environmental effects from production operations**



Source **Hartley Anderson Limited, 2001**

The main environmental threats that may arise from different offshore exploration and production phases are described in this section and the main sources of effects during each phase are illustrated in figure 1, figure 2, annex 1, and annex 2. These risks occur at various stages throughout exploration and production.

a Prospecting and Exploration Phase

Seismic surveys and exploratory drilling during the exploration phase can each have a significant effect on Lebanon's offshore environment.

1 Effects of noise from seismic and drilling activities on marine animals

During seismic exploration activities the main environmental threats include the impact of noise generating activities. Sound is readily transmitted underwater and there is potential for noise produced by seismic sources to have adverse effects on marine animals. The use of underwater sound is important for animals such as marine mammals (e.g. seals, whales, and dolphins) in order to navigate, communicate, and forage effectively. The introduction of additional noise into the marine environment could potentially (through masking effects) interfere with these animals' ability to determine the presence of predators, food, and underwater land features and obstructions (Richardson et al. 1995). It could therefore cause short-term behavioral changes and, in more extreme cases, there is a risk of temporary or permanent auditory trauma to marine mammals within a range of several hundred meters of a typical air gun array, particularly if they swim beneath the array.

The animals most likely to be affected by sound produced from a seismic survey are baleen whales, beaked whales, and seals, as it is believed that most toothed whale species are less affected by sound frequencies used in seismic operations (Evans 1998, Gordon et al. 2004).

Additionally, underwater noise may also cause behavioral changes in other animals such as fish and cephalopods. The behavioral response shown by fish is to move away from the seismic survey sound sources temporarily. Research indicates that such movements are short-lived and that fish stocks will most likely return to the area after completion of the survey. Research also indicates that larval fish and eggs can be killed within 2 meters of a detonating air gun source (Coull et al. 1998).

During exploratory drilling, sound levels originating from offshore installations are dependent on the platform type. Semi-submersible installations may generate more radiated sound than fixed installations when using thrusters to maintain position. Little information has been published on which sources and propagation processes are the most significant in generating sound from installations, although sound generated during drilling operations—by the drill bit itself, the drill string, or riser—does not appear to be a significant source (NCE 2007).

Vessels used to support offshore operations are also a source of sound that radiates from propellers/thrusters and internal machinery. The characteristics of sound generated by shipping are determined by ship size, mode of propulsion, operational characteristics, speed, and other factors (NCE 2007). In addition, rigs will be visited several times a week for personnel transfers. Low-flying helicopters may increase localized underwater noise levels. The majority of sound will be reflected off the sea surface. Only animals immediately below aircraft will therefore be affected.

Individual drilling operations only occur for a short time. During these drilling operations, noise will be generated as the drill moves through the seabed strata, and from machinery vibrations and generator noise. On a semi-submersible rig the drilling machinery and generators are located on solid platforms above the water, where sound is lost as it transmits through the air and the rig flotation structure (Richardson et al. 1995).

Low frequency noises from drilling wells, and all associated vessels, will add to the ambient noise in the exploration area. The impact of generated noise is difficult to assess due to uncertainties in how noise affects specific marine mammals, and how far the noise will be transmitted in the sea. However, it is estimated that the underwater noise produced could elicit a response from some individual marine mammals if they pass within 1 kilometer of a drilling rig.

2 Risks to human health and the environment from atmospheric emissions

Exhaust emissions from ships include air pollutants, greenhouse gases, and ozone-depleting substances that entail risks to human health and the environment. The impacts of these potential emissions are generally mitigated circumstantially by the open and dispersive environment offshore. Shipping in general is built and operated according to standards that preclude significant impacts to the health of their crews, while other environmental receptors (e.g. flora and fauna) tend to be sparsely distributed and/or transient in the local area.

The main sources of atmospheric emissions from drilling activity will be from drilling rigs and associated vessels and aircraft support. Drilling rigs typically are powered by diesel engines that emit air pollutants including CO, NOx, SOx, particulate matter (PM), volatile organic compounds (VOCs), and greenhouse gases, primarily CO2. Support vessels and helicopters will also emit air pollutants from the combustion of diesel fuel (vessels) and aviation fuel. Also, in the event that drilling is successful and hydrocarbons are discovered, atmospheric emissions may additionally include those arising from the combustion of produced hydrocarbons during well testing.

3 Impacts on fishing, shipping activities, and sub-sea features due to the presence of survey vessels and drill and support vessels

Survey vessels have limited capability to avoid other vessels
Acquisition of 2D seismic data requires the towing of a single streamer of between 3 to 12 kilometers in length at around 5 meters depth. Surveys operate in a grid shape and therefore need turning area at the end of each line. Three dimensional seismic surveys, however, tow a number of streamers in parallel and the length of streamers are shorter than those used in 2D seismic surveys, around 3 kilometers in length. In both cases, while the survey is being conducted, survey vessels are limited in their ability to take avoiding action with respect to other shipping. Fishing vessels will be unable to operate in the vicinity of a seismic survey and will therefore lose access to grounds in the survey area for the duration of the survey.

The presence of the drill and the support vessels may interface with other sea users
During exploratory drilling, the exclusion zone that surrounds the drilling rig while on site is patrolled by a safety standby vessel. This will lead to the temporary loss of fishing access and will require other vessels to avoid the area.

Interference with other sea users (especially the fishing industry) due to the physical presence of the rig, vessels, and subsea equipment, is expected as well. Due to the requirement that a support vessel be on standby during drilling operations, a vessel will be present for the duration of drilling operations. Supply vessels and helicopters will ferry goods and personnel to and from the drilling rig, leading to an increase in vessel traffic in the region.

Seismic survey and exploratory drilling activities may interface with subsea benthic communities, archaeological sites and infrastructure
Some types of seismic surveys involve a limited amount of sea floor disturbance. The extent of sea floor disturbance would be minimal, and in most cases impacts are negligible. However, resources that could be significantly affected include benthic communities and underwater archaeological resources.

In order for exploration drilling to take place, a drilling rig is towed into position over the well site by towing vessels and anchored into position by the same vessels performing an anchor handling role. Depending on the type of the drilling rig used, sea floor sediments could be disturbed during installation and removal of drilling rigs. During the drilling operation itself, supply vessels will serve the drilling rig and helicopters are expected to be used to carry personnel.

After a drilling rig is removed, anchor scars will likely remain on the sea bottom for months to years. The anchor scars will eventually disappear as sediments are redistributed by currents and benthic organisms. The main concern with regard to potential impacts is the placement of anchors in areas where protected benthic communities, coral communities, and areas of special marine biodiversity importance exist. Underwater archaeological sites and submarine infrastructure may be susceptible to physical damage if not identified and avoided prior to initiation of activities.

Drilling operations may impact the seascape value
While seismic survey activities will not be distinguishable from other normal shipping activities, drilling operations will be. The visibility of the rig from the shore depends on its proximity to the shore and on other factors such as sea and weather conditions.

Migrating birds can become disoriented by light sources at night
Birds may use offshore structures for resting, feeding, or as temporary shelter from inclement weather. However, evidence indicates that migrating birds can become disoriented when encountering a steady artificial light source at night, likely as a result of a disruption in their internal magnetic compass used for navigation. Birds can become 'trapped' when a light source enters their zone of influence at night. This phenomenon can cause birds to circle the light source for hours, increasing the risk of collision with the lighted structure, decreasing fat reserves, and potentially interrupting migration.

4 Effects of exploratory drilling operations on seawater quality

Routine discharges during seismic surveys and exploratory drilling typically include treated sewage and domestic wastes (including food waste), deck drainage, and bilge and ballast water. These are subject to MARPOL regulations. Such discharges may affect concentrations of suspended solids, nutrients, and chlorine, as well as generating biological oxygen demand. These discharges are expected to be diluted rapidly in the open sea, however, discharges in sensitive areas must be avoided.

During drilling of exploration and appraisal wells, drill cuttings and spent drilling muds require disposal. Cuttings and particulate material from water-based muds used to drill the top hole section(s) are typically deposited on the sea bed close to the wellhead. A small quantity of the cement used to secure the first set of casings in the borehole is also deposited in the same location. Cuttings generated from subsequent sections of a well are contaminated with residual drilling muds and associated chemicals.

Most of the discharged material will end up as deposits on the sea bed, where the main potential for environmental impact occurs. Additionally, discharges from caissons create plumes of suspended fine sediment, which may cause localized chemical changes as sediment settles through the water column. The impacts of drilling discharges on both the sea bed and its associated fauna, as well as on marine organisms in the water column need to be considered. Chemicals are added to drilling muds and to cement used to secure well casings, and drilling rigs and ships also carry contingency chemicals which might be used in the event of an abnormal occurrence. The potential for such chemicals to be toxic to marine organisms when discharged therefore needs to be assessed and policies need to be put in place to avoid significant negative impacts. In many jurisdictions, when oil-based mud or synthetic-based mud is used, no discharge is allowed into the sea and onshore disposal is required.

5 Accidental events associated with the oil industry

The risk of accidental hydrocarbon and/or chemical spillage into the sea is one of the main environmental concerns associated with oil industry developments. Spilled oil and chemicals at sea can have a number of environmental and economic impacts, the most conspicuous of which affect seabirds and marine mammals. The actual impacts depend on many factors, including the volume and type of oil or chemical spilled, and sea and weather conditions.

Oil may enter the marine environment during seismic operations as a result of accidental streamer rupture or collision with another vessel. The most likely scenario is spillages of several hundred liters of kerosene-like oil entering the environment from a streamer parting while deployed. However, seismic survey vessels may have numerous streamers deployed containing several thousand liters of oil in each and the potential for larger volume spills cannot be ruled out. Accidental collision with another vessel and a complete loss of fuel inventory and streamer reservoir would be a worst case scenario.

During exploration and appraisal drilling, there is a risk of spillage of oil (fuel/crude), and spillage or leakage of chemicals. Drilling accidents are usually associated with unexpected blowouts of liquid and gaseous hydrocarbons from a well as a result of encountering zones with abnormally high pressure. No situations other than tanker oil spills are as frequent or severe as drilling accidents. Broadly speaking, two major categories of drilling accidents should be distinguished. One covers catastrophic situations involving intense and prolonged hydrocarbon gushing. These occur when the pressure in a drilling zone is so high that usual technological methods of well muffling are not sufficient. The probability of such extreme situations is relatively

low, with some oil experts estimating it at one incident per ten thousand wells. The other group of accidental situations includes regular, routine episodes of hydrocarbon spills and blowouts during drilling operations. These accidents can be controlled rather effectively (in several hours or days) by shutting the well with the help of blowout preventers and by changing the density of the drilling fluid. Accidents of this kind usually do not attract any special attention. At the same time, their ecological hazard and associated environmental risks can be rather considerable, primarily due to their regularity, leading ultimately to chronic impacts on the marine environment.

Hydrocarbon spills

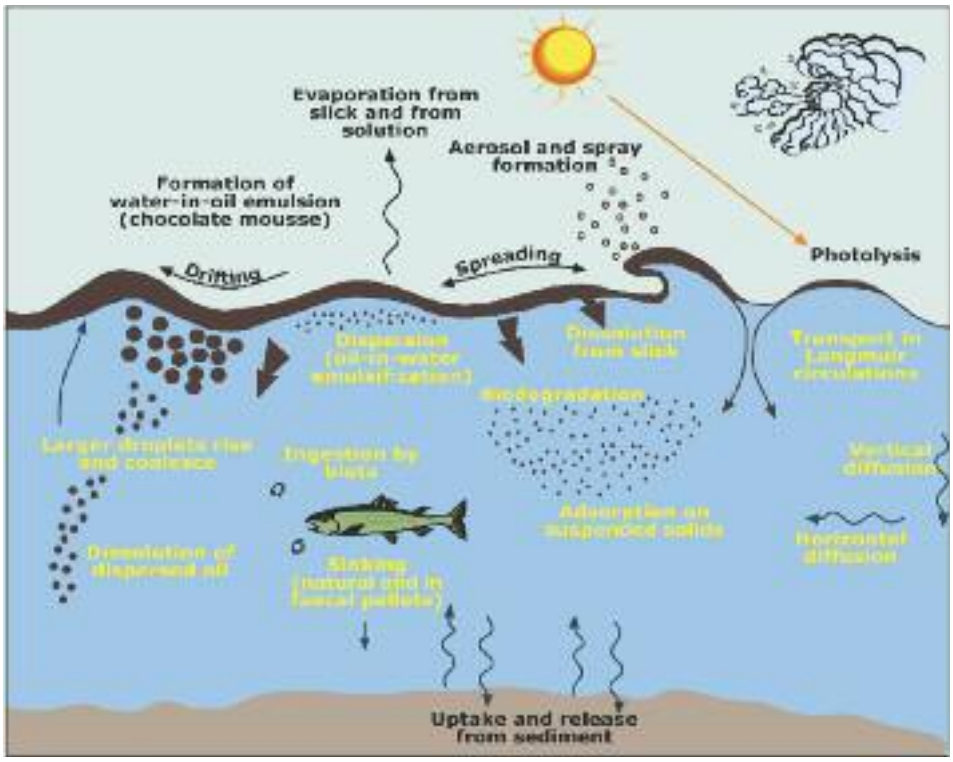
When oil is released into a marine environment it undergoes a number of physicochemical changes, some of which assist in the degradation of the spill, while others may cause it to persist. These changes are dependent upon the type and volume of oil spilled, and prevailing weather and sea conditions (figure 1). Evaporation and dispersion are the two main mechanisms that remove oil from the sea surface. Following a hydrocarbon spill, evaporation is the initial predominant mechanism of reducing the mass of oil, as the light fractions (including aromatic compounds such as benzene and toluene) evaporate quickly. If the spilled oil contains a high percentage of light hydrocarbon fractions, such as diesel, a large part of the spilled oil will evaporate relatively quickly in comparison to heavier (crude) oil. The evaporation process will be enhanced by warm air temperatures and moderate winds and can produce considerable changes in the density, viscosity, and volume of the spill.

After the light fractions have evaporated from the slick, the degradation process slows down and natural dispersion becomes the dominant mechanism in reducing slick volume. This process is dependent upon sea surface turbulence, which in turn is affected by wind speed. Water soluble components of the oil mass will dissolve in seawater, while the immiscible components will either emulsify and disperse as small droplets in the water column (an oil-in-water emulsion) or, under certain sea conditions, aggregate into tight water-in-oil emulsions, often referred to as 'chocolate mousse'. In practice, usually only one of the two processes will take place (dominate), as they will hardly ever take place at the same time. The rate of this emulsification is dependent upon the oil type, sea state, and the thickness of the oil slick. Thick (large) oil slicks tend to form water-in-oil emulsions, where thin (smaller) slicks tend to form oil-in-water emulsions that usually disappear due to natural dispersion.

When a water-in-oil emulsion ('chocolate mousse') is formed, the overall volume of such a water-in-oil emulsion increases significantly, as it may contain up to 70% or 80% water. This chocolate mousse will

form a thick layer on the sea surface, reducing slick spreading and inhibiting natural dispersion. By diminishing the surface area available for weathering and degradation, these chocolate mousses will be difficult to break up using dispersants. In their emulsified form, with drastically increased volume, they can cause complications for mechanical recovery devices as well.

Figure 2 **Fate and Behavior of Spilled Oil at Sea**



Source **ERT (Scotland) Ltd, IOSEA1, Ireland, 2006**

Wind and surface current speed and direction are the main parameters affecting where a slick travels. The slick will roughly travel at the same speed and direction as surface water currents. Additionally, the prevailing wind drives a slick downwind at 3% to 4% of the wind speed.

Spill modeling in the oil and gas industry is undertaken as a matter of course as there is usually a requirement, prior to drilling, that an Oil Spill Contingency Plan (OSCP) be prepared.

For crude oil spills, modeling must be based on the expected characteristics of the crude i.e. heavy/light, which are determined by the reservoir the crude originated from. Therefore, site-specific modeling should be undertaken where drilling is expected to take place in an oil bearing formation. The OSCP produced for all drilling operations will specify the level of spill response equipment and facilities present both offshore and onshore.

Factors important to determining oil spill impacts and recovery rates include the type of oil, the thickness of shore deposits, climate and season, biological and physical characteristics of the area, relative sensitivity of species and communities, and type of clean-up response. A summary of impacts arising from oil spills is provided below.

- Plankton: Short-term effects have been recorded in the industry. However, serious impacts on planktonic organisms have not been observed in the open sea. The main impact is considered to be through initial acute toxicity, while long-term effects have been reduced, possibly due to the high reproductive rates and immigration from outside the affected area.
- Benthos: Effects on benthos include acute toxicity and possible organic enrichment. Offshore impacts are likely to be minimal and influenced by water depth and local hydrography. Shallow inshore areas and the shoreline are susceptible to heavy mortalities if coated with fresh crude oil. Recovery times are variable, dependent on many environmental factors, and may be in the region of one to ten-plus years.
- Fish and cephalopods: Adult fish tend to avoid impacted areas, however, populations moving back into an effected area may take some time to recover. Eggs and larvae in shallow areas may suffer heavy mortalities under fresh slicks, particularly if dispersants are used. There is no evidence that offshore fish populations have been significantly affected. Spills that affect spawning migration of fish into rivers can affect populations in subsequent years.
- Mammals and reptiles: It has been rare for cetaceans to be affected following a spill. They may be able to avoid affected areas and are not believed to be susceptible to the physical impacts of oil emulsion lowering their resistance to the cold. Respiratory problems may be caused by volatile hydrocarbon fractions.
  Seals are susceptible to oiling and the contamination of food sources, particularly in the coastal areas around their colonies.
  Impacts on marine turtles are considered to be similar to those for cetaceans. Additionally, if nesting beaches are polluted they may be significantly affected.
- Birds: Potential fatalities of offshore species may arise, although this tends to be dependent on species present at the time of the spill. Birds are sensitive to physical fouling of feathers and toxicity by ingestion.
- Archaeology: Historic wrecks and archaeological sites in sheltered shallow water on the coast may be at risk from large hydrocarbon spills. The OSCP should take the location of these sites into account when adopting a response strategy. Impacts on coastal archaeology are associated with smothering and damage from cleanup operations.
- Fisheries and mariculture: Fish exposed to oil may become tainted by

oil-derived substances. This is of particular concern in caged fish and shellfish culture. Major spills can result in a loss of fishing days. Additionally, exclusion zones and bans on certain species may be enforced and may last several years. Media coverage together with public perception can also damage fisheries and lead to a loss of market confidence that can hurt fishing businesses, even those located in areas unaffected by the spill.

- Tourism: Coastal tourism is vulnerable to the effects of major oil spills. The impact would be influenced by a number of factors including media coverage and public perception. When an oil spill occurs, not only are tourist destinations directly affected in areas where the spill has flooded land and washed up on beaches, but the tourism industry also faces serious reputational impacts. Public perception strongly influences people's decisions about whether to visit and spend time in a particular community.

Chemical spills

The environmental implication of a chemical spill is largely dependent on the type of chemical involved, the size and location of the spill, and the weather conditions at the time. The actual hazard presented by a spill will depend on the exposure concentration, which is determined by the quantity and rate of spillage as well as dilution and dispersion rates. These factors will differ according to whether the spill takes place at the sea surface or sea bed.

The dilution and dispersion of a sea surface spill will depend on the sea state at the time: Larger waves will be more effective at dispersing the spill than calm sea states. An oil spill is generally diluted as it sinks and will be moved by tidal currents and wave activity. Diluted chemicals are also carried with the body of ambient seawater and gradually disperse and degrade. Although it may be detectable within a circle of a tidal motion, a spill will only be toxic within a very limited area and for a short period of time.

The fate of a spill at seabed level will depend on the properties of the chemical. If the chemical is denser than seawater it may spread over the sea bed and become mixed within the substrate, causing potential harm to the benthic community. A lighter chemical will leach into the water column and be dispersed with the currents.

Gas blowout

A gas blowout occurs when a drilling pipe encounters a shallow or a deep pressurized gas zone or an over-pressured rock layer in the subsurface without being prepared to counter the pressure. This allows the gas or the fluid from the rock layer to enter the drilling pipe and flow toward the surface. Any gas zone penetrated before a blowout

preventer (BOP) has been installed is called a shallow gas blowout.

Based on an OGP 2010 report, blowout frequency during exploration drilling for deepwater HPHT wells (high pressure/high-temperature) is 1 in every 526 wells drilled, and in the case of deepwater—but 'normal' wells—the frequency is 1 in every 3,226 wells drilled for offshore operations of North Sea standard and 1 in every 714 wells drilled for offshore operations not of North Sea standard (OGP 2010). While potentially dangerous, there are few studies available on gas interactions with the marine environment. Naturally occurring gas blowouts have been linked to gas hydrates and form a potential natural geohazard in the marine environment.

Atmospheric emissions may occur as a result of a blowout in an emergency situation. Emissions would be reservoir specific and are likely to contain a large proportion of methane (CH4) with smaller amounts of volatile organic compounds. In the unlikely event of an explosion and hydrocarbons burn, combustion products including carbon dioxide (CO2) and carbon monoxide (CO) will be emitted. Exact emissions would be well specific but could be considered large in a worst case scenario.

b During Development and Production Phase

Development drilling, the presence of production facilities, and accidents have the potential to present a threat to both wildlife and humans.

1 Atmospheric emissions entail risks to human health and the environment

The main sources of atmospheric emissions from the operation of rigs will be from power generation on the platform and associated vessels and support aircraft. Platform equipment are typically powered by diesel engines or natural gas that emit air pollutants including CO, NOx, SOx, PM, VOCs, and greenhouse gases such as CO2 and CH4.

Another source of emissions related to oil production is the associated gas brought to the surface, which is disposed of at offshore facilities by venting or flaring into the atmosphere. This practice is now widely recognized to be a waste of a valuable resource, as well as a significant source of GHG emissions. However, flaring or venting is also an important safety measure used on offshore oil and gas facilities to ensure gas and other hydrocarbons are safely disposed of in the event of an emergency, power or equipment failure, or other plant upset condition.

2 Sub-sea features, birds, fishing and shipping activities may be impacted by the physical presence of the production facilities and support vessels

Sea floor-disturbing activities during installation of production facilities will re-suspend bottom sediments, crush benthic organisms, and produce

turbidity. The impacts of facility installation will depend on the type of facility selected for a particular project. Physical impacts on the sea bottom may occur in connection with installing pipelines, cables, and platforms, including platform legs and anchoring.

The main concern with regard to potential impacts is the placement of structures in areas where sensitive benthic communities, coral communities, and areas of special marine biodiversity importance exist.

Production facilities typically remain in place for a long period of time. The physical presence of platforms will attract pelagic fishes. Noise and lights may cause minor behavioral changes in marine mammals and sea turtles (e.g., attraction or avoidance). Benthic communities may be affected by sloughing of organic debris from platforms and by the physical presence of pipelines on the sea floor.

The visibility of a platform from the shore depends on its proximity to the shore and on other factors such as sea and weather conditions. Platforms typically are visible from shore at distances of 5 to 16 kilometers. On a clear night, lights on top of offshore structures can be visible at a distance of approximately 32 kilometers.

Similar to impacts during exploratory drilling, the presence of platforms and support vessels may interact with shipping and marine transport. The exclusion zone that will surround the platform for safety reasons will lead to a loss of fishing access, and will require other vessels to avoid the area.

The movement of a support vessel may lead to a slight increase in vessel activity in the region during the operation period.

3 Drilling discharge effects on sea floor and sea water quality

Impacts during development drilling would be qualitatively similar to those during exploratory drilling (discussed earlier). However, because numerous wells would be drilled at each production location, the areal extent and severity of benthic impacts would be greater than for exploratory drilling.

The impact of the discharge of drilling wastes will primarily affect the sea bed rather than the sea surface or water column. Drilling fluids and cuttings will accumulate on the sea floor if discharged directly, resulting in changes in bottom contours, grain size, barium concentrations, and concentrations of other metals. Impacts on the benthic communities from discharges of mud and cement may occur in the immediate vicinity of each well (approximately within 50 meters), and will likely recover within months or a few years.

Routine discharges during operations typically include produced water, well work over and completion fluids, treated sewage and domestic wastes, deck drainage, and other discharges.

Produced water refers to water found in reservoirs along with oil or

gas. When oil or gas is extracted, produced water is associated with it. Entrained within the water are hydrocarbons that are, as much as possible, removed from the water prior to any discharge. As the volume of hydrocarbons found in a reservoir decreases over the life of the field, the volume of produced water generally increases. Produced water includes formation water, condensed water, brine, injection water, and other technological wastes which usually consist of oil, natural hydrocarbons, inorganic salts, and technological chemicals. The discharge of produced water accounts for the greatest portion of wastes arising from offshore oil and gas production operations.

Produced water, having been in contact with various rock strata at elevated pressure and temperature, contains many soluble components including Barium and the radioactive intermediates of the Uranium and Thorium decay series. As the water is produced the temperature and pressure decreases, creating conditions in which the Barium and radionuclides can co-precipitate inside separators, valves, and pipework, forming an insoluble NORM (naturally-occurring radioactive material) scale. Some of the soluble radionuclides and particles of NORM scale will pass through the system and be discharged with the produced water. Similarly, some particulate scale and soluble radionuclides will be entrained with the exported oil by pipeline and discharged from the onshore terminal.

Additional miscellaneous discharges typically occur from numerous sources on an offshore platform. Examples include work over and completion fluids (brines), sanitary and domestic waste, deck drainage, uncontaminated freshwater and seawater used for cooling and ballast, desalination unit discharges, BOP fluids, and boiler blowdown discharges. These discharges must meet MARPOL requirements.

4 Accidental events

The risk of accidental hydrocarbon and/or chemical spillage into the sea is one of the main environmental concerns associated with oil industry developments. Spilled oil and chemicals at sea can have a number of environmental and economic impacts, the most conspicuous of which are on seabirds and marine mammals. The actual impacts depend on many factors, including the volume and type of oil spilled and sea and weather conditions. During the production phase there is a risk of oil spillages (fuel/crude) and spillage or leakage of chemicals.

The impacts from accidental events during the operation phase are similar to those during drilling operations (discussed earlier).

c Abandoning Oil Fields

Impacts from platform decommissioning are dependent on the type of facility removed and the proposed decommissioning plan. If explosive

charges are used for platform removal, then there is a risk of impacts to fish, marine mammals, and sea turtles.

The large amounts of different types of waste that will result from the removal of a structure may have a significant impact on existing waste management infrastructure in the country and might cause pollution on land.

Naturally occurring radioactive substances in scale, sludge, and other deposits on oil and gas platforms may be found in many different parts of the processing equipment, including valves, wellheads, risers, separators, hydrocyclones, and piping. They may also be present in subsea systems and pipelines that convey hydrocarbons to the processing installation they are linked to. The same applies to wellhead platforms.

Also the disposal of large amounts of marine fouling will pose an environmental threat whether disposed of offshore or on land.

Decommissioning of offshore installations can cause problems both for fisheries and for the aquaculture industry, including fish farming. For fisheries, any problems are largely related to the offshore phase of decommissioning and include restrictions on access to select areas.

II International Best Practices in Environmental Management in the Oil and Gas Sector

Different environmental management systems for offshore petroleum activities are adopted worldwide. The main aspects of environmental management in the offshore petroleum industry in the United States, Norway, Ireland, United Arab Emirates (UAE), and Qatar are presented below and further elaborated on in annex 3. These have been categorized in terms of environmental regulatory authority, main environmental legislation, environmental risk assessment, environmental permits, monitoring, enforcement and assurance mechanisms, and emergency preparedness and response.

a Environmental Regulatory Authority

The world over, petroleum producing states have government agencies which oversee extractive operations, each of which have their own set of prerogatives and authority. By assessing such agencies, it is possible to compare and better assess the environmental regulatory regime in Lebanon.

In the United States, the Bureau of Safety and Environmental Enforcement (BSEE) is responsible for the safety and environmental enforcement functions formerly under the Minerals Management Service. The BSEE's functions include the development and enforcement of safety and environmental regulations; permitting offshore exploration, development, and production; oil spill response and training; and environmental compliance programs. BSSE has the authority to inspect,

investigate, summon witnesses, and produce evidence; levy penalties; cancel or suspend activities; and oversee safety, response, and removal preparedness. The United States Coast Guard (USCG) is responsible for protecting the public, the environment, and US economic and security interests in any maritime region. The US Environmental Protection Agency (EPA) has the primary responsibility of enforcing many environmental regulations. It is responsible for regulating certain environmental activities in the Outer Continental Shelf, specifically concerning air quality, water quality, and waste.

In Norway, the Norwegian Environment Agency (NEA) is responsible for managing Norwegian nature and preventing pollution. The NEA's fields of work include monitoring the state of the environment, conveying environment-related information, exercising authority, overseeing and guiding regional and municipal authorities, cooperating with relevant industry authorities, acting as an expert advisor, and assisting in international environmental efforts.

In Ireland, the Environmental Protection Agency is at the front line of environmental protection and policing. Its primary responsibilities include environmental licensing, enforcement of environmental law, monitoring, and reporting on the environment.

In Abu Dhabi, the ADNOC acts as the de-facto regulator of health, safety, and environment (HSE) matters in the oil and gas industry and has established a Memorandum of Understanding (MoU) with the Abu Dhabi Environment Agency (EAD) whereby the EAD only interferes where projects may affect protected areas. In the other UAE emirates, the environmental department of the respective municipality acts as the environmental regulator.

In Qatar, the Ministry of Environment is the ultimate authority responsible for environmental management. It reviews and approves all EIA studies prepared by oil and gas companies in Qatar and monitors their implementation through the issuance of consent to build and consent to operate.

It can be concluded that in all benchmark countries except for Abu Dhabi in the UAE, the environmental regulatory authority is independent from the oil and gas licensing authority. This is essential to ensure the independence of the opinion of the environmental regulatory authority, avoid conflicts of interest, and ensure that environmental measures are implemented.

b Environmental Legislation

The main pieces of legislation related to the offshore oil and gas industry in the US are: The National Environmental Policy Act (NEPA), 30 CFR 250/550 'Oil and gas and sulphur operations in the Outer Continental Shelf' (includes requirements for pollution prevention), 40

CFR 'Protection of the environment' under EPA, Clean Water Act, and Clear Air Act.

Main relevant legislation in Norway includes the Petroleum Activities Act, Pollution Control Act, and general pollution and waste regulations.

Relevant legislation in Ireland includes the Petroleum and Other Minerals Development Act, Protection of the Environment Act, Dumping at Sea Act, Waste Management Act, and Petroleum Safety Act.

In the UAE, the Federal Environmental Law, Federal Petroleum Resources Conservation Law, UAE Cabinet Regulation for the Protection of Maritime Environment, and local environmental regulations as dictated in every emirate are the main legislation applicable to the offshore O&G industry. Additionally, ADNOC in Abu Dhabi has issued several codes of practice, including those on the environment, to be implemented by oil and gas companies.

In Qatar, general laws apply to the offshore oil and gas industry. These include: The Natural Resources Law, Environmental Protection Law, and Law on Exploitation and Protection of Marine Life. The MOE also recently issued a modern law for the management of NORM wastes.

General environmental legislation applies to the oil and gas sector in all benchmark countries, yet specific petroleum sector legislation includes certain environmental provisions and requirements such as those related to flaring and venting.

c Environmental Risk Assessment

Environmental studies, whether environmental impact statements, environmental area assessments, or EIAs are required for all phases of oil and gas operations.

In the US, the NEPA requires that federal agencies incorporate environmental considerations into their planning and decision-making. The NEPA process consists of an evaluation of the environmental effects of a federal undertaking. Accordingly, an undertaking is either determined to have no significant environmental impact or requires an environmental assessment or environmental impact statement.

In Norway, an environmental assessment is required by law for opening new areas for petroleum activities and in connection with developing an oil and gas field and as a part of submitting a plan for development and operation of an oil or gas field.

In Ireland, a strategic environmental assessment and environmental area assessment are required during the exploration phase and an environmental impact statement is required during production.

In the UAE, EIAs must be undertaken for oil and gas projects, and in Qatar, an EIA is required before undertaking any kind of development projects or other industrial activities that may have a harmful impact on the environment.

d Environmental Permits

Different types of permits are required in different countries. However, they all cover air emissions, flaring, and venting; discharges to sea; and waste management. Such permits are generally granted by the environmental regulatory authority.

In the US, a new or modified exploration or development oil and gas operation requires several permits, including: A local land use development permit, drilling permit, and an operating permit. To obtain these permits, projects are required to comply with certain federal and state emissions regulations, such as the National Emission Standards for Hazardous Air Pollutants and the Clean Water Act (CWA). The CWA requires that all discharges of pollutants to surface waters (including oceans) must be authorized by a permit. In April 2012, the EPA passed rules to address air emissions from oil and gas activities. Under the rules, oil and gas well operators must reduce air emissions.

In Norway, emission permits and discharge permits are required by the NEA. The NEA also issues permits for collection and processing of hazardous waste, while the county governor issues permits for the reception and temporary storage of hazardous waste. Gas flaring and venting is regulated by the Petroleum Act. The level of gas flaring and venting cannot exceed the quantities determined by the Ministry of Petroleum and Energy (MPE).

In Ireland, the EPA issues an Integrated Pollution Prevention and Control License, which is a single integrated license that covers all emissions from the facility and its environmental management.

In the UAE, the Federal Environmental Law lists obligations regarding emissions, including discharge obligations; obligations regarding the handling, transportation, and disposal of hazardous substances and wastes; and burning of any fuel or other substances in oil and gas operations. The Federal Petroleum Resources Conservation Law sets out requirements for dealing with associated gas in the production of oil. In the UAE, the environmental permit is generally linked to the approval of the EIA study.

In Qatar, the permits granted for a particular project by the MOE address all issues involving environmental impact, including permitted emissions and discharges during the extraction and processing of oil and gas. The permit is mainly issued as a result of the EIA study and in the form of a consent to operate, which needs to be renewed on a yearly basis. The CTO is only renewed if the MOE finds that the operator is complying with environmental requirements based on the findings of an audit and review of the operator's environmental reports.

e Monitoring/Enforcement/Assurance Mechanisms

Generally, the environmental regulatory authority monitors compliance by conducting audits and inspections and issuing reports. Scheduled and unannounced inspections are conducted to ensure compliance with license conditions and environmental requirements. Authorities either issue reports of noncompliance or certificates of compliance/consent to operate.

In the US, the OCS Lands Act authorizes and requires the BSEE to provide for both an annual scheduled inspection and a periodic unscheduled (unannounced) inspection of all oil and gas operations on the outer continental shelf. Additionally, industry self-inspections are required by regulation and third party reviews are required for deepwater or novel structures.

In Norway, the NEA monitors compliance through audits, inspections, checking annual reports, and assessing environmental monitoring programs and imposes sanctions if required.

In Ireland, the DCENR monitors compliance at activity level and the EPA monitors change in the environment and adherence to the conditions of the IPC license. The Office of Environmental Enforcement is a dedicated office within the EPA dealing with the implementation and enforcement of environmental legislation.

In the UAE, the ADNOC HSE department conducts self-monitoring in Abu Dhabi. The environmental departments in other emirates conduct inspections.

In Qatar, the MOE conducts inspections and issues/renews consent to operate certificates.

f Emergency Preparedness and Response

Operators are required to submit oil spill response plans that act as a first layer of environmental protection. These plans should be in line with national oil spill response plans prepared by the competent authorities. In most cases, emergency response and cleaning required at a national level are led by coast guard authorities.

In the US, the USCG has the main responsibility for oil spill response efforts, while the BSEE is responsible for planning (i.e. reviewing preparations) for potential oil spills on the Federal Outer Continental Shelf. Operators are required to submit oil spill response plans for approval by the bureau. The EPA and USCG are the main bodies that coordinate national contingency plan preparedness and response activities.

In Norway, the PSA is responsible for emergency preparedness. Operators will coordinate their own emergency preparedness plans and those of the contractors. The Norwegian Clean Seas Association for Operating Companies (NOFO) is responsible for oil spill response,

planning, and preparedness on behalf of companies. Operators use the NOFO to carry out all practical measures. The Norwegian Coastal Administration is responsible for the operational side of such clean-ups.

In Ireland, the operator is responsible for emergency preparedness and the Irish Coast Guard is responsible for oil spill preparedness and response. Local authorities have responsibility for the shoreline response under the oversight of the Irish Coast Guard.

In Abu Dhabi, the Supreme Petroleum Council and ADNOC are responsible for oil spill preparedness and response.

In Qatar, Qatar Petroleum's Oil Spill and Emergency Department (OS&ERD) is the main body responsible for oil spill response, and also monitors the operations and provides support if needed. Doha Port Management is responsible for oil spill and clean-up operations.

III Existing Environmental Governance System in Lebanon

A detailed review of existing environmental governance systems for offshore petroleum activities in Lebanon is presented in annex 4 and the main points of interest are presented in the sub-sections below.

a Environmental Regulatory Authority

The MOE is the main body responsible for environment protection and management in Lebanon. The role of the MOE in the oil and gas sector is explicitly defined in the Offshore Petroleum Resources Law (OPRL) No. 132/ 2010 and the Petroleum Activities Regulations (PAR) Decree No. 10289/2013 in several provisions. The ministry is tasked with supervising the conduct of petroleum activities and ensuring its overall compliance with environmental standards and regulations. In article 60, the OPRL grants the MOE the authority to '(i) supervise; (ii) control environmental matters related to petroleum activities; (iii) coordinate with other concerned authorities; and (iv) take initiatives or measures deemed necessary to minimize negative impacts that petroleum activities may have on local communities and the environment'. Other provisions in the OPRL and the PAR refer to the MOE, particularly in relation to the EIA report and other environmental concerns including monitoring and site inspection.

Different departments of the MOE will be involved with petroleum activities, particularly the Department of Natural Resources Protection, Department of Ecosystems, Department of Chemical Safety, Department of Air Quality, Department of Integrated Environmental Systems, and the Department of Monitoring and Statistics, in addition to other departments.

The new petroleum sector will require capacity building of existing departments at the MOE to cater to new requirements introduced by

the petroleum sector. The need to establish a dedicated department for oil and gas needs to be assessed against empowering specific departments in the existing structure. At the very least, the capacity of a dedicated team from the MOE needs to be strengthened, particularly in the areas of EIAs, mitigation and monitoring, environmental audits and inspections of oil and gas facilities and assets, and environmental emergency preparedness and response.

Another main stakeholder in environmental management of petroleum activities in Lebanon is the Lebanese Petroleum Administration (LPA). The LPA was established on 4 December 2012, to be the regulatory body in charge of managing the petroleum sector in Lebanon.

The QHSE Department of the LPA is responsible for all matters related to the quality of operators' systems and the extent of their adherence to the conditions of health, safety, and environment, and particularly responsible for studying applications for licenses, studying plans on quality of performance, monitoring preparedness for addressing accidents and emergencies, monitoring the compliance of operators with various regulations, assessing the impact of operations on occupational and environmental health, and monitoring facilities to ensure compliance with environmental, health, and safety standards (annex 4).

Other stakeholders involved in the environmental management of the petroleum sector include the Council of Ministers, Ministry of Energy and Water (MEW), Committee for Field Emergencies for Energy and Water, National Emergency Response Committee (NERC), National Council for Environment, Ministry of Public Works and Transport (MOPWT), Ministry of Defense (Lebanese Navy), Lebanese Ministry of Finance (Lebanese Customs), Lebanese Standards Institution - LIBNOR, Disaster Risk Reduction (DRR) (within the Council of Ministers), Lebanese Atomic Energy Commission (LAEC), and CBRN National Team.

The roles of these stakeholders are elaborated on in annex 4.

The above indicates that there are various authorities that have specific roles in environmental protection in Lebanon, although the main competent authority is the MOE. A clear distribution of roles is critical to avoid major environmental impacts that arise from oil and gas operations.

b Main Legislation

Lebanon has ratified various conventions related to the protection of the environment and marine environmental resources.

The MOE or MOPWT (depending on the convention in question) is the focal point for maritime conventions and protocols while the MOE is the focal point for other environmental conventions.

In the event of discoveries of hydrocarbons in offshore Lebanon, activities in the Mediterranean Sea are expected to increase significantly,

making implementation of the requirements of these conventions more challenging and resource-intensive. Effective coordination between both ministries is key to properly implementing these conventions.

The most important national laws, decrees, and ministerial decisions with relevance to oil and gas activities can be found in annex 4.

Existing legislation including general environmental regulations and signed conventions in addition to the OPRL and the PAR covers the majority of environmental issues. However, there are some requirements that existing legislation does not cover such as the management and disposal of drill cutting and fluids, produced water, and NORM wastes, which are the main pollutant streams that arise from the offshore petroleum sector.

Additionally, some requirements referred to in existing legislation are yet to be specified or issued by decrees, such as:

- A decree to determine which industrial institutions require a permit for releasing emissions into the air and to specify the mechanism for granting a permit, which is referred to in Decree No. 2275/2009 (roles of the Department of Air Quality)
- A decree to specify the list of materials allowed to be discharged in the sea referred to in Article 30 of Law No. 444/2002
- COM Decrees mentioned in Articles 40 and 44 of Law 444/2002 related to dangerous or hazardous wastes
- Decree to set the standards for the management of solid waste streams expected from the oil and gas sector (pursuant to ISWM Draft Law)
- Application of MOE Decision No. 99-1/2013, which sets the guidelines for submitting information on greenhouse gas emissions by companies and industrial and commercial institutions

c Environmental Risk Assessment

The requirement of conducting environmental studies for petroleum activities is stipulated in different legislative texts, namely: Law No. 444/2002 (Article 21); Law No.690/2005 (Article 2); Offshore Petroleum Resources Law (OPRL) Law No. 132/2010 (Article 7.2, Article 29.1, Article 29.3, Article 32, Article 47.3); EIA Decree No. 8633/2012; and the Petroleum Activities Regulations (PAR) Decree No. 10289/2013 (Article 43, Article 54, Articles 59/61).

The OPRL and the PAR request an EIA for development, production, transportation, storage, utilization, and decommissioning activities, but do not explicitly require an EIA for exploration activities. Also, the OPRL stipulates that the procedures, requirements, and conditions related to the EIA study shall be stipulated by a COM decree.

According to the EIA Decree, the MOE verifies whether a project

falls within the domain of annex 1 or annex 2 or is located in an area listed in annex 3, in addition to the likelihood of a significant impact on that area. If the proposed project falls in the domain of annex 1, it will be subject to an 'EIA' study. If it falls in the domain of annex 2, it will be subject to an 'IEE'. If the proposed project is classified in the domain of annex 2 and located in an area listed in annex 3, or it may have a significant environmental impact on that area, the project will be subject to an EIA study. If the project does not fall within the domain of annex 1 or annex 2 but is located in an area listed in annex 3 where it may have a significant environmental impact, it will be subject to an 'initial environmental examination'. Additionally, the minister of environment, based on an informed review, may request an IEE or an EIA report for the project regardless of its classification.

Oil and gas pipelines, tanks, refineries, and extraction of oil and gas are listed in annex 1 of the EIA decree and thus require an EIA. However, exploration is not listed in the annexes of the decree.

According to annex 3, sensitive areas include: Areas classified, by laws or decrees, as specifically protected areas, natural environment protected areas, natural forests or wetlands, important bird areas, public parks, natural scenery sites, touristic and historic sites, archaeological locations, river banks, springs, and/or holy places; areas that are habitats of endangered species; watersheds; and sea beaches, river waterways, and springs.

Since marine water is a habitat of many endangered species, and since coastal areas are considered sensitive areas, oil and gas exploration activities may be subject to an IEE or EIA, even if not explicitly listed in annex 1 or annex 2. Additionally, the minister of environment may request an IEE or an EIA report for the project regardless of its classification.

Coordination between the minister of energy and water and minister of environment is essential to ensure an effective EIA process for oil and gas activities in offshore Lebanon. Two points are particularly important:

- Deciding whether a new decree on EIA specific to oil and gas activities should be issued as allowed by article 29.3 of Law 132/2010.
  It is the authors' opinion that the requirement for a new EIA decree specific to oil and gas activities was included in Law 132/2010 due to the absence of an EIA decree when preparing the law. Nevertheless, this requirement is no longer needed after the EIA decree was issued in 2012 (Decree No. 8633 /2012). The EIA decree provides the necessary framework for a robust environmental assessment for oil and gas activities. A guidance document or manual for the development of EIA studies for oil and gas activities is recommended instead.

- Agreeing on whether an EIA (or IEE) shall be required for the exploration phase, and particularly for exploratory drilling activities. While Law 132 and Decree 10289 do not explicitly require it, provisions for such impact assessments are still required by Law 444. The legislation is subject to interpretation and mishandling of this issue could lead to major public opposition and delays in the exploration phase. The authors strongly advise that as Lebanon opens its waters for the first time for exploration activities, detailed environmental assessment studies be conducted, including comprehensive environmental baseline studies (in particular marine and deep water studies) and modeling of discharges as applicable.

d Environmental Permits

Requirements for environmental permits which apply to offshore oil and gas activities are stipulated in several legislative texts.

The Environment Protection Law No. 444/2002 requires a permit for discharge into territorial waters (Article 3.1), a prior permit that sets limits for all types of pollutant releases from the facility (Article 42), and a prior permit for the import, handling, or disposal of dangerous/hazardous chemicals (Article 44).

Decree No. 2275/2009 stipulates that the Department of Air Quality at the MOE is responsible for determining the industrial institutions that require a permit for releasing emissions into the air and specifying the mechanism for granting the permit. The Department of Urban Environmental Protection is responsible for determining the industrial institutions that require a permit for wastewater discharge and specifying the mechanism for granting the permit.

The PAR and the OPRL require permits for flaring and venting (excluding emergency flaring or venting). The application for the permit shall include the reasons for venting or flaring, a description of the facility, the amounts, the composition, and the timing of venting and flaring. The permit shall be granted by the minister of energy and water based on the opinion of the LPA in coordination with the MOE.

The Environmental Compliance Decree No. 8471/2012 and Decision No 202/1 dated 30/7/2013 and issued pursuant to it request that industrial establishments apply for a three-year renewable environmental compliance certificate (ECC). The application for an ECC to the MOE by industrial establishments to which Decree 8471 applies is optional until 31/12/2015. The MOE in cooperation with the Ministry of Industry will determine the deadlines for applying for the ECC according to a clear and practical criteria in compliance with sectorial strategies.

Although the requirements for different types of permits are included in Lebanese legislation, the limits, conditions, and procedures for issuing these permits have yet to be specified. This must

be considered a priority as oil and gas activities should not be initiated in the absence of specific environmental permitting procedures.

e Monitoring/Enforcement/Assurance Mechanis

Assurance mechanisms including monitoring, inspection, auditing, and investigation are stipulated in the Offshore Petroleum Resources Law (OPRL) No. 132/2010, Petroleum Activities Regulations (PAR) Decree No. 10289/2013 and in the Environmental Protection Law No. 444/2002, as elaborated in annex 1. Main stakeholders involved are the LPA, MOE, and MEW.

Responsibilities and mechanisms for environmental monitoring, auditing, inspection, and reporting shall be defined between different stakeholders. This can be achieved by signing MoUs between the LPA and concerned ministries, particularly the MOE.

f Emergency Preparedness and Response

Lebanon is party to several international conventions that require the establishment of measures for dealing with offshore pollution incidents, either nationally or in cooperation with other countries. Such conventions include (annex 4):

- IMO International Convention on Oil Pollution Preparedness, Response, and Co-operation
- ILO, C174 - Prevention of Major Industrial Accidents Convention
- 2002 Emergency Protocol of the Barcelona Convention

IV Conclusions and Recommendations

In many aspects, the Lebanese environmental governance system should be considered to meet international standards. However, there are various gaps that need to be addressed to ensure the Lebanese government is ready to manage the environmental risks associated with offshore oil and gas activities. A National Oil Spill Contingency Plan is being prepared by the LPA to organize environmental emergency responses related to activities from the petroleum sector.

a In Terms of Environmental Regulatory Authority

The main environmental regulator for the oil and gas sector in Lebanon (MOE) is independent of the oil and gas licensing authority, which is in line with international best practices.

Although the role of the MOE in the oil and gas sector is explicitly defined in the Offshore Petroleum Resources Law (OPRL) No. 132/2010 and the Petroleum Activities Regulations (PAR) Decree No. 10289/2013 in several provisions, there are gray areas that need to be better defined. These include responsibilities and mechanisms for environmental

monitoring, auditing, inspection, and reporting. This can be achieved by signing MoUs between the LPA and the MOE. Other entities also have specific environmental management roles such as the MOPWT, which is the focal point of important international conventions related to the environment (notably MARPOL) or LAEC, which has specific authority over NORM. MoUs between the MOE and these agencies are encouraged to ensure responsibilities are clearly delineated and to promote coordination and cooperation.

With regard to the capacity of institutions, existing institutions do not currently have the needed capacity to deal with the requirements of the petroleum sector. Training need assessment studies should be performed for different institutions that will have an environmental role in the petroleum sector, and required training and capacity building should be implemented. The needed equipment for monitoring the change in environmental indicators/parameters should be made available. The Norwegian government is supporting the LPA in building the capacity of relevant stakeholders in the oil and gas sector, including the MOE, through the Oil for Development Program.

It is also recommended that an institutional assessment be conducted to evaluate the feasibility and need of establishing a dedicated oil and gas service or department at the MOE and possibly at other ministries with specific environmental management roles, such as the Ministry of Public Works and Transport.

The use of third parties for EIA reviews, inspection, and auditing can be an option, especially in the short term until existing institutions gain the capacity to conduct such work. In this case it is recommended that procedures to prequalify competent firms be put in place.

b In Terms of Environmental Legislation

Existing legislation, including general environmental regulations and signed conventions in addition to the OPRL and the PAR, covers the majority of environmental aspects related to the oil and gas sector. However, there are some requirements that existing legislation does not cover such as the management and disposal of drill cutting and fluids, produced water, and NORM wastes, which are the main pollutant streams that arise from the offshore petroleum sector. Legislative action that covers these aspects should be made (probably in the form of decrees). Sampling procedures should also be set. These could take the form of decisions made by the MOE.

Additionally, some requirements referred to in existing legislation have yet to be specified or issued by decrees, such as those referenced in section III.

It is highly recommended that specific limits and targets regarding GHG emissions be established, along with specific guidelines for the oil and gas sector.

The SODEL (Sustainable Oil and Gas Development in Lebanon) project managed by the United Nations Development Program (UNDP) is supporting the LPA and relevant stakeholders, including the MOE, to strengthen the legal framework in line with the requirements of the oil and gas sector.

c In Terms of Environmental Risk Assessment

With regard to EIA studies, it should be decided whether a new EIA decree specific to oil and gas activities should be issued as allowed by Article 29.3 of Law 132/2010. It is, however, the author's opinion that the existing EIA decree provides a good framework for environmental assessments of oil and gas activities. It can be complemented by guidelines for the preparation of EIA studies for specific oil and gas activities. EIA procedures should also be developed to standardize the way risks are assessed and quantified.

It is also important to agree on whether an EIA (or IEE) shall be required for the exploration phase, and particularly for exploratory drilling activities. According to international best practice, it is recommended that an EIA be required since environmental impacts from exploratory drilling can be significant if not properly managed. Mishandling of this issue could lead to major public opposition and delays in the exploration phase.

d In Terms of Environmental Permits

Although the requirements for different types of permits are included in Lebanese legislation, the limits, conditions, and procedures for issuing these permits have yet to be specified (as elaborated in section 5.2 above).

According to existing legislation, different ministries have roles in issuing related permits. The MOE can issue emissions permits, the minister of public works and transport can authorize disposal in territorial waters and under the seabed in territorial waters, and the MEW can issue flaring and venting permits.

It is recommended that MoUs be signed between these ministries to establish a permitting system with clear responsibilities and procedures.

It is recommended that the MOE be responsible for issuing discharge permits, emissions permits, and waste disposal permits. The discharge limits stipulated in the permit can be specific to the drilling/operation geographic location. General discharge limits at sea may apply to areas that do not contain sensitive receptors (such as important marine eco-systems or areas approximate to fisheries), while more stringent

limits apply to important/sensitive areas. With regard to flaring and venting permits, they shall be reviewed by the MOE before being issued by the MEW as stipulated in the PAR.

e In Terms of Monitoring/Enforcement/Assurance Mechanism

Responsibilities and mechanisms for environmental monitoring, auditing, inspection, and reporting should be defined among different stakeholders. This can be achieved by signing MoUs between the LPA and concerned ministries, especially the MOE. While the LPA can be responsible for monitoring and inspection at the activity level, the MOE should be empowered to monitor changes in environmental indicators, and should conduct regular and unannounced audits and inspections to ensure compliance with the requirements of granted permits and the environmental management plans proposed in EIA studies. Additionally, it should issue annual compliance reports.

The option of using a third party for inspection can be considered and regulated.

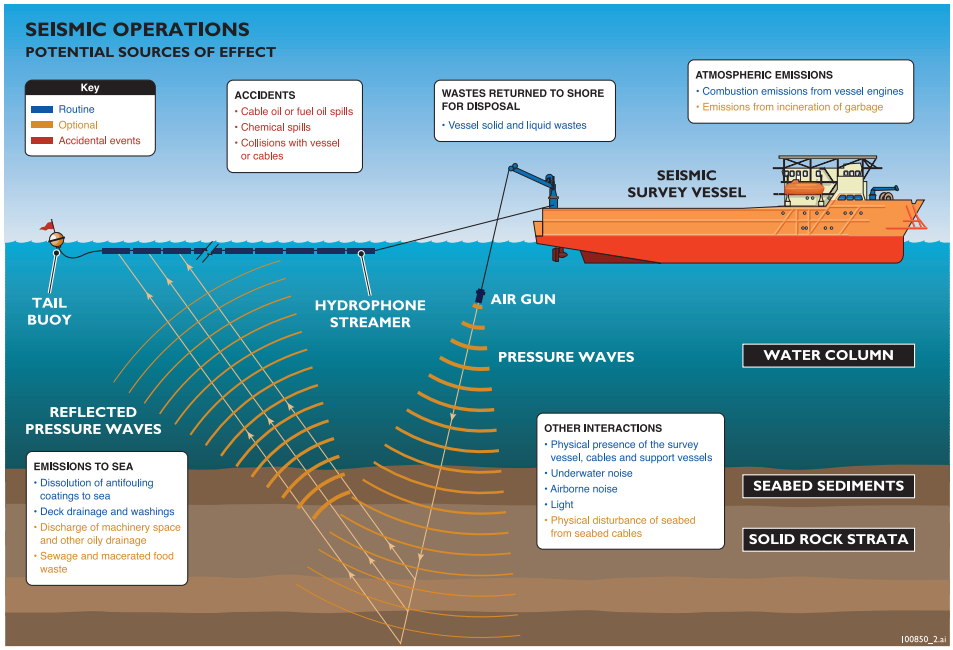
f In Terms of Emergency Preparedness and Response

It is necessary to develop a detailed guidance document for emergency preparedness and response which specifies emergency procedures and roles and responsibilities for different tiers of emergencies. The LPA is working toward the development of a National Oil Spill Contingency Plan in coordination with all relevant stakeholders.

Mechanisms for increased transboundary cooperation in environmental management also need to be established.

Annex 1

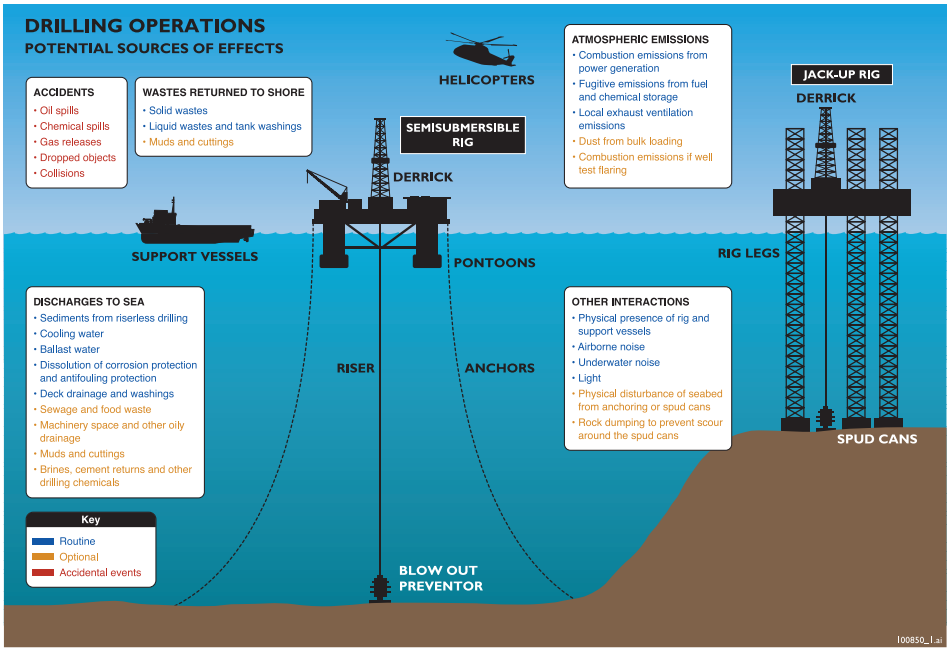
I Sources of Potential Environmental Effects from Seismic Operations



Source **Hartley Anderson Limited, 2001**

Annex 2

I Sources of Potential Environmental Effects from Drilling Operations



Source **Hartley Anderson Limited, 2001**

Annex 3

I Regulatory Regime by Country

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
Environmental Regulatory Authority	Bureau of Safety and Environmental Enforcement (BSEE): The BSEE is an agency under the United States Department of the Interior. The agency exercises the safety and environmental enforcement functions formerly under the Minerals Management Service. BSEE's functions include the development and enforcement of safety and environmental regulations; permitting offshore exploration, development, and production; offshore regulatory programs; oil spill response; and training and environmental compliance programs. BSSE has the authority to inspect, investigate, summon witnesses and produce evidence, levy penalties, cancel or suspend activities, and oversee safety, response, and removal preparedness. United States Coast Guard (USCG): The USCG within the Department of Homeland Security	Norwegian Environment Agency (NEA): The NEA's primary tasks are to reduce greenhouse gas emissions, manage Norwegian nature, and prevent pollution. The NEA was established in 2013 as a result of the merger of the Norwegian Climate and Pollution Agency (Klif) and the Norwegian Directorate for Nature management. NEA's fields of work include monitoring the state of the environment, conveying environment-related information, exercising authority, overseeing and guiding regional and municipal authorities, cooperating with relevant industry authorities, acting as an expert advisor, and assisting in international environmental efforts.	Environmental Protection Agency (EPA): The EPA is at the front line of environmental protection and policing. Their primary responsibilities include: ▪ Environmental licensing ▪ Enforcement of environmental law ▪ Environmental planning, education, and guidance ▪ Monitoring, analyzing, and reporting on the environment ▪ Regulating Ireland's greenhouse gas emissions ▪ Environmental research development ▪ Strategic environmental assessment ▪ Waste management ▪ Radiological protection	ADNOC HSE in Abu Dhabi/EAD in special cases, Environmental Departments in other Emirates: ADNOC acts as the de-facto regulator of health, safety, and environment (HSE) matters in the Abu Dhabi oil and gas industry. ADNOC has signed a Memorandum of Understanding with the Abu Dhabi Environmental Agency (EAD) to waive the need to obtain the EAD's approval on EIAs for oil and gas projects, except in the case of projects that may affect protected areas. ADNOC's HSE department supports and provides guidance to its projects in terms of environmental policies, requirements, and procedures.	Ministry of Environment (MOE): The MOE was established to protect Qatar's environment and support the development and sustainability of the country's living and non-living natural resources. It is the ultimate authority responsible for environmental management and it reviews and approves all EIA studies prepared by oil and gas companies in Qatar and monitors their implementation through the issuance of consent to operate.

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	(DHS), is a military, multi-mission, and maritime service. Its core roles are to protect the public, the environment, and US economic and security interests in any maritime region in which those interests may be at risk, including international waters and America's coasts, ports, and inland waterways. US Environmental Protection Agency (EPA): The EPA is an independent agency of the US government. The EPA has the responsibility of enforcing many United States environmental regulations. The EPA is the primary agency responsible for regulating certain environmental activities in the Outer Continental Shelf (OCS), specifically concerning air quality, water quality, and waste.				
Main Environmental Legislation	▪ National Environmental Policy Act (NEPA) ▪ 30 CFR 250/550 'Oil and gas and sulphur operations in the Outer Continental Shelf' (includes requirements for	▪ Petroleum Activities Act (which include provisions related to HSE) ▪ Pollution Control Act[1] ▪ General pollution and waste regulations[2]	▪ Petroleum and Other Minerals Development Act, 1960 as amended by the Energy Act, 1995 and the Gas (Interim) (Regulation) Act, 2002 ▪ Protection of the Environment Act, 2003[3]	▪ Federal Environmental Law (Law No. 24 of 1999)[5] ▪ Federal Petroleum Resources Conservation Law ▪ UAE Cabinet Regulation for the Protection of Maritime Environment	▪ Natural Resources Law ▪ Environmental Protection Law ▪ Law on Exploitation and Protection of Marine Life[6]

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	pollution prevention) ▪ 40 CFR 'Protection of the environment' under EPA ▪ Clean Water Act ▪ Clean Air Act In general, federal and state laws relating to environmental, health, and safety concerns are not oil and gas industry-specific but are impact oriented		▪ Dumping at Sea Act 1996 ▪ Waste Management Act, 1996 (As amended) ▪ EU Directives (EIA and SEA) ▪ Petroleum (Exploration and Extraction) Safety Act 2015[4]	▪ Local environmental regulations as dictated in every emirate ▪ ADNOC in Abu Dhabi has issued several codes of practice, including those on the environment, to be implemented by oil and gas companies	
Environmental Risk Assessment	The NEPA requires federal agencies to incorporate environmental considerations into their planning and decision-making. The NEPA process consists of an evaluation of the environmental effects of a federal undertaking including its alternatives. There are three levels of analysis: ▪ Categorical exclusion, in which the undertaking is excluded from a detailed environmental analysis if it meets certain criteria which a federal agency has previously determined as having no significant environmental impact ▪ Environmental assessment[7], in which a federal agency prepares a	An environmental assessment is required by law[9] for: ▪ Opening of new areas for petroleum activities ▪ In connection with developing an oil and gas field and as a part of submitting a plan for development and operation of an oil or gas field	▪ Strategic environmental assessment and environmental area assessment (EAA) during exploration phase ▪ Environmental impact statement during production	▪ EIAs must be undertaken for oil and gas projects ▪ In Abu Dhabi, EIAs are prepared as part of a comprehensive Health, Safety and Environmental Impact Assessment (HSEIA) study	An EIA is required before undertaking any kind of development projects or other industrial activities that may have a harmful impact on the environment.

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	written environmental assessment (EA) to determine whether or not a federal undertaking would significantly affect the environment. If the answer is no, the agency issues a finding of no significant impact (FONSI). If the answer is yes, then an environmental impact statement may need to be prepared ▪ Environmental impact statement (EIS), in which a detailed evaluation of the proposed action and alternatives is made.[8] The EIS must include discussions of the purpose of and need for the action, alternatives, the affected environment, and the environmental consequences of the proposed action				
Environmental Permits	Generally, a new or modified exploration or development oil and gas operation requires several permits, including: ▪ A local land use development permit ▪ A drilling permit ▪ An operating permit To obtain these permits, many projects:	Permit requirements are included in the following areas: ▪ CO2 & NOX emissions. Emission permits during the operations phase can be granted by the NEA (Pollution Control Act) ▪ Oil and chemical discharges are regulated nationally	▪ Permit to use or discharge added chemicals ▪ Integrated pollution prevention and control license by the EPA[13] An IPC license is a single integrated license which covers all emissions from the facility and its environmental	The Federal Environmental Law sets out obligations regarding emissions, including: ▪ Parties licensed to conduct oil and gas operations are prohibited from discharging any polluting substance resulting from those operations unless: safety	The permits granted for a particular project by the Ministry of Environment address all issues involving environmental impact, including permitted emissions and discharges during the extraction and processing of oil and gas.

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	▪▪ Require an environmental assessment (EA) under the NEPA or under similar state requirements ▪▪ Are required to comply with certain federal and state emissions regulations, such as the National Emission Standards for Hazardous Air Pollutants and the Clean Water Act ▪ The Clean Water Act (CWA) requires that all discharges of pollutants to surface waters (inc. oceans) must be authorized by a permit issued under the National Pollutant Discharge Elimination System (NPDES) program by the EPA. The two basic types of NPDES permits issued are individual and general permits. Individual NPDES permits are specifically tailored to individual facilities. General NPDES permits cover multiple facilities within a certain category located in a specific geographical area. Permit writers derive effluent limits from the applicable technology-based effluent limitation	through discharge permits granted by the NEA (Pollution Control Act) The NEA issues permits for collection and processing of hazardous waste, while the County Governor issues permits for the reception and temporary storage of hazardous waste.[12] Gas flaring and venting is regulated by the Petroleum Act. The level of gas flaring and venting cannot exceed the quantities determined by the Ministry of Petroleum and Energy (MPE). The burning of any kind of petroleum in excess of the quantities needed for normal operational safety is prohibited, unless approved by the MPE. The gas flaring permits can be divided into three different categories: ▪ Permits required in connection with the start of production in a new field ▪ Permits required for regular operations ▪ Permits required in connection with operational difficulties The gas flaring permits are granted in the form of a	management. It covers emissions to air, water, and land; waste management; and use of energy/resources.	measures preventing damage to the land and aquatic life are adopted and discharged waste and polluting substances are treated by available up-to-date technical systems (Article 18) ▪ The burning of any fuel or other substances in oil and gas operation must be within permissible limits and all precautions must be taken to reduce the quantity of pollutants in combustion emissions (Article 53) The Federal Petroleum Resources Conservation Law sets out requirements for dealing with associated gas in the production of oil, including (Articles 44 to 46): Using gas to maintain reservoir pressure, in production processes, and re-injecting it back into reservoirs. If such use is not possible, it must be disposed of in a safe way and cannot be flared without the written consent of the government (Article 46). The Federal Environmental Law sets out obligations regarding	With regard to discharges to sea, Article 17 of Law No. (4) of 1983 concerning the Exploitation and Protection of Marine Life in Qatar restricts the dumping of petroleum products or waste products into the sea without approval in writing from concerned authorities. The Environmental Protection Law provides for fines and penalties for unauthorized dumping or burial of wastes, including possible imprisonment. Qatar has joined the World Bank's Global Gas Flaring Reduction Partnership. The Ministry of Energy and Industry and Qatar Petroleum regulate flaring and venting of gas in Qatar.

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	guidelines (ELGs) and water quality-based standards. The more stringent of the two will be written into the permit[10] ▪ Air Permit (By EPA): In April 2012, the EPA passed rules to address air emissions from oil and gas exploration, production, processing, and transportation. Under the rules, oil and gas well operators must reduce air emissions from drilling and hydraulic fracturing. Companies have until 2015 to meet the green completion requirements in the final rule Beginning 15 October 2012, gas well completion notification provisions under the EPA's 2012 oil and gas standards took effect.[11]	total amount of flared gas per quarter and this amount is limited to what is required for safety reasons to achieve normal operation. For new developments and fields, the gas flaring permits are issued on a monthly basis.		the handling of hazardous substances and wastes (Article 58, 59, 60, 61, 62) including the following: ▪ Handling, dealing and treatment of hazardous substances or wastes requires a license (Articles 58 and 59) ▪ Transportation and disposal of hazardous wastes by land, sea, or air must comply with regulatory requirements and have a written permit from the Ministry of Environment and Water (Articles 60 and 62)	
Monitoring/ Enforcement/ Assurance Mechanisms	▪ The OCS Lands Act authorizes and requires the BSEE to provide for both an annual scheduled inspection and a periodic unscheduled (unannounced) inspection of all oil and gas operations on the outer continental shelf. The annual inspection examines all safety	▪ Norwegian Environment Agency (NEA) monitors compliance (by audits and inspections, checking annual reports, by assessing environmental monitoring programs) and impose sanctions	▪ DCENR Monitors compliance at activity level ▪ The Environmental Protection Agency (EPA) monitors change in the environment and the adherence to conditions of the IPC license. The Office of Environmental Enforcement is a dedicated office	▪ Self-monitoring by ADNOC HSE in Abu Dhabi ▪ Environmental Departments in other emirates conduct inspections	▪ Ministry of Environment conducts inspections and issues consent to operate certificates

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	equipment designed to prevent blowouts, fires, spills, or other major accidents[14] ▪ Potential Incident of Noncompliance (PINC) - Checklist items which BSEE inspects to pursue safe operations on the Outer Continental Shelf ▪ Incident of Non-compliance (INC) - If an inspector finds a violation of BSEE regulations as they are outlined in the PINC check-lists, the Bureau Inspector issues an Incident of Non-compliance (INC) citation to the operator. Depending on the severity of the violation, the inspector can declare either a warning or shut-in INC If the violation is not severe or threatening, a warning INC is issued. The warning INC must be corrected within a reasonable amount of time specified on the INC. The shut-in INC may be for a single component or the entire facility. The violation must be corrected before the operator is allowed to continue the activity in question. In addition to the		within the EPA dealing with the implementation and enforcement of environmental legislation		

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	enforcement actions specified above, the bureau can assess a civil penalty of up to $40,000 per violation per day if: 1) the operator fails to correct the violation in the reasonable amount of time specified on the INC; or 2) the violation resulted in a threat of serious harm or damage to human life or the environment. ▪ Industry self-inspections and records are required by regulation ▪ Drills (spill response, BOPE, H2S, evacuation, etc) are required and may be initiated by BSEE without notice ▪ 3rd party reviews (design, fabrication, and installation) are required for deepwater or novel structures				
Emergency Preparedness and Response	▪ USCG has main responsibility for oil spill response efforts ▪ BSEE is responsible for planning (i.e. reviewing preparations) for potential oil spills on the Federal Outer Continental Shelf. Operators are required to submit Oil Spill Response	▪ PSA has responsibility of emergency preparedness ▪ Operator will coordinate its own emergency preparedness plans and those of the contractors ▪ Operator responsible for combatting, cleaning up, and normalizing oil spill	▪ Operator responsible for emergency preparedness ▪ Irish Coast Guard responsible for oil spill preparedness and response ▪ Local authorities have responsibility for the shoreline response under the oversight of the Irish Coast Guard	▪ Supreme Petroleum Council and ADNOC are responsible for oil spill preparedness and response (in Abu Dhabi)	▪ Qatar Petroleum's Oil Spill and Emergency Department (OS&ERD) is the main body responsible for oil spill responses ▪ Doha Port Management is responsible for oil spill and clean-up operations ▪ OS&ERD monitors the operations and

Aspect	Country				
	US	Norway	Ireland	UAE	Qatar
	Plans for approval by the Bureau. These plans must address worst case discharge ▪ EPA and USCG main bodies that coordinate national contingency plan preparedness and response activities	▪ Norwegian Clean Seas Association Operating Companies (NOFO) responsible for oil spill response, planning and preparedness on behalf of the companies ▪ Operators use NOFO to carry out all practical measures[15] ▪ Norwegian Coastal Administration is responsible for the operational side of such clean-ups[16]			provides support if needed

1 https://www.regjeringen.no/en/dokumenter/pollution-control-act/id171893/

2 http://miljodirektoratet.no/en/Legislation1/Regulations/

3 http://www.epa.ie/pubs/legislation/#.VjZp_fkrLIV

4 http://www.dcenr.gov.ie/natural-resources/en-ie/Pages/Legislation/Petroleum-(Exploration-and-Extraction)-Safety-Act-2015.aspx

5 http://www.MEW.gov.ae/ar/laws-and-legislations/federal-laws.aspx#page=2

6 http://www.moe.gov.qa/English/Rules/SitePages/Default.aspx

7 http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/When-to-Prepare-an-Environmental-Assessment.aspx

8 http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/policy/eis/process.aspx

9 http://www.npd.no/en/Regulations/Regulations/Petroleum-activities/#6b

10 http://www3.epa.gov/npdes/pubs/pwm_2010.pdf

11 http://www3.epa.gov/airquality/oilandgas/implement.html

12 http://www.environment.no/Topics/Waste/Hazardous-waste/

13 http://www.epa.ie/licensing/ipc/whoneedsalicence/#.Vj-gSPkrLIU

14 http://www.bsee.gov/Inspection-and-Enforcement/Inspection-Programs/Inspection-Programs/, http://www.bsee.gov/Inspection-and-Enforcement/Enforcement-Programs/Enforcement-Programs/

15 http://www.nofo.no/en/our-operation/

16 http://www.kystverket.no/en/

Annex 4

I Existing Environmental Governance System in Lebanon

a Environmental regulatory authority

The Ministry of Environment (MOE) is the main body responsible for environmental protection and management in Lebanon.

The Ministry of State for the Environment was established in 1981. At that time there was no direct 'environmental' law, yet, the legislation, various disparate regulations, and different guidelines belonging to several sectors have been addressing environmental matters indirectly since 1920. Such legislation, for example, tackled the most pressing environmental subjects, such as: Preserving coastal zone ownership and preventing its distortion, protecting public property, banning theft of antiquities, regulating dredging of sand and gravel, preventing dumping of waste on roads or on public and private properties, and prohibiting disposal of wastewater in artesian wells, rivers, streams, or along the beach.

On 2 April 1993, Law 216/93, established the MOE and identified its tasks. Consequently, this law was a major step toward environmental management in terms of protection and sustainable conservation of natural resources, and initiation and activation of Lebanon's participation in global environmental conventions.

On 29 December 1997, law 216/93 was amended by law 667/97 to activate the MOE, and the latter was amended under law 690 dated 26/8/2005 to further redefine and emphasize the role of the MOE within the framework of emerging environmental national and international issues. Decree No. 2275/2009 regulated and defined the units of the MOE, their functions, staffing, and recruitment.

On 29 July 2002, the Lebanese Parliament ratified Law 444—the Environmental Protection Act—which established basic principles and general provisions to regulate the protection, management, preservation, and maintenance of environmental basins, and issue environmental impact assessments (EIA) of projects. Moreover, this law defined the responsibilities and penalties for those who abuse environmental resources and cause pollution.

The role of the MOE in the oil and gas sector is explicitly defined in the Offshore Petroleum Resources Law (OPRL) No. 132/ 2010 and the Petroleum Activities Regulations (PAR) Decree No. 10289/2013 in several provisions. The ministry is tasked with supervising the conduct of petroleum activities and ensuring its overall compliance with environmental standards and regulations. In article 60, the OPRL grants the MOE the authority to supervise and control environmental matters related to petroleum activities, coordinate with other concerned

authorities, and take initiatives or measures deemed necessary to minimize negative impacts that petroleum activities may have on local communities and the environment'. Other provisions in the OPRL and the PAR refer to the MOE, particularly in relation to the EIA report and other environmental concerns including monitoring and site inspection.

The General Directorate of Environment consists of the central administration and regional departments. The central administration has seven service (units), some of which have different departments and divisions. The staffing of the services laid out by Decree 2275/2009 (however most departments and divisions are under-staffed) are:

- The Registrar (thirty-one personnel)
- Service of Environmental Guidance (fifteen personnel)
- Service of Urban Environment (twenty-six personnel)
- Service of Natural Resources (twenty-four personnel)
- Service of Environmental Technology (twenty-six personnel)
- Service of Planning and Programming (twenty-one personnel)
- Service of Regional Departments and Environmental Police (thirty-three personnel); this department is still not operational

Different departments of the MOE will be involved with petroleum activities, particularly the Department of Natural Resources Protection, Department of Ecosystems, Department of Chemical Safety, Department of Air Quality, Department of Integrated Environmental Systems, and the Department of Monitoring and Statistics, in addition to other departments.

The new petroleum sector will require capacity building of existing departments at the MOE in order to adhere to the requirements introduced by the petroleum sector. The need to establish a dedicated department for oil and gas needs to be assessed against empowering specific departments in the existing structure. At the very least the capacity of a dedicated team from the MOE needs to be strengthened, particularly in the area of EIAs, mitigation and monitoring, environmental audits and inspections of oil and gas facilities and assets, and environmental emergency preparedness and response.

Although the MOE is the main regulatory authority for environmental matters in Lebanon, environmental management of petroleum activities in Lebanon is the Lebanese Petroleum Administration (LPA). The LPA was established on 4 December 2012 to be the regulatory body in charge of managing the petroleum sector in Lebanon.

The petroleum administration consists of six technical departments, namely:

1 Strategic Planning Department
2 Technical and Engineering Department
3 Geology and Geophysics Department
4 Legal Affairs Department
5 Economic and Financial Department
6 Quality, Health, Safety, and Environment Department (QHSE)

The QHSE Department is the unit responsible for all matters related to the quality of operators' systems and the extent of their adherence to the conditions of health, safety, and environment, and particularly responsible for:

- Studying applications by applicants for licenses from the perspective of the quality of performance in health, safety, and environment protection related matters
- Studying and following up on requests and inquiries from operators and rights-holders with respect to quality of operations in health, safety, and environment protection related matters
- Studying plans related to the quality of performance, health, safety, environmental protection, and contingency plans
- Monitoring the readiness of operators to address accidents and emergencies
- Studying the extent and boundaries of safety zones
- Coordination with competent authorities in aspects related to environmental matters
- Monitoring the compliance by operators with regulations on safety, systems for workers protection, health, and the environment
- Review of EIA studies in coordination with relevant authorities
- Studying the impact of operations on the environment, occupational health and safety, local communities, and the global environment
- Monitoring of facilities and auditing their performance to ensure compliance of petroleum operations with environmental, health, and safety standards
- Proposing measures for the modernization and development of work in the unit

In addition to department heads, two staff members have been recruited and the department will be further staffed as the need arises.

Other stakeholders involved in the environmental management of the petroleum sector include:

1 Council of Ministers (COM): Sets forth the state's petroleum policy, particularly related to the management of its petroleum resources and settles differences between concerned stakeholders. In respect to EIA

studies, Article 29.3 of the OPRL states that 'the procedures, requirements, and conditions related to the EIA study shall be stipulated by the COM Decree on the basis of a proposal by the minister of energy and water based upon the opinion of the petroleum administration after consulting the concerned ministries.' Article 32 also highlights the above and adds that the minister of energy and water shall revise a detailed EIA based on an approved program as part of any plan for 'development, production, transportation, storage, or utilization' submitted by the operator on behalf of the right holder. Article 57 grants the COM the authority to establish a safety zone surrounding a facility. According to Article 76 of the OPRL, the COM shall supplement this law when necessary by decrees proposed by the minister of energy and water.

2 Ministry of Energy and Water (MEW): The role of the ministry in offshore oil and gas activities is stipulated in the Offshore Petroleum Resources Law (OPRL) No. 132/ 2010 and the Petroleum Activities Regulations (PAR) Decree No. 10289/2013. Article 9 of the OPRL stipulates that 'The minister of energy and water shall in cases of emergency ensure the implementation of the petroleum policy and implement this law for granting petroleum rights, and he shall endeavor to enhance the state petroleum capabilities, be responsible for monitoring and supervising petroleum activities, and take the necessary measures to protect water, health, property, and the environment from pollution. Article 33.1 states that the minister of energy and water shall give his approval, based upon the opinion of the LPA to the right holder prior to the initiation of test production. Article 36 stipulates that the right holder must obtain a permit from the minister of energy and water and in coordination with the MOE before any planned flaring or cold ventilation is initiated'. Article 58 provides that in the event of incidents, accidents, or emergencies, 'the minister based on recommendation by the LPA may order petroleum activities to be suspended to the extent necessary, or impose particular conditions to allow continuation of petroleum activities when exceptional circumstances occur'. Article 64 provides that when necessary, the right holder may request from the minister the use of land.
PAR provisions related to the role of the MEW include: Article 13 provides that the reconnaissance licenses shall be awarded by the minister of energy and water based on the opinion of the LPA. The application shall include information on the possible impact of planned activities concerning environmental and mitigation measures. Article 14 also provides that the minister shall, based on the opinion of the LPA, specify the conditions of the reconnaissance license. Article 31 stipulates that the minister shall approve, on the basis of the opinion of the LPA, the commencement of exploration works. This

information shall include details regarding the eventual impact of projected activities on the environment and mitigation measures. Article 41: 'The right holder shall prepare a plan for development and production including a report on the conducted EIA study. The minister of energy and water, based on the opinion of the LPA shall have the authority to approve the proposed EIA program and verify that the EIA and the report resulting there from, comply with the approved program and applicable legal requirements'. Article 46: 'a production permit shall be awarded by the minister of energy and water based on the opinion of the LPA'. Article 47: 'An application for test production shall be submitted to the minister of energy and water with a copy to the LPA'. The application shall include a 'description of prerequisite special safety and environmental protection systems planned or implemented' and 'unless clearly not required due to existing studies or for other special reasons as approved by the minister of energy and water, a summary EIA study'. Article 48: Flaring or venting shall be subject to a permit awarded by the minister. Article 51: 'An application for a license for the construction, placement, and operation of transportation or storage facilities shall be submitted to the minister of energy and water, with a copy to the LPA. The minister may require further information'. Article 59: 'A plan for the cessation of petroleum activities and the decommissioning of facilities, including a report of the conducted EIA study shall be submitted to the minister of energy and water for approval'. Article 90: 'A drilling and well plan for activities planned to be performed during the exploration phase shall be submitted to the minister with a copy to the LPA. Article 92: Before commencement of drilling of any individual well or well path deeper than 50 meters, a drilling permit must be granted by the minister of energy and water based on the opinion of the LPA. Article 137: In case of emergency, the minister of energy and water may propose intergovernmental coordination of emergency response measures. Article 138: The operator shall submit to the minister of energy and water with a copy to the LPA, an emergency response plan for handling accidents and situations which may occur during petroleum activities.

3 Committee for Field Emergencies for Energy and Water: The role of this committee is strictly advisory in terms of protection from pollution and preservation of the environment in relation to petroleum facilities and the transportation of liquid fuels and petrochemical activities.

4 National Emergency Response Committee (NERC): Twenty-two members representing the ministries of National Defense, Interior and Municipalities, Public Health, Public Works and Transport, Telecommunications, Environment, Energy and Water, Education and higher education, and Information, as well as the Civil Defense and the Lebanese Red Cross.

The NERC develops (1) a general framework for combating disasters, (2) a detailed contingency plan to respond to threats from various types of disasters (i.e., earthquakes, floods, forest-fires, landslides, weapons of mass destruction, wars, and radioactive threats), and (3) an emergency management plan when a disaster occurs.

5 National Council for Environment: Under Decree No. 8157, the council shall be formed from fourteen members including representatives of the MOE, Ministry of Finance, Ministry of Interior and Municipalities, Ministry of Agriculture, Ministry of Public Works and Transport, MEW, and Ministry of Industry, in addition to members from non-governmental institutions such as unions and syndicates and NGOs. The National Council for Environment shall be responsible for defining objectives and priorities, evaluating environmental data, formulating proposals and recommendations for a comprehensive and integrated environmental policy as well as suggesting implementation plans, which would become binding upon their approval by the COM.

6 Ministry of Public Works and Transport (MOPWT): The MOPWT, Directorate General of Land and Maritime Transport is responsible for maintenance and improvement of marine navigational aids in ports and along the coast. Based on Decree No. 17614 /1964: Article 2 - the permit applications to occupy a public maritime property must be submitted to the MOPWT. Article 31 of the Environmental Protection Framework Law provides that the Minister of Public Works and Transport has the authority, based upon the IEE and EIA, to permit evacuating, immersion, and burning in territorial waters and ground waters, for materials which do not represent cited threats to the environment.

7 Ministry of Defense (Lebanese Customs, Lebanese Navy): The Lebanese Navy is solely responsible in the event of offshore accidents or disasters at sea for the emergency response, safety, and rescue. In practice, the Civil Defense also provides support. The department for hydrography is responsible for securing marine safety, controlling the movement of ships and vessels, and protecting the marine environment.

8 The Lebanese Standards Institution - LIBNOR: LIBNOR is the entity authorized by law to develop standards and specifications.

9 Disaster Risk Reduction (within the Council of Ministers): A national committee that has worked for two years to develop a National Framework for Emergency Preparedness and Response. The draft Law to establish a National Committee for Disaster Preparedness and Response is awaiting ratification by parliament. The National Operations Room for Disaster Management acts in case of a crisis or disaster (defined as when national capacities are not enough to deal with the issue).

10 Lebanese Atomic Energy Commission (LAEC): LAEC has a department for environmental radiation control and a department for authorization,

inspection, and regulations. LAEC regulates the use and protection against ionizing radiation (Decree No. 105 of 1983). Any license intended to use RAM must provide LAEC with a detailed program showing the discharge system.

11 CBRN National Team: CBRN mandates include emergency response and national action plan development based on risk/threat assessment (accidents and terrorism).

The above indicates that there are various authorities that have specific roles in environmental protection in Lebanon, although the main competent authority is the MOE. A clear distribution of roles is critical to avoid major environmental impacts that arise from oil and gas operations.

b Main Legislation

Lebanon has ratified 34 conventions related to the protection of the environment and marine environmental resources. The conventions that are most relevant to the offshore oil and gas activities are:

- The United Nations Convention on the Law of the Sea (UNCLOS)
- Barcelona Convention and its following protocols:

a 1976 Dumping Protocol
b 976 Emergency Protocol
c 1980 Land-Based Sources Protocol
d 1982 Specially Protected Areas Protocol
e 2002 Emergency Protocol
f 1995 Integrated Coastal Zone Management in the Mediterranean

- IMO MARPOL 73/78 and its annexes (except for Annex IV related to air emissions from vessels, which is in the process of being ratified):

a Annex I: Regulations for the Prevention of Pollution by Oil
b Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk
c Annex III: Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
d Annex IV: Prevention of Pollution by Sewage from Ships
e Annex V: Prevention of Pollution by Garbage from Ships

- Convention on Biological Diversity (CBD)
- Cartagena Protocol on biosafety
- Vienna Convention for the protection of the ozone layer and Montreal Protocol on substances that deplete the ozone layer
- Stockholm Convention on Persistent Organic Pollutants
- United Nations Framework Convention on Climate Change (UNFCCC) treaty and the Kyoto Protocol
- Basel Convention on the control of transboundary movements of hazardous wastes and their disposal

- Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade
- The Agreement on the Conservation of African-Eurasian Migratory Water Birds (AEWA)
- The convention on wetlands of international importance - (Ramsar)
- The Convention of the Conservation of Cetaceans in the Black Sea, Mediterranean Sea, and Contiguous Atlantic-ACCOBAMS
- IMO International Convention on Civil Liability for oil pollution damage (CLC) (1969)
- IMO International Convention relating to intervention on the High Seas in cases of Oil Pollution Casualties
- IMO International Convention on Oil Pollution Preparedness, Response, and Co-operation
- IMO Ballast Water Management Convention
- The International Convention on the control of harmful anti-fouling systems on ships, 2001
- IMO International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER)
- The International Convention relating to the Limitation of the Liability of Owners of Sea-Going Ships, and Protocol (Brussels, 1957); this convention was replaced by The IMO Convention on Limitation of Liability for Maritime Claims (LLMC),1976, but the LLMC has not been ratified by Lebanon. Under the 1976 convention, the limit of liability for claims covered is raised considerably, in some cases up to 250% to 300% percent

The MOE or MOPWT (depending on the convention in question) is the focal point for maritime conventions and protocols while the MOE is the focal point for other environmental conventions.

In the event of discoveries of hydrocarbons in offshore Lebanon, activities in the Mediterranean Sea are expected to increase significantly, therefore making implementation of the requirements of these conventions more challenging and resource-intensive. Effective coordination between both ministries is key to effectively implementing these conventions.

The most important national laws, decrees, and ministerial decisions with relevance to oil and gas activities are as follows:

- Law No. 64/1988, Preservation of the environment against pollution from dangerous waste and hazardous substances
- Law No. 444 /2002, Environmental Protection Law
- Law No. 690 /2005, Organization of the MoE
- Decree No. 2275 /2009, Organization and mandates of the MoE
- Law No. 132/2010, Offshore Petroleum Resources Law

- Decree No. 10289/2013, Petroleum Activities Regulations (PAR)
- Decree No. 7968/2012, Lebanese Petroleum Administration (LPA)
- Decree No. 8213/2012, strategic environmental assessment in the public sector
- Decree No. 8471/2012, Environmental compliance standards for industrial establishments
- Decree No. 8633 /2012, Environmental Impact Assessment
- MOE Decision No. 52/1/1996 National Standards for Environmental Quality and environmental limit values for air, noise, water, and soil
- MOE Decision No. 8/1/2001 National Standards for Environmental Quality (NSEQ) related to air contaminants and liquid waste emitted from classified establishments into receiving water bodies. Amends some regulations in Decision 52/1/1996
- MOE Decision No. 99-1/2013 Guidelines for submitting information on greenhouse gas emissions by companies and industrial and commercial institutions in order to obtain a declaration from the MoE

Existing legislation, including general environmental regulations and signed conventions in addition to the OPRL and the PAR covers the majority of environmental issues. However, there are some requirements that existing legislation does not cover such as the management and disposal of drill cutting and fluids, produced water, and NORM wastes, which are the main pollutant streams that arise from the offshore petroleum sector.

Additionally, some requirements referred to in existing legislation have yet to be specified or issued by decrees, such as:

- A decree to determine which industrial institutions require a permit for releasing emissions into the air, and to specify the mechanism for granting the permit, which is referred to in Decree No. 2275/2009 (Roles of the Department of Air Quality)
- A decree to specify the list of materials allowed to be discharged in the sea referred to in Article 30 of Law No. 444/2002
- COM Decrees mentioned in Articles 40 and 44 of Law 444/2002 related to dangerous or hazardous wastes have yet to be issued
- Decree to set the standards for the management of solid waste streams expected from the oil and gas sector shall be issued and put into force (pursuant to ISWM Draft Law)
- Application of MOE Decision No. 99-1/2013, which sets the guidelines for submitting information on greenhouse gas emissions by companies and industrial and commercial institutions in order to obtain a declaration from the MOE, is not mandatory. It shall be mandatory for oil and gas activities

c Environmental Risk Assessment

The requirement of environmental studies for petroleum activities is stipulated in the following legislative texts:

- Law No. 444/2002: Article 21 stipulates that concerned authorities in the public and private sectors shall conduct an initial environmental examination study (IEE) or an EIA for projects that may threaten the environment, because of their size, nature, impact, or activities. The MOE shall review and approve these studies after confirming their suitability to the terms of environmental safety and the sustainability of natural resources.
- Law No.690/2005: Responsibilities of the MOE listed in article 2 include (among others) imposing the preparation of EIA/IEE studies on public and private stakeholders for projects that require the preparation of these studies, in addition to reviewing and approval after confirming that the projects comply with the requirements of environmental safety and natural resources sustainability, otherwise, studies are rejected.
- Law No. 132/2010, Offshore Petroleum Resources Law: Article 7.2 related to preparations of licensing rounds stipulates that the state must conduct a strategic environmental assessment study (SEA) prior to awarding any petroleum rights or allowing any petroleum activities.
- Article 29.1 related to the content of the development and production plan, and states that the plan shall include two parts, the first related to an EIA Study and the second related to management of reservoir resources and economic aspects.
- Article 29.3 states that 'the procedures, requirements, and conditions related to the EIA study shall be stipulated by the COM Decree on the basis of a proposal by the Minister based upon the opinion of the petroleum administration after consulting the concerned ministries'.
- Article 32 also highlights the above and adds that the minister shall revise a detailed EIA based on an approved program as part of any plan for 'development, production, transportation, storage or utilization' submitted by the operator on behalf of the right holder.
- Article 47.3 stipulates that the decommissioning plans shall be divided into two parts, the first includes an EIA and the second includes assessment of resources management and presentation of the industrial, technical, environmental, and economic and safety aspects, particularly the economic aspects of alternatives.
- EIA Decree No. 8633/2012: According to article 5 (related to Project Classification): Upon receiving the proposed project classification request as per the standard format and supporting documents, the MOE shall verify whether the project falls in the domain of annex 1 or annex 2 or is located in an area listed in annex 3, in addition to the

likelihood of a significant impact on that area.

If the proposed project falls in the domain of annex 1, it will be subject to an 'EIA' study. If it falls in the domain of annex 2, it will be subject to an 'IEE'. If the proposed project is classified in the domain of annex 2 and located in an area listed in annex 3, or it may have a significant environmental impact on that area, the project will be subject to an EIA study. If the project does not fall in the domain of annex 1 or annex 2 but located in an area listed in annex 3 where it may have a significant environmental impact, it will be subject to an 'initial environmental examination'.

The Minister of Environment based on an informed review may request an IEE or an EIA report for the project regardless of its classification.

According to Annex 3, sensitive areas include: Areas classified, by laws or decrees, as specifically protected areas, natural environment protected areas, natural forests or wetlands, important bird areas, public parks, natural scenery sites, touristic and historic sites, archaeological locations, river banks, springs, and/or holy places; areas that are habitats of endangered species; watersheds; sea beaches, river waterways, and springs.

Since marine water is a habitat of many endangered species, and since coastal areas are considered sensitive areas, oil and gas exploration activities may be subject to IEE or EIA, even if not listed in annex 1 or annex 2. Additionally, the minister of environment may request an IEE or an EIA report for the project regardless of its classification.

- Decree No. 10289/2013 Petroleum Activities Regulations (PAR): Article 43: The operator must conduct an EIA study for the development and production phase.
- Article 54: The right holder must prepare an EIA study for the construction and operation of the transport and storage facilities, the EIA report shall be submitted no later than the date of the submission of these activities related to part of the development and production plan.
- Articles 59/61: The right holder must prepare a plan for the decommissioning of petroleum activities and permanent decommissioning of facilities, including an EIA study. The EIA report shall be submitted no later than the date of the submission of the decommissioning plan.

The PAR does not explicitly require an EIA for exploration activities. Coordination between the minister of energy and water and minister of environment is essential to ensure an effective EIA process for oil and gas activities in offshore Lebanon. Two points are particularly important:

- Deciding whether a new decree on EIA specific to oil and gas activities should be issued as allowed by Article 29.3 of Law 132/2010.
  It is the authors' opinion that the requirement for a new EIA decree specific to oil and gas activities was included in Law 132/2010 due to the absence of an EIA decree at the time. Nevertheless, this requirement is no longer needed after the EIA decree was issued in 2012 (Decree No. 8633 /2012). The EIA decree provides the necessary framework for robust environmental assessments for oil and gas activities.
- Agreeing on whether an EIA (or IEE) shall be required for the exploration phase, and particularly for exploratory drilling activities; while Law 132 and Decree 10289 do not explicitly require it, provisions for such impact assessment is still required by Law 444. The legislation is subject to interpretation and mishandling of this issue could lead to major public opposition and delays in the exploration phase. The authors strongly advise that as Lebanon opens its waters for the first time for exploration activities, detailed environmental assessment studies be conducted, including comprehensive environmental baseline studies (in particular marine and deep water studies) and modeling of discharges as applicable.

d Environmental Permits

Requirements for environmental permits which apply to offshore oil and gas activities are stipulated in several legislative texts, as follows:

The Environment Protection Law No. 444/2002 requires a permit for discharge into territorial waters.

- Article 31: The minister of public works and transport may, based on IEE and EIA studies, authorize the disposal, sinking, or burning in territorial waters and under the seabed in territorial waters, of materials that do not cause the damages mentioned in article 30 of this law, with conditions to prevent authorized operations from damaging the marine environment.
  The decree mentioned in item 1 of article 30 of this law sets the conditions and procedures for granting the permits mentioned in item 1 of this article and the monitoring procedures and the conditions for the application of these provisions on disposal, sinking, or burning processes.
- Article 42: Each facility is subject to a prior permit that sets limits for all types of pollutant releases. National standards for each category of facilities shall be set by a CoM based on a proposal by the minister of environment and concerned ministers.
- Article 44: A permit is requested before import or production or extraction or processing or marketing or transfer or possession or use or disposal of dangerous/ hazardous chemicals which cause or may

cause danger to public health and safety and the general environment. Conditions for granting the permit shall be specified in a decree from the Council of Ministers based on a proposal from the minister of environment and other concerned ministers. The decree shall also include disposal conditions and procedures for each group of products; conditions of production, storage, packaging, classification, transport, marketing, and recycling of the subject materials; and monitoring procedures and measures.

- Decree No. 2275/2009: The Department of Air Quality at the MOE is responsible for determining the industrial institutions that require a permit for releasing emissions into the air, and specifying the mechanism for granting the permit. The Department of Urban Environmental Protection is responsible for determining the industrial institutions that require a permit for wastewater discharge, and specifying the mechanism for granting the permit.
- Decree No. 10289/2013 (PAR): Article 47 (Test Production): Test production shall be subject to a permit stipulating procedure, volumes, and including when required in case of necessity, flaring or venting. The approval of the test production plan may be subject to conditions with regard to duration, methods, or facilities; flaring and sale of petroleum; and particular measures related to health, safety, working environment and the protection of the environment, including mitigating or remedial measures to be taken.
- Article 48: Flaring or venting of extracted petroleum components shall be subject to a permit awarded by the minister. Flaring or venting of extracted petroleum components due to an emergency shall not require approval, but shall be registered and reported to the minister within twenty-four hours from their occurrence.
- Offshore Petroleum Resources Law (OPRL) No. 132/ 2010: Article 36 related to venting and flaring stipulates the right holder shall receive a permit for venting and flaring from the minister of energy and water based on the opinion of the LPA in coordination with the MOE. The application for the permit shall include the reasons for venting or flaring, a description of the facility, the amounts, the composition and the timing of venting and flaring. The permit will depend on the production program upon which the development and production plan was prepared. Venting or flaring can be accepted only due to safety reasons or during trial operations.
- Environmental Compliance Decree No. 8471/2012: This decree provides in article 3 that the MOE shall grant the establishment of a three-year renewable environmental compliance certificate (ECC) by virtue of a decision of the minister, which will be sent to the Ministry of Industry and the Ministry of Interior and Municipalities. Furthermore, article 8 describes the role of the MOE in the environmental compliance system.

- Decision No 202/1 dated 30/7/2013 was issued pursuant to decree 8471/2012 to define the mechanism for the implementation of decree 8471/2012. It states that the application for an ECC to the MOE by industrial establishment to which decree 8471 applies is optional until 31/12/2015. The MOE in cooperation with the Ministry of Industry will determine the deadlines for applying for the ECC according to a clear and practical criteria in compliance with sectoral strategies.

Although the requirements for different types of permits are included in the Lebanese legislation, the limits, conditions, and procedures for issuing these permits have yet to be specified. This must be considered a priority as oil and gas activities should not be initiated in the absence of specific environmental permitting procedures.

e Monitoring/Enforcement/Assurance Mechanisms

Assurance mechanisms including monitoring, inspection, auditing, and investigation are stipulated in the Offshore Petroleum Resources Law (OPRL) No. 132/ 2010, Petroleum Activities Regulations (PAR) Decree No. 10289/2013 and in the Environmental Protection Law No. 444/2002, as elaborated below:

- OPRL: Article 58: The minister, based on recommendation by the Petroleum Administration may order petroleum activities to be suspended to the extent necessary, or impose particular conditions to allow continuation of the petroleum activities when exceptional circumstances occur.
- Article 60: (Environmental Protection and Related Measures): The minister of environment, in coordination with the minister of energy and water, shall be charged with supervising and controlling environmental matters related to petroleum activities and shall coordinate with other concerned authorities, and take initiatives or measures deemed necessary to minimize negative impacts that petroleum activities may have on local communities and the environment.
- Article 74: (Inspection, Monitoring and Verification): A competent authority has the right to inspect an area subject to a petroleum right and any facility used for petroleum activities in order to monitor and verify the consistency of information and reports relating to petroleum activities or performance of petroleum activities; competent authorities undertaking monitoring, control, or verification of petroleum activities or facilities pursuant to this law may charge fees as stipulated by a Council of Ministers Decree upon a proposal by the minister in consultation with concerned ministries. Such fees shall be payable to the state and shall only reflect costs incurred by the competent authority.

- PAR: Article 131: Testing, inspection, and compliance reports to be submitted to the Petroleum Administration for consideration.
- Article 144: (Inspection): The representatives of relevant government entities may inspect sites, buildings, and facilities where petroleum activities are carried out. The representatives of the relevant government entities shall, in coordination with the LPA, audit all assets, records, and data kept by the operator or the right holder following a prior notice given to the operator or the right holder within a reasonable time limit.
- Article 145: (Investigation of incidents or accidents): In the event of a serious incident which has led to, or could lead to an accident, the petroleum administration shall monitor the actions undertaken by the right holder and the operator in order to restore the situation to its prior condition. The petroleum administration may also elect to have appointed representatives visit the scene of the accident as soon as the situation has been brought under control. The petroleum administration shall carry out its own investigations, as well as render assistance to other authorities carrying out investigations on the same matter.
- Article 146: (Government representatives presence during petroleum activities): Government authorities and their representatives must be assisted to be given access to any property, building, or facility in order to monitor or observe petroleum activities or participate in meetings as observers.
- Law 444/2002: Article 43: Grants the minister of environment, following the request of the local entities, the authority to conduct any investigation, if needed, and assess the environmental compliance of a classified establishment and the impacts of its activities. The minister may conduct any investigation that aims at monitoring the impacts of the activity of an establishment on the environment with or without a prior notification.
- Article 54: Breaches in compliance to Law 444/2002 shall be inspected and monitored by the MOE inspectors and judicial police.

Responsibilities and mechanism for environmental monitoring, auditing, inspection, and reporting shall be defined between different stakeholders. This can be achieved by signing MoUs between the LPA and the concerned ministries, especially MOE.

f Emergency Preparedness and Response

Lebanon is party to several international conventions that require the establishment of measures for dealing with offshore pollution incidents, either nationally or in co-operation with other countries. Such conventions include:

- IMO International Convention on Oil Pollution Preparedness, Response and Co-operation
- ILO, C174 - Prevention of Major Industrial Accidents Convention
- 2002 Emergency Protocol of the Barcelona Convention

Requirements for emergency preparedness and response, whether at facility level or at the national level, are stipulated in the following pieces of legislation:

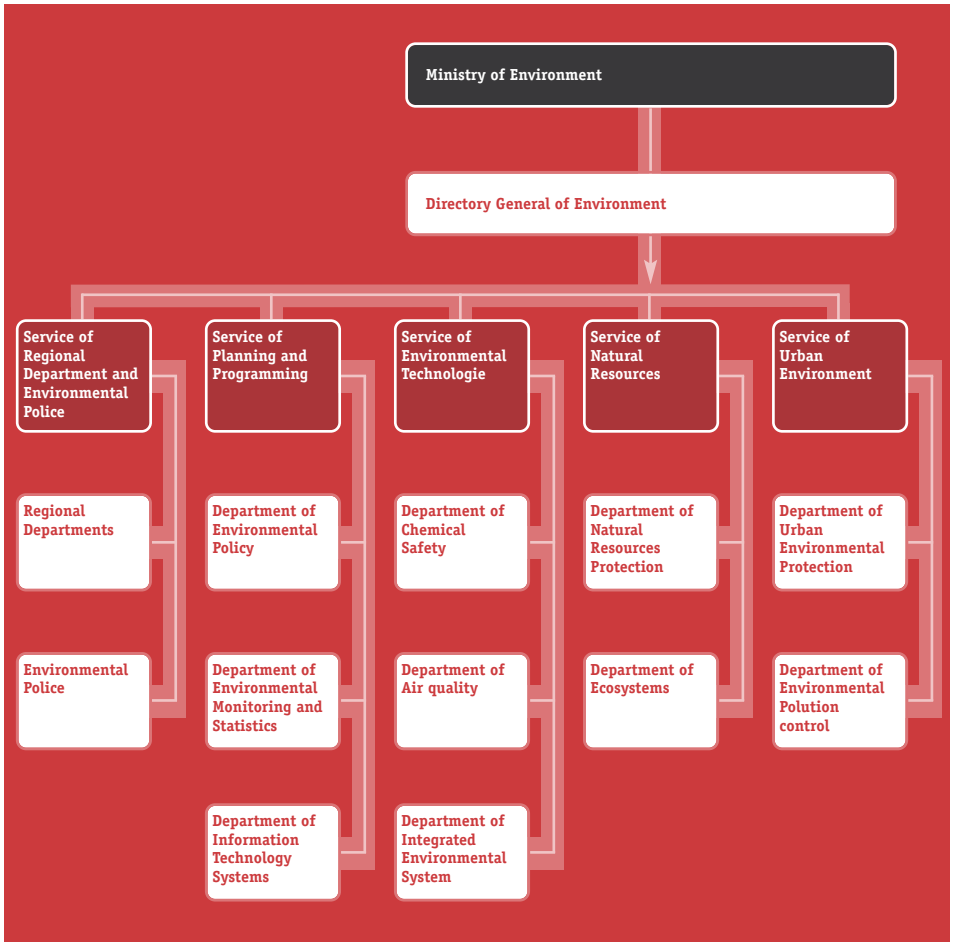
- Decree No. 11802/2004: Article 6: The employer shall prepare a contingency and rescue plan and assign and train responsible persons on its implementation.
- Decree No. 10289/2013 (PAR): Article 137. Emergency Preparedness: The Operator shall be prepared to handle accidents and emergencies which may lead to loss of life, injuries, pollution or major damage to property. The Operator on behalf of Right Holder shall take the necessary measures to prevent or minimize harmful effects of accidents and to restore the environment in accordance with an emergency response plan which shall identify the potential accident events and consequences of such events. The Operator shall cooperate with other Right Holders and Operators on the elaboration of the emergency response plans. The Minister may under specified circumstances, issue orders and stipulate conditions for such cooperation, including the participation of Right Holders in the financing of the emergency response arrangement. In case of emergency, the Minister may propose intergovernmental coordination of emergency response measures. In the event of accidents or emergencies, the Minister may coordinate the measures proposed in the emergency response plan and may: Order other entities to provide emergency related Facilities, resources and equipment; and undertake other measures to obtain the necessary additional resources through other means. Article 138. Emergency Response Plan: The Operator shall submit to the Minister, with a copy to the Petroleum Administration, an emergency response plan for handling accidents and hazardous situations which may occur during Petroleum Activities and such plan shall, among other items, contain the following information: An organizational chart with a precise description of responsibilities, channels of reporting information, and duties of each individual in the event of accidents and dangerous situations; a list of the equipment intended for use in each accident or in each danger situation with a precise description of the nature and type of equipment, its capacity, location, means of transport, usage and corresponding area of use; and a program of action with a precise description of the alarm and communication systems, including means of communication with authorities, of the duties of private parties, of

when and on which terms emergency equipment is to be used, of how the operations shall be performed, of the measures for limiting the extent of the damage in case of accident or hazard, and the procedures for winding up the operation. The plan shall be updated, compatible with national emergency response systems and submitted to the Petroleum Administration and to other relevant authorities and entities. The Petroleum Administration must be notified prior to the carrying out of emergency exercises and must receive a report on such emergency exercises. Article 139. Emergency Equipment: The Petroleum Administration may require the installation of emergency equipment such as firefighting equipment, oil barriers, vehicles, standby boats or aircraft's, near or at the Facilities or at major equipment involved in Petroleum Activities and stipulate the operational requirements of each of such equipment under these circumstances.

- MEW Decision No. 14 /2005: Establishment of the Committee for Field Emergencies for Energy Issues and Aquatic Resources. The Committee is directly linked to the Minister of Energy and Water and implements his instructions and recommendations. Among its tasks, the Committee provides suggestions to combat pollution and preserve the environment in oil and gas installations and in the transport of liquid fuels and petrochemical products.
- COM Decision No. 103/2010 as amended by COM Decision No. 104/2010: On the establishment of National Emergency Response Committee (NERC). It includes 22 members representing the ministries of National Defense, Interior and Municipalities, Public Health, Public Works and Transport, Telecommunications, Environment, Energy and Water, Education and higher education, and Information as well as the Civil Defense and the Lebanese Red Cross. The NERC will develop a general framework for combating disasters, a detailed contingency plan to respond to threats from various types of disasters (i.e., earthquakes, floods, forest-fires, landslides, weapons of mass destruction, wars, and radioactive threats), and an emergency management plan when a disaster occurs.
- Disaster Risk Reduction (DRR): COM Decision No. 103/2010, COM Decision No. 141/2011, COM Decision No. 41/2013 on the establishment of the National Coordination Committee to respond during different kinds of national disasters and incidents, involving the Directors General of concerned ministries. The DRR was formed to prepare Lebanon's National Disasters Response Plan and to accomplish the National Response Framework and to develop guidelines for regional, local and sectorial response plans.

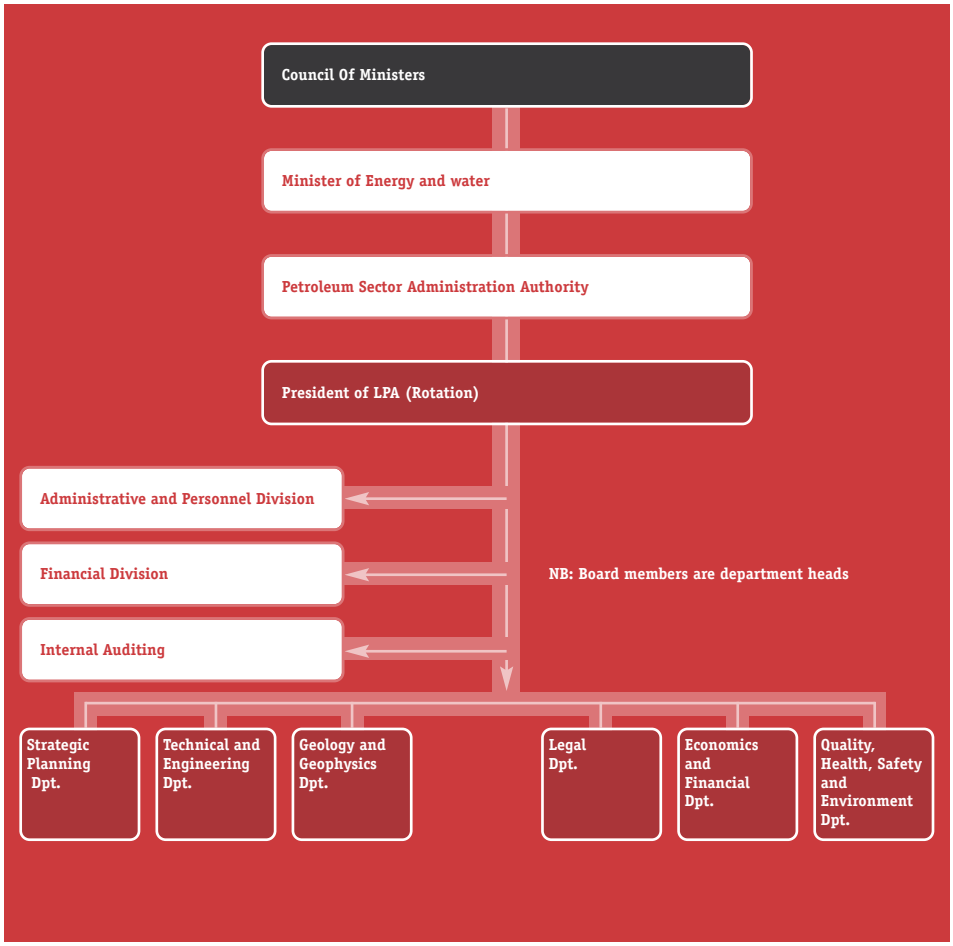
Annex 5

I Organizational Structure of the MoE



Annex 6

I Organizational Structure of the LPA



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