Africa Lakes: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore):
No production
Total Gas Production (onshore/offshore):
No production

The countries in the Africa Lakes regional grouping include Malawi and Uganda, and focus on some of the major lakes with hydrocarbon activity. Specifically, hydrocarbon exploration has mainly taken place in Lake Malawi and Lake Albert in Malawi and Uganda, respectively. Lake Victoria is another lake of interest, but due to its low level of exploration activity, environmental factors were only considered.

Lake Malawi is an African Great Lake in the East African Rift* between Malawi, Mozambique, and Tanzania. It is the ninth largest lake in the world. The Malawian government has divided Malawi's oil exploration area into six blocks: "three cover the lake and the rest are on land in the north and south of the country along the Rift Valley[1]." The prospecting licenses were awarded to South-African based SacOil (Block 1), UK-based Surestream Petroleum (Blocks 2 and 3), the United Arab Emirates' RAK Gas (Blocks 4 and 5), and Indonesian-based Pacific Oil & Gas (Block 6). Lake Malawi has been listed as a World Heritage site, and civil societies have expressed their concerns about the effects of oil extraction on the lake.

Lake Albert is another one of the African Great Lakes, and is the seventh-largest lake in Africa. It is situated between Uganda and the Democratic Republic of Congo. In 2010, London-based multinational oil and gas exploration company Tullow Oil began to accelerate development of the Lake Albert rift basin by purchasing Heritage Oil and Gas Limited's (a Bailiwick of Jersey company, headquartered off the coast of Normandy, France) ownership of blocks EA-1 and EA-3A. Tullow estimates that there are approximately 7 billion cubic feet of recoverable oil reserves in the Lake Albert Rift Basin.

In March 2011, France's Total and the China National Offshore Oil Corporation (CNOOC), each took "one third interest in EA-1, 2, and 3A[2]," after a memorandum of understanding was signed between Tullow and the Government of Uganda on March 15, 2011. A year later, Tullow signed two "production sharing agreements for exploration of the Lake Albert Rift Basin with the Government of Uganda, allowing Tullow and its partners to complete the farm down[3]," which is defined as an agreement in which a "third party agrees to acquire from one or more of the existing licensees an interest in a production or exploration license[4]." As a result, operatorship responsibilities of the area was divided between the three partners, with Total and Tullow in charge of Exploration Area-1 (EA-1) and Exploration Area-2 (EA-2), respectively. CNOOC was

* A rift is defined as a "long narrow zone of faulting caused from the tensional stress in the earth's crust." (http://dictionary.reference.com/browse/rift).
A fault is defined as a planar fracture in a volume of rock caused by the earth's movement.

responsible for the operation of the Kanywataba license and the Kingfisher license of the now former Exploration Area-3A. However, the Kanywataba block of Exploration Area-3A was returned to the east African government in 2012, resulting in CNOOC only having ownership of the Kingfisher block.

Geology and Geophysics

A large part of Malawi is made up of "igneous and metamorphic rocks of the basement complex" (defined as "the assemblage of metamorphic and igneous rocks underlying stratified rocks in a particular region[5]"), of Precambrian age[6]." In addition, Mesozoic and Cenozoic sedimentary rocks are "found in narrow belts aligned parallel to Lake Malawi and extensive Quaternary alluvium[7]" (materials that are left by the water of rivers or floods, such as sand, gravel, silt, and clay deposits), are found on the lake margins.

Seismic stratigraphic analysis of reflection data from Lake Malawi shows that the lacustrine rift environment is quite complex[8]. "Sediment thickness, subsidence, and structural and stratigraphic complexity are greatest in the northern half of the rift[9]," suggesting that the northern half is more structurally mature than the southern half.

Seismic reflection and gravity data collected for Lake Albert show that the "basin contains a maximum of 3.1 miles of synrift, dominantly lacustrine sedimentary fill, in two sub-basins separated by a mid-basin[10]." Seismic observations point towards the fact that the basin most probably experienced a "long-term change from a continuously open lacustrine, possibly deep lake system in the Miocene or early Pliocene, to an alternating shallow lacustrine and fluvial system in the mid and late Pleistocene[11]."

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions and new technologies are not utilized in this region based on available resources.

Methods of Offshore Tender

The offshore tendering method in Malawi consists of oil and gas production sharing contracts. The requirements for a petroleum exploration license is that the potential licensee must "be incorporated or established in Malawi or the potential licensee must be approved by the Minister of the Malawi Government responsible for petroleum if it is not incorporated in Malawi[12]." Petroleum production licenses, on the other hand, will be granted to the potential licensee "unless the potential licensee is incorporated or established in Malawi[13]." The revenue that the Malawi Government can receive from oil and gas exploration and production licenses includes: "fees on application for grant and renewal of the petroleum exploration license and the petroleum production license, annual charges for the petroleum exploration license and petroleum production license, royalty on petroleum recovered at the rate provided for in the license, income tax, and rent resources tax[14]." These taxes and fees tend to change periodically, and therefore specific tax and fee rates were not provided using the available sources.

Production sharing contracts are also used in Uganda. The production sharing contract "details specific obligations and requirements of the parties to the agreement including work programs and financial obligations, health, safety and environment requirements, and other data and reporting obligations[15]." The fiscal regime applied in Uganda consists of royalties, income taxes, and resource rent taxes. The royalty rate is specified in the production sharing contract and is dependent on barrels of oil per day. The income tax rate is 30%, and the resource rent tax is specified in the production sharing agreement.

Environmental Overview and Development

The environmental impact assessment process (EIA) in Malawi requires site selection, environmental screening, scoping, a detailed impact assessment, identification of mitigation, cost/benefit analysis, detailed design of mitigation measures, implementation of mitigation measures (if needed), and monitoring. An EIA is required for a range of public and private projects[16]. The EIA process in Uganda is a legal requirement and must be exhaustive and comprehensive, giving due consideration to all alternatives, including the no-action alternatives. Projects that have completed the EIA process will continually be monitored to assess their impact on the environment. If the impacts are detrimental, it is required that the project be ceased[17].

Natural Resources

The African Lakes of interest are Lake Malawi, Lake Albert, and Lake Victoria, all located below the equator on the eastern side of the continent. Malawi, which borders the western side of Lake Malawi, has 4 protected areas along the shores. Lake Albert, on the western border of Uganda, has protected areas that protect parts of its shore, but do not extend into the lake. The number of protected areas associated with Lake Albert is not specified. Lake Victoria, which makes up the southeastern corner of Uganda, has several protected areas associated with its shores that also do not extend into the lake. The total number is not specified[18]. It is also unclear how many total square miles of the lakes are protected.

A high resource value analysis was not performed for the African lakes of interest. However, each of these lakes are rich in flora and fauna in and around the lakes.

Malawi has a high concentration of biodiversity, including several endemic species. Lake Malawi is estimated to host around 15% of the global fresh water species. Most of these organisms are haplochromine cichlids, a sedentary freshwater fish with many species endemic to Lake Malawi. Due to their low mobility, many communities are isolated to one specific locality on the lake, leading to several species endemic to certain restricted areas within the lake itself. The level of endemic plant, invertebrates, and mammals is not well recorded in the Lake Malawi region, however it is estimated that this classification applies to over 200 species. Several threatened and endangered species reside in the region as well, though only 11 species have legal protection[19].

The high level of biodiversity in and around Lake Albert is due to the variety of landscapes in the Albertine Rift region[20], including forests, escarpments, savannah, grasslands, wetlands, and deltas. Protected areas of Lake Albert exist only on the Ugandan shores, but political issues hinder adequate protected area management. Proposed oil extraction has potential to greatly harm the fragile ecosystems and many of the residential flora and fauna within. The situation is worse outside of the protected areas, where desertification, overgrazing and migrants from the

Democratic Republic of Congo are impacting the natural landscape. Fish diversity and size is declining in the lake due to unregulated fishing gear and methods[21].

Lake Victoria in Uganda is the second largest fresh water lake in the world and has the largest freshwater fishery in the world, mainly housing the introduced Nile perch[22]. The introduction of the perch in the 1940s and 1950s lead to a rapid decline of haplochromine fish species[23]. "The decline of fish species in Lake Victoria is the largest documented loss of biodiversity."[24] The main causes of biodiversity loss are: over-harvesting, habitat loss, degradation and modification, loss of genetic diversity and viable populations, climate change, and invasive species[25].

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

No information pertaining to archaeological resources was found for Lake Malawi, Malawi, or for Lake Albert and Lake Victoria, Uganda. Along the coastline of Lake Malawi, there is archaeological evidence of human occupation with sites dating back to the Iron Age (4th century). In addition, Cape Maclear, on the southern shore of Lake Malawi, was a focal point in the ivory and slave trade era.[26] On the southeast coast of Lake Malawi, situated within a cluster of forested granite hills, there are 127 rock art sites that reflect the scarce tradition of farmer rock art, as well as paintings by BaTwa hunter-gatherers from the late Stone Age.[27] In Uganda, 2,500 Paleolithic pieces have been collected from the former environs of Lake Victoria that indicate a richly developed Acheulean handaxe culture dating between 100,000 and 50,000 years ago.[28] The Tombs of Buganda Kings at the Kasub site within the Kampala district on the northern coast of Lake Victoria, Uganda, embraces almost 74 acres of hillside. On top of the hill sits the former palace of the Kabakas of Buganda. Built in 1882 and converted into the royal burial ground in 1884, it is representative of a significant architectural achievement using organic materials.[29]

Socio-economic and Tribal

Uganda was chosen as the focus country to offer a unique perspective on the African Lakes area. In 2006, Tullow Oil company (Ireland-based) discovered oil-bearing sands in Uganda's Hoima District, right next to Lake Albert. The discovery of oil provided funding for clean water, health clinics, paved roads and schools to the impoverished Hoima district. In addition, the discovery of oil has propelled Ugandan universities to train more mining engineers.[30] The Petroleum Exploration and Production Department in Uganda plans to start awarding fresh oil and gas exploration licenses in 2015, ending an eight-year freeze on the licensing of new players in its fast growing energy sector. Through an open competitive bidding process, the Ugandan government intends to license more than a dozen oil blocks, including at least four lucrative discoveries that have yielded at least 3.5 billion barrels of crude oil. Uganda's crude reserves have grown from less than 500 million barrels to 3.5 billion barrels, with less than 40% of the country's region explored. Analysts believe that excessive bureaucracy, corruption and political interference have slowed the development of the oil fields.[31] The development of the Kingfisher field located on the Southern end of Lake Albert is expected to provide over 400 jobs to Ugandans as well as a new road that will link them to the Lake Albert shores in the oil-rich Buhuka parish.[32] In 2014, Dr. Gerald Sawula Musoke, the deputy executive director of National Environment Management Authority (Nema) said, "the success or failure of the oil sector in Uganda will largely depend on the way the country manages its oil waste." It is feared that the fishing industry may potentially be adversely impacted by poorly-managed toxic waste, oil spills and/or blowouts that

can find their way into streams and finally end up in Lake Albert.[33] No tribal issues pertaining to the African Lakes were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Ministry of Natural Resources, Energy and Environment in Malawi is the mandated entity responsible for all matters concerning Malawi's natural resources, energy and environmental management[34]. The Ministry of Water and Environment (MWE) in Uganda is the mandated entity responsible for setting national policies and standards, and managing and regulating water resources[35].

Offshore and Others

There is a history of conflict between Malawi and Tanzania over Lake Malawi, which was recently amplified when a prospecting license was offered in 2012 by the Malawian government for oil exploration of the lake. The two countries have not been able to resolve the issue over the lake on their own, and as a result, have "accepted mediation from the Forum for Former African Heads of State and Government (Africa Forum), which is led by former Mozambican President Joaquim Chissano[36]."

Malawi's Ministry of Natural Resources, Energy and Environment is responsible for both environmental and energy matters. Descriptions of several of the main regulatory bodies for both Malawi and Uganda are found below.

Malawi – Ministry of Natural Resources, Energy and Environment

This ministry is made up of the following departments: Administration and Management Department, the Department of Energy Affairs, the Department of Environmental Affairs, the Department of Forestry, the Department of Geological Survey, the Department of Mines, and the Department of Climate Change and Meteorological Services. The Department of Mines is in responsible for all matters related to the country's mining sector.

This Ministry is responsible for providing "policy guidance and direction on all matters concerning Malawi's natural resources, energy, and environment management[37]." Its objectives include:

"-Promoting coordination and collaboration in sound utilization and management of the natural resources, energy and environment in Malawi with full participation of government institutions, the private sector, non-profit organizations, communities and other relevant stakeholders at district, national, regional and international levels,

- Promoting development, implementation and compliance of natural resources, energy and environment policies, programs, legislation and other related instruments,

- Promoting capacity building in environmental education, public awareness and participation in sound natural resources, energy and environmental management practices at all levels,

-Promoting and ensuring participatory development and implementation of natural resources, energy and environmental management planning and monitoring tools,

-Providing efficient and responsive weather and climate services including provision of information on climate change that meets national and international obligations and contribute to Malawi's social economic development,

-Transforming the country's energy economy from one that is overly dependent on biomass to one with a high modern energy component in the energy mix[38]."

Uganda – Ministry of Water and Environment

The Ministry of Water and Environment is made up of three directorates: Directorate of Water Resources Management (DWRM), Directorate of Water Development (DWD) and the Directorate of Environmental Affairs (DEA). It is responsible for "setting national environmental and water policies and standards, managing and regulatory water and natural resources, and determining priorities for water and environmental development and management[39]."

Uganda – Ministry of Energy and Mineral Development

The mandate of the Ministry of Energy and Mineral Development is "to establish, promote the development, strategically manage and safeguard the rational and sustainable exploitation and utilization of energy and mineral resources for social and economic development[40]."

Its roles and functions are to:

-"Provide policy guidance in the development and exploitation of the energy and mineral resources,

-Create an enabling environment in order to attract investment in the development, provision and utilization of energy and mineral resources,

-Acquire, process and interpret technical data in order to establish the energy and mineral resource potential of the country.

-Inspect, regulate, monitor and evaluate activities of private companies in energy and mineral sectors so that the resources are developed, exploited and used on a rational and sustainable basis."

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Malawi Ministry of Natural Resources, Energy and Environment

Address: P/Bag 228, Lilongwe 3, Malawi
Telephone: +265 177 2428
Email: psegov@opc.gov.mw
Website:
http://www.malawi.gov.mw/index.php?option=com_content&view=article&id=36&Itemid=1

Uganda Ministry of Water and Environment

Address: P.O. Box 20026, Kampala, Uganda
Telephone: +256 414 505942
Website:
http://www.mwe.go.ug/index.php?option=com_content&view=article&id=7&Itemid=101

Uganda Ministry of Energy and Mineral Development

Address: Amber House, Kampala Road, P.O. Box 7270, Kampala, Uganda
Telephone: +256 414 311 111
Website: http://www.energyandminerals.go.ug/index.php

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Bay of Bengal: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore) 267 million bbl / year
Total Gas Production (onshore/offshore): 2.4 trillion cubic feet/year

The Bay of Bengal is the largest bay in the world, and forms the northeastern part of the Indian Ocean. The four countries that make up this regional grouping consist of India, Sri Lanka, Myanmar (Burma), and Bangladesh. The Bay of Bengal is bounded by India and Sri Lanka to the west, Myanmar to the east, and Bangladesh to the north.

India's most explored basin in the Bay of Bengal is the Krishna-Godavari basin. The first deepwater discoveries were made by Scottish oil company Cairn Energy "with a number of small oil and gas fields on block KG-DWN-98/2, before operatorship was transferred to India's state owned oil and gas company, Oil and Natural Gas Corporation Limited (ONGC)[1]." In 2002, a large field was discovered by India-based Reliance Industries, Ltd. Other basins of interest include the Mahanadi Basin, which is north-east of the Krishna-Godavari basin, and the Bengal Basin, north of the Mahanadi Basin.

Offshore licensing in Bangladesh has been delayed due its maritime boundary dispute with India. There is only one producing Bangladeshi field in the Bay of Bengal, named the Sangu field and operated by Cairn Energy. However, this field is currently on the decline. The Bangladesh offshore area covers an area of approximately 24,000 square miles, but it is generally underexplored. In 2008, the Bangladesh government offered 28 offshore blocks for licensing during its third licensing round. "Two deep water blocks in the Central Bay Area and one shallow water block alongside the Bangladesh-India maritime border were awarded to U.S. ConocoPhilips and British Tullow, respectively[2]."

A significant amount of the offshore production in Myanmar comes from the Yadana and Yetagun fields. The Yadana gas field was discovered in 1980. The infrastructure of this oil field consists of "two well-head platforms consisting of seven wells[3]." Other facilities include a "215 mile subsea pipeline and a 39 mile onshore pipeline connecting through the Tenasserim district to the Thai border[4]." In addition, in 2007, "a manifold compression platform was installed for an initial project development plan to make sure that certain gas production levels are met[5]."

Another project in Myanmar is the Zawtika project, which consists of the development of the Zawtika, Kakonna, and Gawthaka fields in blocks M9 and M11 of the Gulf of Martaban. These three fields were discovered in 2007, and the operators include the Petroleum Authority of Thailand Exploration and Production International and the Myanma Oil and Gas Enterprise[6]. In 2014, Myanmar awarded oil and gas tenders for 20 offshore blocks to international energy companies, like Royal Dutch Shell PLC, ConocoPhilips, and Total[7].

In 2007, the Mannar Basin in Sri Lanka "was divided into nine exploration blocks ranging from 1290 to 2654 square miles[8]." The Cabinet of Ministers, which forms the central government of Sri Lanka, offered three of the nine blocks for "petroleum exploration under an international licensing round[9]." The licensing round was successful and bids were received for the three blocks. Block SL2007-01-001, with an area 1290 square miles in water depths of 0.2 to 1 meters, was awarded to Cairn, and they made two discoveries from this block. In 2011, Cairn announced that "its exploratory well CLPL-Dorado-91H/1z, drilled 19 miles from the Sri Lankan coast in a water depth of 0.8 meters,[10] contained gas. Another well, CLPL-Barracida-1G/1, drilled to a depth of 3 miles in 0.9 miles of water, also held gas.

Geology and Geophysics

The Bay of Bengal is bounded "to the north by a continental shelf that narrows to the south and by slopes of varying gradient on the northwest, north, and northeast, all cut by canyons from the rivers[11]." The main canyons include the following: the Ganges Ganges-Brahmaputra, Andhra, Mahadevan, Krishna, and Godavari canyons. The Bay of Bengal spans an area of about 850,000 square miles and has an average depth of about 1.9 miles[12]. Sediments in the Bay of Bengal consist of "terrigenous deposits from the rivers, mostly coming from the Indian subcontinent and from the Himalayas[13]." In addition, "relict carbonates of late Pleistocene age are exposed as small patches on the eastern Indian shelf, off Irrawady, the river that flows north to south through Myanmar, and on the Mergui terrace, which is an archipelago in southern Myanmar[14]." Pelagic carbonates can be found on the Ninety-East Ridge, which is a seamount chain in the Indian Ocean that can be mapped out topographically from the Bay of Bengal to the Southeast Indian Ridge.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

The Bay of Bengal has special operating conditions, such as deepwater drilling conditions, that need to be taken into account for offshore operators. . For instance, in 2011 ConocoPhilips signed a production sharing agreement with both the government of Bangladesh and Petrobangla, which is Bangladesh's state owned company, for two deepwater blocks in the Bay of Bengal. The two blocks, DS-08-10 and DS-08-11, have a total area of 1992 square miles, and are in water depths of 0.6 – 0.9 miles, about 175 miles from Chittagong, which is the main seaport of Bangladesh.

In 2013, Reliance Industries Limited, along with London-based BP and Indian and South-East Asia focused NIKO, announced "significant gas and condensate discovery in the KG block off the eastern coast of India[15]." The KGD6-MJ1 well was drilled to a depth of 2.8 miles, in a water depth of 0.6 miles. Studies show that "a gross gas and condensate column exists in a well of about 0.1 miles in the Mesozoic reservoirs[16]."

Technologies used in the region include subsea equipment. In 2014, Hallin Marine, an energy services company, announced a subsea development in the G1 deepwater region. Hallin "will be providing the subsea operations vessel *Ullswater* with survey, air diving, and marine crews as well as flexible and umbilical laying equipment and construction crew[17]." The vessel is 0.05 miles long and 0.01 miles wide and "is fully equipped for wellhead servicing, inspection, and construction diving[18]."

Methods of Offshore Tender

The offshore tendering method used by the countries in the Bay of Bengal region consist of either production sharing agreements, corporate income taxes, or royalties, or a combination of all three. For instance, in India, royalties are 10% for crude oil and natural gas in shallow offshore areas and 5% in deepwater offshore areas for the first 7 years of commercial production (after the first 7 years, the royalty increases to 10%). Local companies are expected to pay a tax rate of 30%, while foreign companies pay a tax rate of 40%[19].

Myanmar and Bangladesh also use production sharing agreements. In Myanmar, potential licensees sign production sharing agreements with Myanmar Oil and Gas Enterprise, a state-owned company that is administratively subordinate to the Ministry of Energy, to participate in exploration and production activities in Myanmar. A royalty rate of 12.5% is applied.

Information pertaining to Sri Lankan methods of offshore tender was not be identified in available sources.

Environmental Overview and Development

Myanmar's environmental impact assessment (EIA) process is emerging with goals of assessing all stages of the process, identifying impacts early on, early review and assessment of the project risks, and continual monitoring management and disclosure to meet international standards[20]. India requires an EIA for governmental and private projects overseen by Ministry of Environment, Forest and Climate Change (MoEF). They have a specialized process for coastal management and emphasize monitoring by project authorities every 6 months[21]. The EIA process guidelines in Bangladesh are strict, but lack emphasis on monitoring. The proper implementation of EIAs is not standardized, and the involved agencies are disorganized in their decision making leading to inadequate infrastructure to ensure a proper EIA process[22]. The EIA process in Sri Lanka is required only for large-scale development projects and projects located in environmentally sensitive areas. It includes 6 major steps: screening, scoping, preparation of the EIA report, review of the report by the public and the project approving authority (PAA), approval with terms and conditions or rejection with reasons, and post-approval monitoring. The PAA manages the implementation of each step except the preparation of the EIA which is carried out by the project proponent[23].

Natural Resources

The Bay of Bengal is located off the east coast of India, touching India, Myanmar (Burma), Bangladesh, and Sri Lanka. In this region, there are about 100 marine protected areas (MPAs) including 9 in Myanmar (Burma), 128 in India (about half are located in the Bay of Bengal), 8 in Bangladesh, and 19 in Sri Lanka making up about 1,000 square miles of protected bay[24].

According to the high resource value analysis figure, much of the coastal zone of the Bay of Bengal is under protection. This region is rich in biodiversity with seagrass, salt marsh, mangrove, and coral habitats prominent along the coasts of southern India, Sri Lanka, parts of Bangladesh, and Myanmar (Burma). Endangered and threatened species ranges line the coast of all 4 countries bordering the Bay, and marine bird areas are present along with marine turtle nesting beaches and foraging grounds (See Figure 1 below).

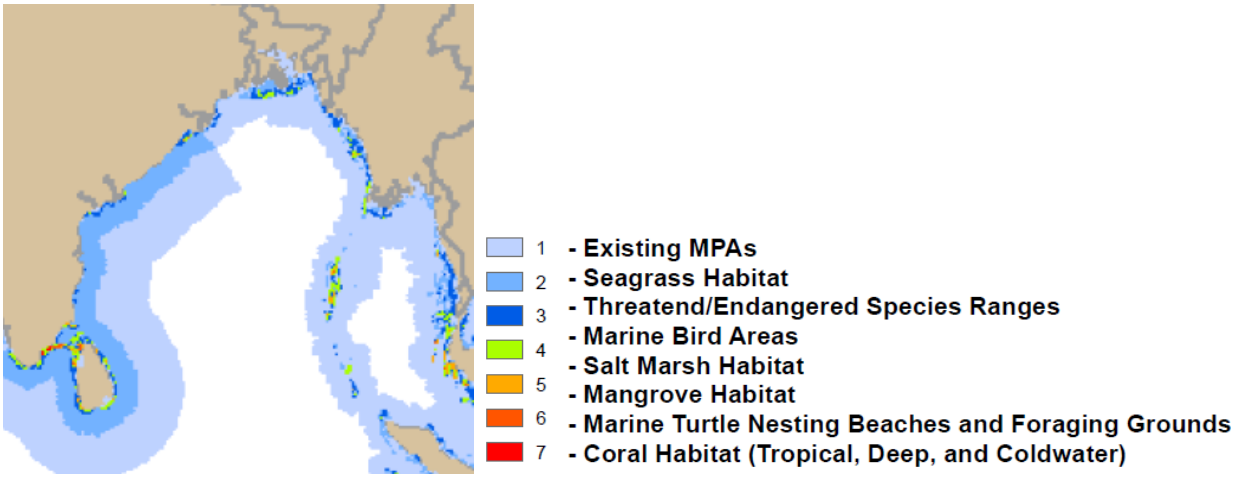

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

Several historical ships have been discovered in the Bay of Bengal, including a 1783 American Revolutionary War naval ship.[25] Off the coast of Mahabalipuram, in Tamil Nadu, South India, a complex of submerged ruins made of granite was discovered. The complex is believed to be the remnants of six magnificent temples dating back 1,500 to 1,200 years before present.[26] The Sun Temple, Konârak, in India, built in the 13th century on the shores of the Bay of Bengal, is one of India's most famous Brahman sanctuaries.[27] There are several archaeological sites as well as historic properties and towns along the Bay of Bengal coastline.[28]

Socio-economic and Tribal

India was chosen as the focus country to offer a unique perspective on the Bay of Bengal region. Since the late 1990s, India's "revamped" New Exploration Licensing Policy (NELP) has initiated more than 60 offshore exploration blocks. Prior to this, the Bay of Bengal was largely ignored by international oil and gas companies.[29] Offshore exploration has yielded some significant gas discoveries. In 2009, Reliance Industries Ltd commenced production from its substantial Dhirubhai deep water gas development. Investments for offshore exploration and production fell from US$6 billion in 2007-08 to US$1.8 billion in 2011-12, a decline of nearly 60 percent in Indian offshore drilling activity over the 2007-2013 period. In 2014, unmet gas demand represented a considerable burden on India's economy. Motivated by economic growth, policy reforms as of June 2014 increased the price of domestically produced gas, thereby stimulated additional domestic exploration and production activity.[30] In July, 2014, India surrendered its four-decade claim to a swathe of the Bay of Bengal, opting to regard a United Nations-backed ruling. V.K. Singh, junior minister in India's Ministry of External Affairs stated, "the award puts an end to a long standing issue between India and Bangladesh which has impeded the ability of both countries to fully exploit the resources in that part of the Bay of Bengal." No tribal issues pertaining to the Bay of Bengal were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Ministry of Environmental Conservation and Forestry is Myanmar's mandated entity for formulation environmental policies and ensuring the protection and sustainability of natural resources[31]. India's MoEF is the administrative body for the planning, promotion, coordination, and overseeing the implementation of environmental policies[32]. The Ministry of Environment and Forest (MoEF) in Bangladesh is the mandated entity responsible for the planning, promotion, and implementation of environmental policies[33]. The Ministry of Environment and Renewable Energy in Sri Lanka is the mandated body responsible for the formulation and implementation of policies regarding natural resources and the Environment[34].

Offshore and Others

The main regulatory bodies in the Bay of Bengal are offshore licensing bodies and environmental protection agencies. The goals and objectives of these agencies are diverse. No specific examples of cooperation or conflict seem to exist between the agencies, although there has been conflict between the countries in this region. The 40-year old maritime dispute between India and Bangladesh was finally settled on July 7, 2014, when the Hague-based Permanent Court of Attribution recently "awarded Bangladesh four-fifths of the total area (which is 9,885 square miles)[35]." Both India and Bangladesh have accepted this verdict as change in the positive direction, encouraging friendly relations. Descriptions of several of the main regulatory bodies are found below:

India – Ministry of Environment, Forest and Climate Change

The main objective of this ministry is to implement policies and programs "relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests, and wild life[36]." In addition, it is concerned with policies for the "prevention and abatement of pollution[37]." "The Ministry also serves as a nodal agency in the country for the United Nations Environment Programme and the South Asia Cooperative Environment Programme[38]."

India – Directorate General of Hydrocarbons

The Directorate General of Hydrocarbons was established in 1993 "under the administrative control of Ministry of Petroleum and Natural Gas and its responsibilities include implementation of India's New Exploration Licensing Policy, as well as promotion and monitoring of offshore oil and gas activities, to ensure that it is being conducted safely[39]."

Myanmar – Ministry of Environmental Conservation and Forestry

The Environmental Conservation Department is a subgroup of the Ministry of Environmental Conservation and Forestry, "and is responsible for implementing national environmental policy, strategy, framework, and planning and action plan for the integration of environmental consideration into the national sustainable development process. It is also responsible for natural

resources conservation, pollution control on water, air, and land, and for cooperating with government and international organizations concerned with environmental management[40]."

Myanmar – Ministry of Energy

The Ministry of Oil is made up of 4 subgroups: The Energy Planning Department, the Myanma Oil and Gas Enterprise, the Myanma Petrochemical Enterprise, and the Myanma Petroleum Products Enterprise. The Myanma Oil and Gas Enterprise is the subgroup responsible for "exploring oil and gas by conducting geological and geophysical surveys for oil and gas exploitation and for cooperating with foreign oil companies by signing the production sharing contracts for onshore and offshore blocks for early monetization of petroleum resources[41]."

Bangladesh – Ministry of Environment and Forests

The Ministry of Environment and Forests "is the nodal agency in the administrative structure of the central government for the planning, promotion, coordination, and oversight of the implementation of environmental and forestry programs[42]." The responsibilities of this Ministry include "the conservation and survey of flora, fauna, forests, and wildlife, prevention and control of pollution, forestation and regeneration of degraded areas, and the protection of the environment[43]."

Bangladesh – Ministry of Environment and Forests

The Ministry of Environment and Forests "is the nodal agency in the administrative structure of the central government for the planning, promotion, coordination, and oversight of the implementation of environmental and forestry programs[44]." The responsibilities of this Ministry include "the conservation and survey of flora, fauna, forests, and wildlife, prevention and control of pollution, forestation and regeneration of degraded areas, and the protection of the environment[45]."

Bangladesh – Ministry of Power, Energy and Mineral Resources

The Energy and Mineral Resources Division is a subgroup of the Ministry of Power, Energy, and Mineral Resources. Its functions include "all policies and matters relating to liquid petroleum, natural gas, and mineral resources, as well as any administrative, planning, and policy work related to geological surveys[46]."

Sri Lanka – Ministry of Environment and Renewable Energy

The responsibilities of the Ministry of Environment and Renewable Energy include "managing the environment and natural resources in the country, maintaining the equilibrium between the trends in rapid economic development and the use of natural resources, and implementing policies for the conservation of the environmental and natural resources with the participation of stakeholders such as government agencies, non-profit organizations, and local communities[47]."

Sri Lanka – Ministry of Petroleum Industries

The Ministry of Petroleum Industries was established in 2005 to "formulate and implement policies, plans, and programs for petroleum resources development, while meeting the energy needs in the petroleum sector though importing, refining, selling, and distributing oil and natural gas[48]."

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

India Ministry of Environment, Forest and Climate Change

Telephone Directory: http://envfor.nic.in/about-ministry/telephone-directory-officers-moef
Website: http://envfor.nic.in/

India Directorate General of Hydrocarbons

Address: OIDB Bhawan, Plot No 2, Sector 73, Noida
Telephone: 0120-2472000
Website: http://www.dghindia.org/Index.aspx

Myanmar Ministry of Environmental Conservation and Forestry

Email: dg.ecd@moecaf.gov.mm
Website: http://www.moecaf.gov.mm/userpage.aspx

Myanmar Ministry of Energy

Address: Building No. 6, Nay Pyi Taw City, Myanmar
Telephone: +95-67-411060
Email: moe.ho@energy.gov.mm
Website: http://www.energy.gov.mm/

Bangladesh Ministry of Environment and Forests

Address:
Government of the People's Republic of Bangladesh
Building # 6, Level # 13
Bangladesh Secretariat, Dhaka
Website: http://www.moef.gov.bd/index.php

Bangladesh Ministry of Power, Energy and Mineral Resources

Website: http://www.emrd.gov.bd/index.html

Sri Lanka Ministry of Environment and Renewable Energy

Address:
82, Sampathpaya,
Rajamalwatte Road,
Battaramulla,
Sri Lanka
Telephone: +94-11-2865452
Email: secretary@environmentmin.gov.lk

Website:
http://www.environmentmin.gov.lk/web/index.php?option=com_content&view=frontpage&Itemid=1&lang=en

Sri Lanka Ministry of Petroleum Industries

Telephone: +94112564969
Email: pimin@sltnet.lk
Website: http://www.petroleummin.gov.lk/home

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http://www.britannica.com/EBchecked/topic/60740/Bay-of-Bengal

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http://www.oilandgastechnology.net/upstream-news/ril-bp-niko-make-deepwater-gas-discovery-offshore-india

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[24] Protected Planet. Available online at: http://www.protectedplanet.net/countries/206

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[40] Ministry of Environmental Conservation and Forestry. Available online at: http://www.moecaf.gov.mm/userpage2.aspx?mid=28

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[48] Ministry of Petroleum Industries. Available online at: http://www.petroleummin.gov.lk/about-us

Black Sea: Regional Offshore Exploration and Production Profile

Total (onshore and offshore) Oil Production: 241,000 barrels/day (2013)

Total (onshore and offshore) Gas Production: 1 Trillion cubic feet/year (2013)

Countries within the Black Sea Region include Bulgaria, Georgia, Turkey, Romania, Slovenia, and Ukraine. The Black Sea is considered a developing region of offshore oil and gas resources, with significantly less activity compared with major offshore regions in the world. In 2014, only two rigs were operating in the Black Sea, and less than 100 wells had historically been drilled[1]. With varying degrees of intensity, countries within the Black Sea region depend on oil and natural gas imports from nearby Russia. Romania is the largest oil and gas producer in Central/East Europe, although overall the country is still a net importer of oil and gas[2].

Offshore exploration and/or production operations take place in Turkish, Romanian, Bulgarian, and Ukrainian portions of the Black Sea. Georgia's offshore territory in the Black Sea is diminutive, and the country has reportedly attracted little interest from industry since Anadarko quit operations in the region in 2009[3]. Turkey first began exploration in shallow water in the Black Sea in 1973, and as of 2010, it had participated in drilling 34 exploratory wells in the region[4]. Turkey's Ministry of Energy and Natural Resources has announced plans to begin commercial production in the Black Sea in 2016[5]. Additional recent developments in Black Sea oil/gas operations include deep water natural discovery and follow up exploration off the Romanian Coast by Exxon Mobil and OMV Petrom,[6,7] as well as the plans for Total to begin drilling in deep water for oil and gas in the Han Asparuh block off the coast of Bulgaria.

Oil companies with Black Sea offshore exploration and production operations/interests include: national oil companies OVM Petrom (Romania), Naftogaz (Ukraine), and Türkiye Anonim Ortakliği - TPAO (Turkey) as well international operators including Exxon Mobil, Chevron, Petrobras, Repsol, Total, and Lukoil.

Geology and Geophysics

The Black Sea is one of the largest enclosed marine areas in the world, covering approximately 167,000 square miles[8]. The Black Sea can be subdivided into four physiographic provinces: the continental shelf, basin slope, basin apron, and abyssal plain[9]. A significant percentage of the Black Sea's continental shelf is located in shallow water, less than roughly 650 feet[10]. In 2012, less than 100 hydrocarbon wells had been drilled in the Black Sea, and the area is primarily unexplored. A major deep sea discovery occurred off the coast of Romania at the Domino-1 well, at a water depth of approximately 3,000 feet. The estimated natural gas reserves at this location were approximately 1.5-3.2 trillion cubic feet[11]. Black sea countries have been active in seismic exploration of the region, and in July 2013, seismic data collection was completed in the Neptun block off the coast of Romania, where Exxon Mobil and PMV Petrom discovered a deep water gas reserve[12].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Deepwater and the presence of hydrogen sulfide are two operating conditions associated with the Black Sea. The Black Sea is reported to be the largest anoxic (environment without the presence of oxygen) body of water in the world and hydrogen sulfide is present at water depths ranging from 300 to 6,600 feet (approximate max depth)[13]. Deepwater development in the Black Sea is in its infancy. Recent important developments include discovery of the first deep water exploratory gas well (Domino-1) by Exxon Mobil and Romania's oil company OVM Petrom in 2012[14] and Black Sea exploration operations by Petrobras and Turkey's state oil company, (TPAO)[15]. Currently-used innovative technologies associated with Black Sea offshore drilling and production operations include horizontal drilling and subsea tiebacks, respectively[16,17].

Methods of Offshore Tender[18]

Offshore licensing/concessions and production sharing agreements apply to upstream oil/gas operations in the Black Sea. In Romania, concessions agreements are awarded from a public bidding process for a maximum period of 30 years with a possible extension of 15 years[19]; corporate income is taxed at 16% and hydrocarbon royalty charges range from 3.5-15% of the extracted value[20]. Bulgaria and Turkey also have similar royalty systems. In Ukraine, viable offshore oil/gas contracts include licenses/concessions and production sharing agreements. Oil and gas production permits are generally auctioned off, at a value of no less than 2% of the projected total net profit or a well or deposit[21]. A corporate tax of 18% as well as subsoil use payments also apply. In Turkey, license/concessions contract regime applies to upstream oil and gas operations. Exploration licenses are granted for an 8 year period and production licenses are granted for a maximum period of 20 years. Under Turkey's new petroleum law, exploration and production license holders pay the Turkish state one eighth of the values of extracted natural gas and oil[22]. Finally, production licensing/concessions agreements are used in Bulgaria[23]. Production sharing agreements apply to oil/gas contracting in Georgia[24], and in Slovenia joint venture contracts are used between foreign oil companies/contractors and Slovenian energy producers[25].

Environmental Overview and Development

The countries bordering the Black Sea – Bulgaria, Romania, Slovenia, Ukraine, Georgia, and Turkey – all have an EIA process. Bulgaria Requires an SEA and EIA process administered and approved by the Ministry of Environment and Water[26]. Romania complies with the EU's EIA Directive[27]. Slovenia requires an EIA under the Environmental Protection Act of 1993[28]. Ukraine joined the Energy Commission of the EU in 2011, committing itself to aligning its EIS procedure with the European standard by the end of 2012[29]. Georgia adopted an EIA/SEA system in 1996 through the Law of Georgia on the Protection of the Environment[30]. Turkey's EIA Regulation came into effect in 1993 through the Environmental Law[31].

Natural Resources

The Black Sea has a total of 107 marine protected areas (MPAs), including 21 in Bulgaria, 17 in Romania, 9 in Slovenia, 37 in Ukraine, 4 in Georgia, and 19 in Turkey. This equates to almost 2,400 square miles of protected waters in the Black Sea[32].

According to the high resource value analysis figure, over a third of the Black Sea is covered by existing MPAs. There are visible threatened and endangered species ranges in the Black sea as well as some seagrass habitat, but there is little to no evidence of salt marsh, mangrove, or coral habitat (See Figure 1).

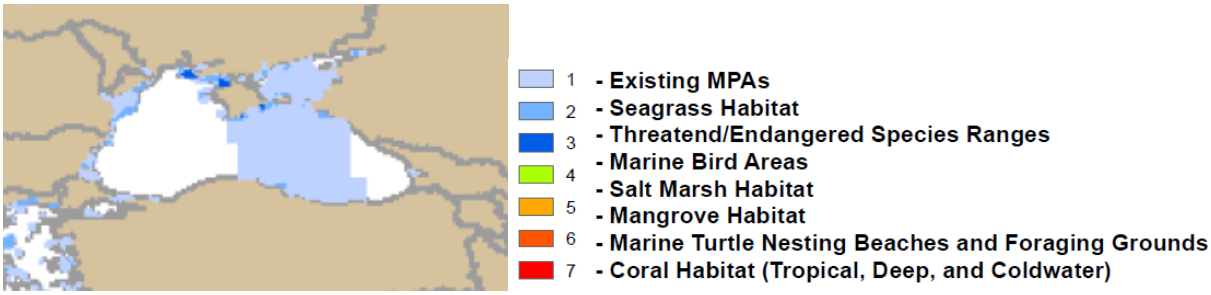

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

Several ancient shipwrecks have been discovered off the coast of Sinop, Turkey. The most notable is a 6th century Byzantine merchant ship, Sinop D, found in the Black Sea's anoxic waters which are renowned as the best-preserved ancient shipwreck ever discovered.[33] In addition, well-preserved remnants of human habitation, a mud and wattle house, have been discovered approximately 12 miles off the coast of Sinop. It is believed the human settlement dates to a time before the flooding of the Black Sea by the waters of the Mediterranean, an event which probably occurred around 7,500 years ago.[34] There are several archaeological sites as well as historic properties and towns along the Black Sea coastline.[35]

Socio-economic and Tribal

Oil companies are looking to invest in off-shore exploration and drilling in Ukraine, Romania, Bulgaria and Turkey. As of 2013, Turkey has already spent over $2.5 billion on offshore exploration, and Exxon Mobil Corp (XOM) reportedly prepared to spend $735 million to drill two deep-water wells offshore Ukraine.[36] As of 2014, the future of offshore drilling operations in the Black Sea may be contingent on a resolution to Ukraine's dispute with Russia over Crimea. Eni, Italy's largest oil and gas producer, as well as Exxon and Royal Dutch Shell Plc signed a production sharing agreement with the Ukrainian government to grant access to offshore exploration on the eastern and southwest coast of Crimea, respectively.[37] Without Crimea, there is potential that Ukraine will not benefit from the valuable oil and gas fields that lie just offshore the Crimean peninsula. The profits from oil and gas discovery will not only boost the economic and energy future, but could help reduce Ukraine's dependence on Russian gas imports.[38] No tribal issues pertaining to the Black Sea was found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Overarching environmental regulatory agency in Bulgaria is the Executive Environment Agency (ExEA). They are the agency of the Ministry of Environment and Water that carries out

management, coordination and information availability with regards to environmental protection in Bulgaria[39]. The regulatory agency for Romania is the National Environmental Protection Agency. It is a specialized authority of the central government and is a subordinate of the Ministry of Environment and Sustainable Development. Romania is a Member State of the EU, so they are required to comply with the EU's Environmental Impact Assessment (EIA) Directive[40]. Slovenia's environmental regulatory agency is the Slovenian Environment Agency. They undertake expert, regulatory, analytical and administrative tasks related to the environment at the national level[41]. The regulatory agency in Ukraine is the Ministry of Ecology and Natural Resources of Ukraine[42]. A translator is needed for this department's website. The National Environmental Agency is a legal entity of the Ministry of Environment Protection of Georgia. They are tasked with monitoring and evaluating environmental activities[43]. The regulatory agency in Turkey is the Republic of Turkey Ministry of Environment and Urbanisation. They are tasked to ensure the implementation of marine conservation, pollution prevention or disposal, and to identify the principles and procedures needed to retain the integrity of the natural environment[44].

Offshore and Others

Offshore regulation/enforcement procedures vary among countries within the Black Sea grouping. A main source of conflict in the region is between federal governments over territorial rights in the Black Sea. Most prominent are disputes between Romania and Ukraine over exploration and drilling rights in an approximately 4,600 square mile area in the Black Sea[45] , as well as Russia's annexation of the Crimean peninsula, which affected offshore exploration/production plans/operations in the region[46]. A source of cooperation between Black Sea region countries is the participation of European Union members Bulgaria, Romania, Slovenia, and prospective member Turkey to develop regulatory oil/gas offshore frameworks with regards to cited activities including licensing, safety, and environmental protection[47].

Federal regulatory authorities in the realms of oil/gas financing/licensing, environmental regulation, and safety and health in industry exist in Black Sea region countries. Descriptions of regulatory authorities with most direct apparent influence/authority in oil/gas operations in the region (by country) are provided below.

Bulgaria – Ministry of Economy and Energy, the State Energy and Water Regulatory Commission, and the Ministry of Environment and Water

Main pieces of legislation regulating the oil/gas activities in Bulgaria include the Underground Resources Act (1999), The Energy Act (2003), The Protection of Environment Act (2002), and the Waters Act 1999. The Ministry of Economy and Energy and the State Energy and Water Regulatory Commission are two main regulating bodies responsible for implementing state policy in the oil/gas exploration and production sectors[48]. Bulgaria' Ministry of Environmental and Water is the federal environmental agency, responsible for review of environmental impact assessments of proposed oil/gas developments[49].

Georgia – Georgian Oil and Gas Regulatory Agency and Ministry of Environment and Natural Resources Protection

Georgia's Oil and Gas Regulatory Agency is responsible for supervising and controlling oil/gas operations in the country[50]. The legal basis for the Georgian Oil and Gas Regulatory Agency was established in 1999 Law of Oil and Gas, which also determined the functions of the National Oil Company of Georgia[51]. The Ministry of Environment and Natural Resources Protection of Georgia is the main federal environmental regulatory body in the country. Its responsibilities include: to

create and implement state environmental policy, including national environmental action programs and management plans in the field of environmental protection and natural resources; to protect and preserve air, water, land and mineral resources; to regulate waste management and chemicals; and to implement international commitments in environmental matters[52].

Turkey – Ministry of Energy and Natural Resources, General Directorate of Petroleum Affairs, and the Ministry of Environment

Responsibilities of the Ministry of Energy and Natural Resources include oversight of all exploration and production activities regarding energy and natural resources. The General Directorate of Petroleum Affairs is a subordinate body within the Ministry of Energy and Natural Resources whose responsibilities include oversight/approval of exploration and production permitting and licensing[53]. The Turkish Ministry of Environment is a primary national environmental regulatory body in the country[54].

Romania – Environmental Protection Agency and National Agency for Mineral Resources

The Environmental Protection Agency supervises/manages the environmental impact process and enforces environmental protection as established by Romanian law. The National Agency for Mineral Resources' responsibilities include compliance monitoring of environmental protection and assessment of permit compliance in oil/gas operations[55].

Slovenia – Energy Directorate and Ministry of Environmental and Spatial Planning

These two federal agencies have roles in the energy/environmental regulation in Slovenia. Responsibilities of the Energy Directorate include legislative authority in the energy and mining sectors and preparation and implementation of country energy policy, including in the exploration and production sectors. Duties of the Ministry of Environment and Spatial Planning include regulation of environmental permits, environmental impact assessments, waste management, and advancement of environmental regulation/protection in Slovenia[56, 57].

Ukraine – Cabinet of Ministers of Ukraine and Ministry of Ecology and Natural Resources

Ukraine's cabinet of Ministers is responsible for the administration of Production Sharing Agreements and the formation of the general legal framework for hydrocarbons. The Ministry of Ecology and Natural Resources performs environmental compliance supervision and has permitting and licensing authorities[58].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Bulgaria – Ministry of Economy and Energy and State Energy and Water Regulatory Commission

Ministry of Economy and Energy
Address:
8, Slavyanska Str., Sofia 1052, Bulgaria
Telephone: +359 2 940 7001
Email: e-docs@mee.government.bg
Website: http://www.mi.government.bg/en/themes-c261.html

State Energy and Water Regulatory Commission
Address:
1000 Sofia 8-10 Dondukov Blvd. Bulgaria
Telephone: +359 2 988 8730
Email: dker@dker.bg
Website: http://www.dker.bg/indexen.php

Georgia – Georgian Oil and Gas Regulatory Agency and Ministry of Environmental and Natural Resources Protection

Oil and Gas Regulatory Agency
Address:
Tbilisi, Georgia, 0177, Kazbegi Av. N:45.
Telephone: +(995 32) 253399, +(995 32) 253300, +(995 32) 253311, +(995 32) 988173.
Email: sarogr@access.sanet.ge
Website: http://moe.gov.ge/index.php?lang_id=ENG

Ministry of Environment and Natural Resources Protection (Office of Public Relations)
Address:
6 G. Gulua Street, 0114 Tbilisi, Georgia
Telephone: +(995 32) 272 7224, +(995 32) 272 7234
Email: pr@moe.gov.ge
Website: http://moe.gov.ge/index.php?lang_id=ENG

Turkey – Ministry of Energy and Natural Resources and the General Directorate of Petroleum Affairs

Ministry of Energy and Natural Resources
Address:
Türk Ocağı Street No:2 06100 Çankaya/ANKARA/TÜRKİYE
Telephone: +90 312 212 64 20
Email: Not identified in public sources
Website: http://www.enerji.gov.tr/en-US/Mainpage

General Directorate of Petroleum Affairs
Address:
Eskişehir Yolu 7 km No. 166, Çankaya, Ankara, Turkey
Telephone: + 90 312 219 8112
Email: pigm@pigm.gov.tr
Website: http://www.pigm.gov.tr/ (Turkish)

Romania – Environmental Protection Agency and the National Agency for Mineral Resources

Environmental Protection Agency
Address:
Splaiul Independentei, nr.294, Corp B, Sector 6, Bucureşti, Cod 060031
Telephone: 021-207.11.01; 021-207.11.02
Email: office@anpm.ro
Website: http://www.anpm.ro/ (Romanian)

National Agency for Mineral Resources
Address:
Dacia Street, no. 59, sector 1
010407, Bucharest, Romania
Telephone: 021 – 3170018; 3170094; 3170095 (Main Desk numbers)
Email: claudia.raileanu@namr.ro (Claudia Railneau – Petroleum Department)
Website: http://www.namr.ro/home-3/

Slovenia – Energy Directorate (Ministry of Infrastructure) and Ministry of Environmental and Spatial Planning

Energy Directorate
Address (Ministry of Infrastructure):
Langusova ulica 4
SI-1000 Ljubljana
Slovenia
Telephone: +386 1 478 7450 (Danijel Levičar -Director-General)
Email: gp.mzip(at)gov.si
Website: http://www.mzi.gov.si/en/areas_of_work/energy/

Ministry of Environment and Spatial Planning
Address:
Dunajska c. 47
SI-1000 Ljubljana, Slovenia
Telephone: +386 1 478 74 00
Email: gp.mop(at)gov.si
Website: http://www.mop.gov.si/en/

Ukraine – Ministry of Ecology and Natural Resources (MENR)

Address:
35, Urits'koho str., Kyiv, Ukraine 03035
Telephone: (044) 206-33-02
Email: yar@menr.gov.ua, karnax@menr.gov.ua, polishuk@menr.gov.ua
Website: http://eng.menr.gov.ua/

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Caribbean Sea: Regional Offshore Exploration and Production Profile

Total (onshore and offshore) Oil Production (2013): 1.05 million barrels/day

Total (onshore and offshore) Gas Production (2013): 421 billion cubic feet/year

The Caribbean Sea regional grouping includes a total of 9 countries, specifically: Belize, Colombia, Costa Rica, French Guiana, Guyana, Honduras, Nicaragua, Panama, and Suriname. Priority countries also found in the Caribbean but not in this specific regional grouping include the Bahamas, Cuba, Jamaica, Mexico, Trinidad and Tobago, and Venezuela. In the Caribbean regional grouping, French Guiana, Guyana, Nicaragua, and Panama do not have either offshore or onshore oil or gas production[1]. From the priority countries, Trinidad and Tobago is one of the most mature offshore producing countries in the Caribbean Sea, with several decades of production[2]. There are historical and/or active offshore exploration operations in nearly all non-priority Caribbean regional grouping countries, including Belize[3], Colombia[4], Costa Rica[5], French Guiana[6], Guyana[7], Honduras[8], and Suriname[9]. Production operations in non-priority region countries is very limited and includes natural gas production at the Guajira basin, offshore Colombia[10]. French Guiana most recently engaged in deep-water exploration operations in the Caribbean, following a petroleum discovery at the Zaedyus well by UK operator Tullow in 2011[11]. Further advances in deep-water offshore technology and perceived potential for hydrocarbon reserves have spurred recent increased exploration activity in the Caribbean region[12,13]. In addition to national oil companies/operators, international oil companies involved in upstream Caribbean offshore operations include Pacific Rubiales (Canada), CGX Energy (Canada), Tullow Oil plc (UK) Statoil (Norway), Chevron (U.S.), Shell (U.S.), Repsol (Spain), Exxon Mobil (U.S.) and Anadarko (U.S.)[14].

Geology and Geophysics

The Caribbean region has been considered a region of lesser hydrocarbon potential given a lack of exploration efforts/seismic data and limited understanding of the source and reservoir rocks in the region[15]. There is active seismic surveying within Caribbean Sea regional countries, examples include: collection of two dimensional (2-D) and three dimensional (3-D) seismic data in Guyana offshore basin[16] and anticipated collection of approximately 12,000 square miles of seismic data[17]. Estimated mean offshore undiscovered hydrocarbon reserves in the Guyana-Suriname Basin, including areas of Guyana, French Guiana, and Suriname are approximately 30 billion barrels of oil and 11 trillion cubic feet of gas[18]. Gas hydrates (naturally occurring crystalline structures composed of mostly light gases) have been reported off the coast of Belize at depths ranging from 800 to 1,300 feet[19].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions in the Caribbean Sea include deep water and adverse weather such as strong seasonal storms and hurricanes. New technologies used in offshore exploration and production operations in the area include extended reach drilling[20] and vessel-based well intervention[21].

Methods of Offshore Tender

Offshore licensing/concessions agreements, production sharing agreements, technical service agreements and associated income tax/royalty payments (with country-specific conditions/stipulations) are used to finance upstream operations in Caribbean Sea regional countries. For example, in Colombia, exploration and production licensing contracts are used and royalty charges are assessed based on monthly production rates for crude oil and production location for natural gas. The royalty charges on produced crude oil range from 8% (for up to 5,000 barrel (bbl)/day monthly production) to 25% for more than 600,000 bbl/d monthly production).[22] Gas royalty charges in Colombia ranges from 60% (for natural gas produced offshore at a depth greater than 1,000 feet) to 80% (for natural gas produced onshore/offshore at a depth less than 1,000 feet)[23]. As of 2003, Colombia banned production sharing contracts, replacing them with exploration and production contracts which include production licenses up to 24 years with 10 year extensions available. License/concessions agreements are used in Caribbean Sea regional grouping countries including Costa Rica[24], Guyana[25], Honduras[26], and Nicaragua[27]. Production sharing agreements are used in Belize[28], Guyana[29], and Suriname[30], while technical service agreements have been used to finance hydrocarbon exploration/production operations in Guyana[31] and Nicaragua[32].

Environmental Overview and Development

In Belize, projects, programs and activities are subject to an EIA. The Minister is responsible for administering the regulations, and the DOE (Department of the Environment) is responsible for approving the EIA. The DOE also had jurisdiction over investigations to ensure and enforce compliance with the law. In Honduras, an EIA is required for projects, industrial facilities, and all public and private activities. The project gets registered with DECA (Office of Environmental Evaluation and Oversight) prior to the EIA being carried out and DECA is responsible for compliance monitoring and oversight. In Nicaragua an EIA is required for activities, works and projects with a potential negative effect on the environment. MARENA in Nicaragua (Ministry of Environment and Natural Resources) is responsible for the final decision of approval, and an environmental license issued by them sets monitoring requirements and specifies how monitoring and compliance are to be carried out. In Costa Rica, an EIA is required prior to beginning specific works, activities, and projects. Regulatory plans are also required to be evaluated. SETENA in Costa Rica (National Environmental Technical Secretariat) prepares guidelines for all activities, works, projects, and plans and is responsible for monitoring and enforcing compliance with EIA standards.

The EIA process in Panama acts as an early warning system based on continuous evaluation that enables preventative decision making to preserve the environment. Activities, works, and projects are subject to an EIA, as well as some national development plans. ANAM in Panama (National Environmental Authority) is responsible for the final decision of approval. The developer is responsible for conducting monitoring and submitting reports to ANAM. ANAM certifies environmental auditors to evaluate and ensure monitoring and oversight programs. In Columbia, the EIA process acts as an authorization to carry out projects subject to meeting conditions for prevention, mitigation, and compensation to support the management of environmental impacts. MAVDT (Ministry of the Environment, Housing, and Territorial Development) in Colombia is responsible for the decision of approval for the relevant project, and regional authorities are responsible for supervision and monitoring at all stages. In Guyana, the EIA process is used as an instrument to obtain information for identification and planning to avoid or reduce impacts on

the environment and strengthen environmental development. The EPA Guyana is responsible for the decision of approval and conducting inspections during and after construction. The developer is responsible for monitoring[33]. French Guiana is a territory of France, and therefore is subject to EU's EIA Directive of 1985 (85/337/EEC). It applies to a wide range of public projects and includes all Member States[34]. In Suriname, the National Institute for Environment and Development in Suriname (NIMOS) is the agency responsible for issuing and approving the EIA[35].

Natural Resources

The Caribbean Sea encompasses Belize, Honduras, Nicaragua, Coast Rica, Panama, Colombia, French Guiana, Guyana, and Suriname, along with many other countries that have been individually researched prior to this grouping. A large portion of the Caribbean Sea is preserved through marine protected areas (MPAs) – at least 200. This includes 48 in Belize, 41 in Honduras, at least 7 in Nicaragua, at least 20 in Costa Rica, 15 in Panama, 10 in Colombia, 16 in French Guiana, and 10 in Suriname (Guyana does not currently have any existing MPAs). Together these make up at minimum 8,000 square miles of preserved ocean[36].

According to the high resources value analysis figure, the Caribbean Sea has almost all of its coastline preserves under existing MPAs. There is also a significant amount of seagrass, salt marsh, mangrove, and coral habitats, threatened and endangered species ranges, marine bird areas, and marine turtle nesting beaches and foraging grounds (See Figure 1 below).

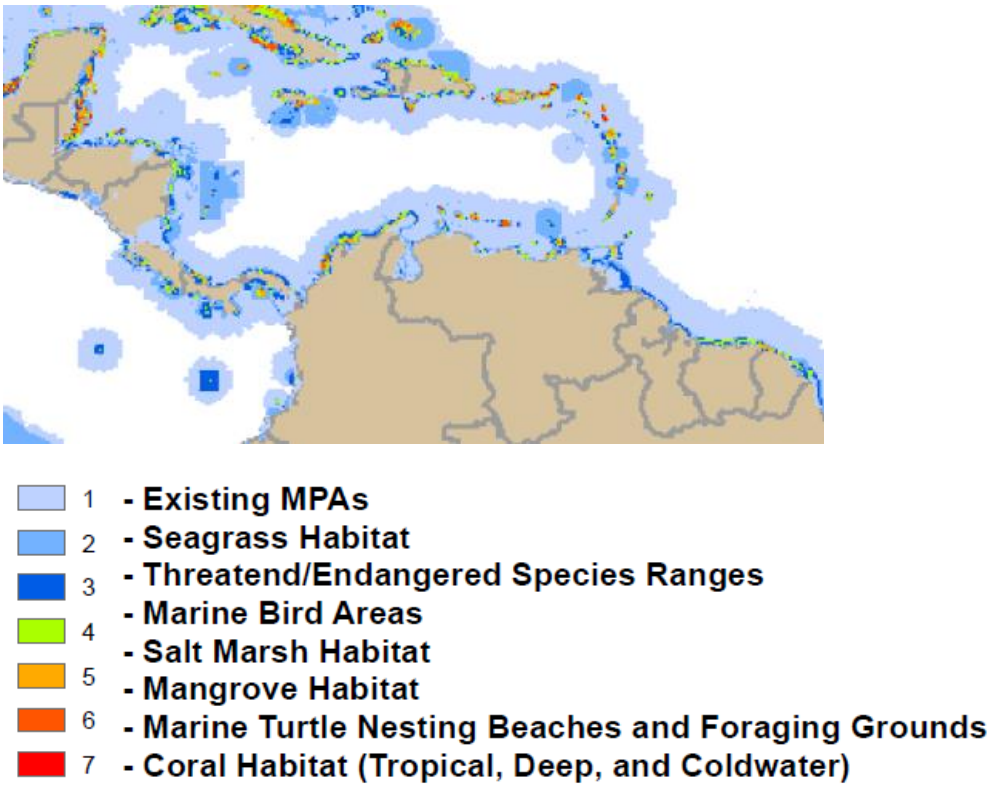

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

Colombia was chosen as the focus country to offer a unique perspective on the Caribbean Sea region. The Caribbean coast of Colombia has a long rich history for being a part of the Spanish trade route. It is believed that there are several shipwrecks of the coast of Colombia; although little has been done in terms of study and documentation, leaving many areas unexplored.[37] The most notable shipwreck discovery is the Spanish Galleon San Jose, which sunk on June 8, 1708 after a battle with the British Navy. The Spanish Galleon San Jose is noted as the richest shipwreck in history with a registered cargo estimated to be worth 10 Billion dollars (as of 2013).[38] Not far from the Caribbean Sea coastline in Colombia, Ciudad Perdida (Lost City) is a heritage site inhabited by the Tayrona people until the end of the 16th century. Ciudad Perdida is believed to have been a regional center of political, social and economic power.[39] There are several archaeological sites as well as historic properties and towns along the Caribbean Sea coastline.[40]

Socio-economic and Tribal

As of 2013, Colombia is South America's third-largest oil producer and has achieved approximately one million barrels per day (b/d). In efforts to boost exploration activities, which are deemed vital for its economy, Colombia is focusing on new technologies that will make it easier to extract its oil.[41] The US Energy Information Administration (EIA) notes that a series of regulatory reforms in Colombia has increased the oil and natural gas production in recent years. In 2014, Statoil ASA (Norwegian company) and ExxonMobil Exploration Colombia had been awarded 33.33% interest in the COL4, while Spain's Repsol SA will serve as operator with 33.34%. During the first exploration phase there are no well commitments.[42] Chevron has initiated programs and efforts to address the human needs for the Wayúu population of La Guajira Province. Chevron has provided the Wayúu peoples with medical supplies, improved healthcare services and facilities, nine water wells (benefiting more than 100,000 people). In addition, Chevron implemented a program that created 22 self-sustaining farms and has offered more than 80 scholarships to high school graduates in La Guajira.[43]

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The overarching regulatory bodies regarding environmental issues in Belize is the Ministry of Natural Resources[44] and the Ministry of Forestry, Fisheries and Sustainable Development. Within the Ministry of Forestry, Fisheries and Sustainable Development is the Department of the Environment (DOE)[45] which is the authority with responsibility for environmental issues, particularly regarding environmental impact assessments (EIAs)[46]. The regulatory body for Honduras is the Office of Environmental Evaluation and Oversight (DECA) which is the division of the Secretariat of Natural Resources and Environment (SERNA) responsible for coordinating the National System of Environmental Impact Assessment (SINEIA) required by law for all public and private projects with potential negative impact on the environment[47]. In Nicaragua, the central regulatory body is the Ministry of Environment and Natural Resources (MARENA). MARENA is authority responsible for environmental issues, specifically regarding EIAs[48]. The governmental

body for the environment in Costa Rica is the National Environmental Technical Secretariat (SETENA), a division of the Ministry of Environment and Energy (MINAE)[49]. SETENA is the main authority responsible for environmental issues, particularly regarding EIAs[50]. The overarching regulatory body in Panama is the National Environmental Authority (ANAM). They are the autonomic entity for the state on matters of natural resources and the environment to ensure the compliance and application of laws, regulations, and national environmental policies[51]. In Colombia, the Ministry of the Environment, Housing, and Territorial Development (MAVDT) is the central authority regarding environmental issues, including the EIA process[52]. The central authority of environmental issues in Guyana is the Environmental Protection Agency (EPA). As far as the research shows, French Guiana is under French control, making the French Ministry of Ecology, Energy, Sustainable Development and Territorial Planning (MEEDDAT) the overarching regulatory body. French Guiana has a regional environmental authority, DIREN, which supervises local activities[53]. The Guyana EPA is mandated to undertake the effective management, conservation, protection, and improvement of the natural environment[54]. The overarching regulatory body for Suriname is the Ministry of Labour, Technological Development, and Environment (ATM)[55].

Offshore and Others

The extent and types of responsibilities of offshore upstream regulatory bodies within the Caribbean Sea regional grouping vary by country. One source of cooperation in the regional grouping includes an arrangement between the government of French Guiana and the national French government to share tax income from oil/gas operations[56]. Another source of cooperation is coordination of offshore regulatory responsibilities in French Guiana, France, and the European Union: As the European Union released a directive on offshore operations in 2013, countries with active offshore exploration and production operations (including France's territory of French Guiana) are expected to incorporate the directive's rules in national offshore operations by 2015. Once source of conflict involves border disputes between Caribbean Sea regional countries; for example, a maritime boundary dispute between Costa Rica and Nicaragua and tension over the potential use of trans boundary horizontal drilling[57].

Federal regulatory authorities in the realms of oil/gas financing, environment, and industrial safety and health were identified for Caribbean Sea region countries. Descriptions/background and contact information for environmental and oil/gas authorities are provided below.

Belize

Geology and Petroleum Department

Belize's Geology and Petroleum Department, a subordinate agency within the Ministry of Energy, Science & Technology, and Public Utilities, administrates the petroleum industry in Belize and is responsible for "promot[ing] and regulat[ing] oil and gas exploration in a safe, environmentally, and socially responsible manner[58]." The Geology and Petroleum Department was created as part of an agreement between the Government of Belize and the United Nations Development Programme (UNDP) in 1984, and the Department currently is comprised of 12 staff members[59].

Department of Environment

Belize's Department of Environment, established in 1989, within the Ministry of Forestry, Fisheries, and Sustainable Development, is the main environmental regulatory body in the country whose tasks include: establishing and enforcing pollution control standards, reviewing and revising national environmental legislation, and overseeing environmental impact assessment procedures[60].

Colombia

Ministry of Mining and Energy

Colombia's Ministry of Mines and Energy is a federal body responsible for regulating upstream hydrocarbon activities in the country, including inspection and approval of exploration/production facilities[61].

Ministry of Environment and Sustainable Development

The Colombian Ministry of Environment and Sustainable Development is a federal agency responsible for national environment policy, protection, planning, management, and use and exploitation of natural resources[62].

Costa Rica

Ministry of Environment and Energy

Costa Rica's Ministry of Environment and Energy is a federal regulatory body in Costa Rica whose responsibilities include hydrocarbon environmental and energy policy.

French Guiana

Bureau of Hydrocarbon Exploration and Production

The French Bureau of Hydrocarbon Exploration and Production is a governmental body responsible for managing French hydrocarbon exploration and production activities, including exploration and production licenses and field monitoring[63].

Ministry of Ecology, Energy, and Sustainable Development

The French Ministry of Ecology, Energy, and Sustainable Development is the federal environmental regulatory and compliance body in France and French Guinea. Its responsibilities in offshore operations in French Guinea include approval of upstream activities[64].

Guyana

Petroleum Division of the Guyana Geology and Mines Commission

The Petroleum Division with Guyana's Geology and Mines Commission is responsible for regulation of all activities in the crude oil industry in Guyana, including provision of technical/environmental advice and administration of licensing/production sharing agreements[65].

Ministry of Natural Resources and Environment

Guyana's Ministry of Natural Resources and Environment is the main environmental agency in the country with responsibilities in forestry, mining, environmental management, wildlife, protected areas, land use planning and coordination, and climate change[66].

Honduras

Secretary of Energy, Natural Resources, Environment, and Mines

Honduras' Secretary of Energy, Natural Resources, Environment, and Mines is the country's federal environmental regulatory body with responsibilities in environmental management, water resources protection, climate change, contaminant control, energy policy, and biodiversity[67].

Nicaragua

Ministry of Energy and Mining

Nicaragua's Ministry of Energy and Mining is the national regulatory body with responsibilities in the upstream hydrocarbon sectors, including operations permitting/licensing and strategic planning and policy formation[68].

Ministry of Environment and Natural Resources

The Ministry of Environment and Natural Resources of Nicaragua is the environmental regulatory body in the country responsible for environmental impact assessment administration as well as regulation of environmental protection and sustainable use of natural resources[69].

Panama

National Hydrocarbons and Alternative Energies Department

Panama's National Hydrocarbons and Alternative Energies Department is a federal regulatory body responsible for hydrocarbon resources planning and policy[70].

National Environmental Authority

The National Environmental Authority of Panama is a main federal body whose responsibilities include national environment/natural resource policy/legislation development, evaluation of environmental impact studies, and assessment of sanctions and fines for environmental violations[71].

Suriname

Ministry of Natural Resources

The Ministry of Natural Resources of Suriname is the federal regulatory bodies with responsibilities including the formation of energy and natural resources policy, and survey, exploration, and development of mineral resources[72].

Regulatory Contact Information[73]

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Belize – Geology and Petroleum Department and Department of Environment

Geology and Petroleum Department
Address: Market Square, Belmopan City, Cayo District Belize
Telephone: +501-802-2651/2178
Email: secretary.gpd@estpu.gov.bz
Website: http://estpu.gov.bz/index.php/geology-petroleum

Department of Environment
Address: Market Square, Belmopan City, Belize, C.A.
Telephone: +501-822-2548/2819
Email: envirodept@ffsd.gov.bz
Website: http://www.doe.gov.bz/# (Spanish)

Colombia

Ministry of Mines and Energy
Address: Calle 43 No. 57 – 31 CAN – Bogotá, Colombia, 111321
Telephone: 01800-0910-180
Email: menergia@minminas.gov.co
Website: http://www.minminas.gov.co/minminas/otroidioma.jsp (Spanish)

Ministry of Environment and Sustainable Development
Address: Calle 37, No. 8-40, Bogota, Colombia
Telephone: (57-1) 332-3400
Email: servicioalciudadano@minambiente.gov.co
Website: https://www.minambiente.gov.co/index.php (Spanish)

Costa Rica – Ministry of Environment and Energy

Ministry of Environment and Energy
Address: Edificio Vista Palace, Calle 25, Avenida 8 y 10 San José, Costa Rica
Telephone: (506) 2233-4533
Email: prensa@minae.go.cr
Website: http://www.minae.go.cr/ (Spanish)

French Guiana

Bureau of Hydrocarbon Exploration and Production -
Contact information not identified in publicly available English language sources.

Ministry of Ecology, Energy, and Sustainable Development
Address: Grande Arche Tour Pascal A et B, FR-92055 Paris La Defense CEDEX, France
Telephone: +33-140-8121-22
Email: ministere@developpement-durable.gouv.fr
Website: http://www.developpement-durable.gouv.fr

Guyana

Geology and Mines Commission
Address: Upper Brickdam, Georgetown, Guyana
Telephone: 226-5591, 225-2862
Email: http://www.ggmc.gov.gy/contact.php (contact website)
Website: http://www.ggmc.gov.gy/

Ministry of Natural Resources and Environment
Address: Upper Brickdam, Georgetown, Guyana
Telephone: 231-2506-11 Ext. 205
Email: ministry@nre.gov.gy
Website: www.nre.gov.gy

Honduras

Secretary of Energy, Natural Resources, Environment and Mines
Address: Not identified in public sources
Telephone: Not identified in public sources
Email: denunciasegura@serna.gob.hn
Website: http://www.serna.gob.hn/ (Spanish)

Nicaragua

Ministry of Energy and Mining
Address: Hospital Bautista 1c: al Oeste 1c: al Norte
Telephone: 2280-9500
Email: cap@marena.gob.ni
Website: http://www.mem.gob.ni/index.php?s=1 (Spanish)

Ministry of Environment and Natural Resources
Address: Carretera Norte Km 12 ½, frente a la Zona Franca Managua Nicaragua
Telephone: 2233-1232
Email: http://www.mem.gob.ni/index.php?s=1&idp=118&idt=1# (list of email contacts)
Website: http://www.marena.gob.ni/

Panama – National Environment Authority

National Hydrocarbons and Alternative Energies Department –
Contact information not identified in public sources

National Environment Authority
Address: http://www.anam.gob.pa/index.php/2012-12-06-22-51-52/localizacion (Link to office locations)
Telephone: http://www.anam.gob.pa/index.php/2012-12-06-22-51-52/directorio-telefonico (Link to telephone directory – Spanish)
Email: Not identified in public sources
Website: http://www.anam.gob.pa/

Suriname

Ministry of Natural Resources
Address:
Not identified in public sources
Telephone: #410160
(http://translate.google.com/translate?hl=en&sl=nl&u=http://www.gov.sr/sr/ministerie-van-nh.aspx&prev=search - Link to contact names and telephone numbers.
Email: secretariaat@naturalresources.gov.sr (Mr. Dr. JC de Miranda – Secretary of Natural Resources)
Website: http://translate.google.com/translate?hl=en&sl=nl&u=http://www.gov.sr/sr/ministerie-van-nh.aspx&prev=search (translated from Dutch to English)

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Caspian Sea: Regional Offshore Exploration and Production Profile

Offshore Oil Production (onshore/offshore): 939 thousand barrels/day
Offshore Gas Production (onshore/offshore): 563 billion cubic feet/year

The Caspian Sea regional grouping includes Azerbaijan, Iran, Kazakhstan, and Turkmenistan (as well as primary country, Russia, covered in a separate individual country profile). The region is one of the oldest oil-producing areas in the world and an important global source of hydrocarbon production[1]. It is estimated that 19.6 billion barrels of oil and 106 trillion cubic feet of natural gas exist offshore in Caspian Sea fields, with nearly 50 % of oil and 30% of natural gas located within offshore fields of Kazakhstan and Azerbaijan[2]. The majority of offshore fields in the region are developed using fixed platforms at water depths up to approximately 575 feet[3].

Azerbaijan offshore oil production accounts for 95% of total offshore oil production (890 thousand barrels/day) in the Caspian Sea regional grouping countries. Most of this production is sourced from an offshore complex composed of three fields: Azeri, Chirag, and Gunashli Deep (ACG)[4]. A significant development in Kazakhstan offshore operations is the commencement of production at the large Kashagan field, with an estimated oil reserve of 13 billion barrels, as well as significant gas deposits[5]. Oil production in Iran and Turkmenistan occurs at the Sardar Jangal field and Cheleken project, respectively. Azerbaijan accounts for 99% of offshore natural gas production in the Caspian Sea regional countries. Most of this gas is from the Shah Deniz field, and additional produced gas is associated with oil production at the ACG fields[6].

National oil companies operating in the region include State Oil Company of Azerbaijan Republic – SOCAR (Azerbaijan), KazMunaiGas (Kazakhstan), and the National Iranian Oil Company (Iran). International operating companies in the region include BP, Chevron, Royal Dutch Shell, ExxonMobil, Total, and Eni. In Turkmenistan, an independent company with headquarters in the United Arab Emirates, Dragon Oil, operates the Caspian offshore Cheleken area, and the Chinese National Petroleum Company (CNOPC) and Petronas (Malaysia's national oil company) have invested in minor ownership of select Turkmenistan energy assets[7].

Geology and Geophysics

The Caspian Sea is the world's largest inland body of water, with four identified geologic basins with offshore hydrocarbon reserves: the South Caspian Basin Province, the Middle Caspian Basin province, the North Ustyurt Basin Province, and the North Caspian Basin Province[8]. The north basin, comprising half of the sea's surface area off the coasts of Kazakhstan and Russia, is in shallow water, while the southern basin contains deeper water (maximum identified depth of 3,363 feet)[9]. The U.S. Geological Survey (USGS) published an assessment of total hydrocarbon reserves in the Caspian Sea region in 2010, which included an estimate of conventional offshore hydrocarbon reserved in identified geologic basin provinces. Total hydrocarbon reserves (offshore and onshore) in the area were estimated at 16.6 billion barrels of crude oil, 243 trillion cubic feet of gas, and 9.3 billion barrels of natural gas liquids[10]. Without agreement of established maritime borders between Turkmenistan, Azerbaijan, and Iran, there is limited geologic exploration in the southern Caspian basin[11].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions in the Caspian sea include cold weather/harsh environmental conditions (drifting ice), deep water (primarily Southern Caspian Sea), frozen waters (contributed by low water salinity), hydrogen sulfide presence, and high pressure reservoirs (e.g. approximately 11,000 psi at the Kashagan oil field in Azerbaijan)[12]. Additionally there is limited access to rigs/equipment in the Caspian Sea via the Vola-Don canal, in the winter months when the waters have frozen over[13]. Innovative offshore technologies are used in several phases of offshore exploration and production in the Caspian Sea, including managed pressure and extended reach drilling, and riserless mud recovery systems (drilling phase)[14,15,16]; high integrity pressure protection systems, subsea production systems, subsea flow assurance, and dry production trees (production phase)[17,18]; subsea water injection wells and down hole electric submersible pumps (enhanced recovery phase)[19]; and vessel-based and coiled tubing well intervention/work over[20]. The West Chirag fixed platform at the offshore Azeri-Chirag-Gunashli (ACG) oilfield is the largest production platform in the Caspian Sea, installed at a depth of approximately 560 feet[21].

Methods of Offshore Tender[22]

Offshore licensing/concessions, production sharing, and technical service agreements are relevant to offshore tender/hydrocarbon contracts in the Caspian Sea region. Licensing/concessions agreements are used in Kazakhstan and Turkmenistan, and production sharing agreements are used both in Turkmenistan and Azerbaijan. In Iran, buyback contracts, (similar to service contracts) are used. In this type of contract, the international oil company (IOC) or contractor must make its own investment to develop a hydrocarbon field. Once production has started, the national oil company/relevant party overtakes ownership of the site and uses oil/gas sales to pay the IOC/contractor[23].

Environmental Overview and Development

All four countries that border the Caspian Sea have some sort of environmental impact assessment (EIA) process is place. However, there is not a reliable regulatory agency in any of the countries to consistently and effectively monitor the process. Azerbaijan originally followed the Soviet Union's EIA process, which lacked essential elements of an effective EIA. They adopted a parallel system in 1996 that conformed more to the typical EU model. Since the establishment of this new model, it has had a non-mandatory stigma, and has been applied to fewer than 100 major developments[24]. The EIA process in Kazakhstan was first introduced in the Law on Environmental Expertise in 1993 where it states that an EIA should be applied to all planned economic activity without exception. The current instructions and requirements for the EIA procedure are unclear and do not include public involvement[25]. The Law on Ecological Assessment was established in Turkmenistan in August of 2014. It includes guidelines and regulations regarding the EIA process. The Turkmen Government has expressed its readiness to implement an EIA requirement with the guidance of international experts[26]. There is no evidence of a formal system monitoring the EIA legislation and compliance in Iran. Some informal monitoring by environmental agencies has taken place, and the agencies are helping to improve the EIA process[27].

Natural Resources

The Caspian Sea borders Azerbaijan, Kazakhstan, Turkmenistan, and Iran. It is a land locked sea in Central Asia east of the Black Sea. There are very few marine protected areas (MPAs) in the

Caspian Sea. A total of 4: 1 in Azerbaijan, 2 in Kazakhstan, 1 in Turkmenistan, and none in Iran not a measure of total area for the existing MPAs[28].

According to the high resource analysis, existing MPAs are so small that they cannot be seen on the provided map (See Figure 1 below).

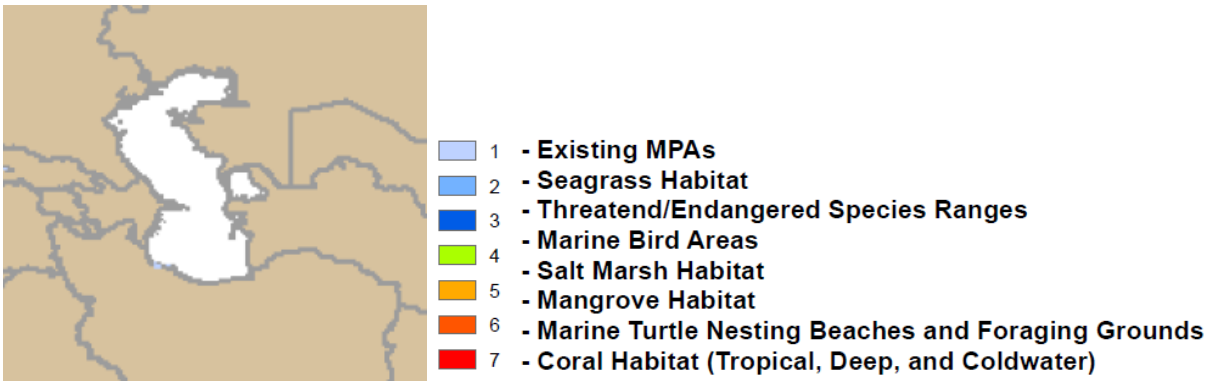

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

There are several sunken ships near the Absheron archipelago. According to a map of the Capsian Sea depicting shipwrecks, approximately 60 ships sank in this archipelago between 1873 and 1898. Artifact findings comprising mostly of ceramics, jewelry, domestic items and copperware from the 16th to 18th centuries recovered along the coast of Azerbaijan suggests, that part of the settlement of Bilgah in Absheron was once situated on a lower terrace, which is now beneath the sea.[29] Several plates and bowls painted with birds dating back to the 12th and the beginning of the 13th centuries, depicting a period of Muslim renaissance, were also discovered in the Caspian Sea.[30] There are several archaeological sites as well as historic properties and towns along the Caspian Sea coastline[31]

Socio-economic and Tribal

The Caspian Sea region is one of the oldest oil-producing areas in the world and is an increasingly vital source of worldwide energy production. The Energy Information Administration (EIA) estimates, "that there were 48 billion barrels of oil and 292 trillion cubic feet (Tcf) of natural gas in proved and probable reserves within the basins that make up the Caspian Sea and surrounding area in 2012."[32] In 2012, despite the heavy sanctions imposed on Iran over its nuclear program, Iranian Oil Minister Qassemi argued that there was still high demand for Iranian-produced crude oil and that Iran will begin offshore drilling in early 2013.[33] In 2014, Iran's Oil Minister Zanganeh stated that no foreigners will be authorized to drill in Iran's sector of the Caspian, arguing that the offshore hydrocarbon fields are in deep water requiring sophisticated technology.[34] For Iran, the Caspian Sea has historical, political, and economic significance. The Caspian Sea is enriched with fish supplies and caviar which is of keen economic importance for the people of Iran and the Iranian tribe, the Talysh, whom have been living on its southern coast for 3,000 years.[35]

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The overarching regulatory agency for Azerbaijan is the Ministry of Ecology and Natural Resources of Azerbaijan Republic. Their tasks include resolving ecological problems, preventing further ecological degradation, and facilitating solutions for existing problems[36]. The regulatory body for Kazakhstan is the Ministry of Environmental Protection. The regulatory body for Turkmenistan is the State Agency for the Management and Use of Hydrocarbon Resources. They do not engage in much, if any, environmental monitoring or management[37]. The regulatory body for Iran is the Department of Environment (DOE)[38].

Offshore and Others

Offshore regulation/enforcement procedures vary among countries within the Caspian Sea grouping. One identified source of conflict amongst Caspian Sea region countries is the lack of inter-national cooperation in development of oil and gas resources in the region[39]. A second identified source of conflict is over the legal definition of the Caspian sea as either a 'sea' or a 'lake,' with this playing a role over which set of international boundary law applies (National Convention on the Law of the Sea of 1982 – UNCLOS) for the former, or international law concerning border lakes for the latter[40].

Federal regulatory authorities in the realms of oil/gas financing/licensing, environmental regulation, and safety and health in industry were identified for Caspian Sea region countries. Descriptions and identified background of regulatory authorities with most direct apparent influence/authority in oil/gas operations in the region (by country) are provided below.

Azerbaijan

Ministry of Industry and Energy

The Ministry of Industry and Energy was established in 2006 to participate primarily in preparation and implementation of state policy in the hydrocarbon industry. Azerbaijan's state oil company (State Oil Company of Azerbaijan Republic) also plays an important role in regulation of oil and gas matters[41]. Azerbaijan's Subsoil Law is the main piece of regulation regarding hydrocarbon exploration and well as compliance and safety matters.

Ministry of Ecology and Natural Resources

The Ministry of Ecology and Natural Resources is the primary environment regulatory agency in Azerbaijan. Its responsibilities include implementing state policy and control of environmental protection and efficient use of natural resources[42].

Iran

Ministry of Petroleum

The Ministry of Petroleum supervises activities of the state-owned National Iranian Oil Company and its affiliates. Responsibilities of the Ministry of Petroleum are outlined in the Iran's Petroleum Act of 1987. Identified responsibilities/authorities of the Ministry include: supervision of petroleum

operations through "sound planning for conservation of petroleum reserves, wealth and installations and prevention of environmental pollution," as well as recruitment of technical personnel to develop and grow the oil/gas industry[43].

Department of Environment

The Iranian Department of Environment is the main national environmental body in the country, responsible for administration of environmental impact assessments.

Kazakhstan

Ministry of Oil and Gas

In 2010, Kazakhstan's Ministry of Oil and Gas was created in order for the state to play a greater role in the oil/gas sector, after dissolution of the Ministry of Energy and Mineral Resources[44]. Identified responsibilities of the Ministry include administration of tenders/hydrocarbon contracts, state representation in negotiations with foreign operators, and approval of project development plans.

Ministry of Environmental Protection

Responsibilities of Kazakhstan's Ministry of Environmental Protection include planning and management of coastal areas and environmental regulation and pollution control in the Caspian Sea[45].

Turkmenistan

State Agency for the Management and Use of Hydrocarbon Resources under the President of Turkmenistan

The Turkmenistan State Agency for the Management and Use of Hydrocarbon Resources under the President of Turkmenistan was established in 2008 by the Law on Hydrocarbon Resources to manage Turkmenistan's oil and gas sector. Identified responsibilities of the Agency include: issuing licenses for hydrocarbon exploration and development/production activities and establishing uniform sector rules for companies operating in the region[46].

Ministry of Nature Protection

Turkmenistan's Ministry of Nature Protection is the main national environmental regulatory body responsible for environmental policy and protection[47]

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Azerbaijan – Ministry of Industry and Energy

Ministry of Industry and Energy
Address: Azerbaijan, Baku, AZ1012, Zardabi str., 88,
Telephone: (994 12) 4987586, 5981675, 5980384,
Email: pressa@mie.gov.az
Website: http://www.azerbaijans.com/content_530_en.html

Ministry of Ecology and Natural Resources
Address: Bakuy City, B. Aghayev Street, 100A, Azerbaijan
Telephone: +994-538-04-81
Email: ekologiya.nazirliyi@gmail.com
Website: http://www.eco.gov.az/en/

Iran

Ministry of Petroleum
Address:Not identified in publicly available English language sources
Telephone: Not identified in publicly available English language sources
Email: Not identified in publicly available English language sources
Website: http://www.mop.ir/Portal/Home/Default.aspx (in Persian)

Department of Environment
Address: Tehran, north of Highway martyr wise, fazlollah and legacy of Sheikh Imam, Nature Park campus EPA
Telephone: 42781000-021
Email: info@doe.ir
Website: http://translate.google.com/translate?hl=en&sl=fa&u=http://www.doe.ir/&prev=search (web translation)

Kazakhstan

Ministry of Oil and Gas
Address: 19 Kabanbay Batyr Avenue, Astana, 010000, Kazakhstan
Telephone: +90 312 212 64 20
Email: mgm@mgm.gov.kz
Website: Not identified in public sources

Ministry of Environmental Protection
Address: 8, Orynbor St, House of Ministries, entrance 14, Astana, 010000
Telephone: 8-7172-74-08-83
Email: pressa.eco@mail.ru
Website: http://ortcom.kz/en/catalog/view/83 (informational link)

Turkmenistan

State Agency for the Management and Use of Hydrocarbon Resources under the President of Turkmenistan
Address: Archabil avenue 56, Ashgabat, Turkmenistan 744036
Telephone: (+99312) 40-38-05;
Email: stateagency@online.tm
Website: http://www.oilgas.gov.tm/ (in Turkmen)

Ministry of Nature Protection
Address: 744036, Aşgabat ş.,Arçabil şaýoly, 92
Telephone: (993-12) 44-80-02
Email: mail@natureprotection.gov.tm
Website: http://www.natureprotection.gov.tm/index_tm.php (in Turkmen)

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Equatorial Atlantic: Regional Offshore Exploration and Production Profile

Total (offshore and onshore) Oil Production (2013): 2.3 million barrels/day

Total (offshore and onshore) Gas Production (2013): 1.4 trillion cubic feet/yr.

The Equatorial Atlantic regional grouping includes eight countries located on/off the west coast of Africa: Benin, Cameroon, Ghana, Ivory Coast, Nigeria, Sao Tome and Principe, Togo, and Equatorial Guinea. Offshore oil production is the primary method of hydrocarbon resource development in the region. There is no domestic (onshore or offshore) hydrocarbon production in three Equatorial Atlantic region countries: Benin, Sao Tome and Principe, and Togo[1]. Benin was a past offshore oil producer with operation in the Sèmè field in the Gulf of Guinea, but the field was ultimately abandoned in 1998, after 14 years of production[2]. Nigeria is the largest oil producer in Africa and holds the largest natural gas reserves on the continent[3]. Oil production in Equatorial Guinea, the second largest producer in the Equatorial Atlantic region, is exclusively from offshore fields (290 thousand barrels per day in 2013). Ghana is the third largest offshore producer in the region. The country's national production increased from 7,000 barrels per day (bbl/d) in 2009 to 99,000 bbl/d in 2013, connected with the development of the Jubilee offshore oil field in 2010; new offshore projects are anticipated to come online in 2016[4].

There is competition between Equatorial Atlantic countries for offshore development/funding from foreign oil companies/operators. Notably, Cameroon's offshore production has recently declined and the country is looking for further investment to boost national production. The Ivory Coast also has offshore oil production and hopes to increase output through new offshore discoveries[5]. Oil companies with operations in the Equatorial Atlantic region include Tullow Oil, ExxonMobil, Hess, Marathon, and Noble Energy, as well as national oil companies such as PETROCI (Ivory Coast), Nigerian National Petroleum Corporation (NNPC), GEPetrol (Equatorial Guinea), and National Hydrocarbon Corporation (Cameroon).

Geology and Geophysics

The Equatorial Atlantic region is an area of significant offshore exploration and geophysical investigation. Equatorial Guinea and Nigeria are believed to hold significant offshore reserves in the region. As of 2013, Equatorial Guinea was the eighth largest holder of proved crude oil reserves in Sub-Saharan Africa (1.1 billion barrels of oil); a majority of the reserves are located offshore near the Island of Bioko[6]. Proven crude oil reserves in Nigeria are estimated at 37.2 billion barrels of oil, as of January 2013, including primary reserves located offshore in the Bight of Benin, Gulf of Guinea, and the Bight of Bonny[7]. Current exploration efforts in Nigeria are concentrated in deep and ultra-deep offshore areas, including in the Chad basin, located on the northeast portion of the country; proved offshore hydrocarbon reserves are located in the Niger Delta continental shelf as well as in deeper offshore locations[8]. Offshore two dimensional (2-D) and three dimensional (3-D) data have been collected by several international operators in at least 61 blocks in these Nigerian offshore areas[9]. The United States Geological Survey has performed assessments of geology and hydrocarbon potential of areas within the Equatorial

Atlantic region, including Cameroon, Equatorial Guinea, and Nigeria. Major offshore producing geological formations in top producing countries in the Equatorial Atlantic include the Gulf of Guinea Province (Ghana and southwestern Nigeria), the Nigerian Delta Province, (south-central and eastern coasts of Nigeria) and the Azile-Senonian Total Petroleum System (includes Equatorial Guinea and Cameroon)[10,11,12,13]. Offshore areas in the vicinity of several of the region's countries were previously explored and are reaching maturity, though are now being re-explored for hydrocarbon potential. In Cameroon, offshore production comes from the well-explored Rio del Rey basin in the Gulf of Guinea, with first production from the Kole field in 1977, though since the mid-1980s offshore production has declined[14]. The country recently announced three offshore exploration blocks for auction in the Rio del Ray basin which have been previously explored with three dimensional (3-D) seismic methods[15].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions in the Equatorial Atlantic region include deep-water and ultra-deep-water hydrocarbon resources as well security risks due to military group activity in the area (e.g. in Nigeria, oil theft, pipeline vandalism, kidnappings)[16]. New technologies are used in various stages of the upstream offshore development lifecycle in the region including: vessel-based well intervention for production well workover/abandonment operations[17], extended and horizontal reach wells[18], smart completions[19], riser base gas lift[20], flexible risers[21], and complex subsea production systems[22].

Methods of Offshore Tender

The primary method of offshore contracting in the Equatorial Atlantic region is through production sharing contracts, although license/concessions agreements are also used. In Nigeria, large natural gas and oil projects are normally funded through joint ventures between the Nigerian National Petroleum Corporation and international oil companies, and production sharing contracts are also typically used to finance deep-water projects[23]. Production sharing agreements are used for oil/gas contracting in Cameroon (corporations income tax rate is 40%); initial exploration periods are set at 25 (oil) to 35 years (gas) with up to a 10 year extension possible[24]. Production sharing agreements are also used in Benin, and royalties of 10% (for gas) and 12.5% (for oil) are paid to the government[25]. In Ghana and the Ivory Coast, both production sharing and licensing agreements are used to finance oil/gas exploration and development operations[26,27]. In Togo and Sao Tome and Principe, license/concessions agreements between operators and the government are used to contract upstream oil/gas operations, and royalty payments are made on produced hydrocarbons[28]. In Equatorial Guinea, production sharing agreements are the main method of offshore contracting.

Environmental Overview and Development

The Ministry of Mines, Industry and Energy regulates the petroleum division is Equatorial Guinea, and does not require extractive companies to conduct environmental impact assessments (EIAs)[29]. The aim of Cameroon's EIA process is to equip decision makers with comprehensive information concerning the consequences of projects[30]. The Federal Environmental Protection Agency (FEPA) oversees the EIA process in Nigeria. All industrial plans, developments, and activities on FEPA's mandatory list must execute an EIA before they begin the proposed action[31]. The EIA process in Benin is administered by the Benin Environmental Agency, a division of the Ministry of the Environment, Habitat and Town Planning. The process consists of screening, scoping, public hearings, analysis of the environmental impact study report, the decision, and the follow-up assessment audit. The EIA process in Benin lacks national expertise and consistency

in their methods of assessment[32]. Several EIAs have been submitted to Togo's relevant authority that follow set guidelines, including mitigation measures[33]. A source was not found with the specific guidelines and requirements for Togo's EIA process. The EIA process in Ghana is legally bound with the Environmental Protection Agency (EPA) of Ghana as the head authority. The process includes screening, scoping, assessment and reporting, review, decision-making, and finally monitoring, compliance and enforcement. Monitoring is required and is carried out by field divisions of the EPA[34]. The EIA process for the Ivory Coast requires that the permit holder performs the EIA. The EIA is submitted to the Ministry of Mines and the Bureau of Environmental Impact Assessment. If the authorities do not respond within two months, the proposal is deemed as approved[35]. It appears that Sao Tome and Principe has an established EIA process for development projects[36]; however, an adequate source explaining the official process was not found.

Natural Resources

Equatorial Atlantic touches the northwestern coast of 8 African countries including Equatorial Guinea, Cameroon, Nigeria, Benin, Togo, Ghana, Ivory Coast, and Sao Tome and Principe. It is named for its location straddling the equator. In total there are about 30 marine protected areas in the Equatorial Atlantic region: 9 in Equatorial Guinea, 2 in Cameroon, 6 in Nigeria, none in Benin or Togo, 5 in Ghana, 11 in Ivory Coast, and 1 in Sao Tome and Principe. Together they make up at least 100 square miles of protected ocean[37].

According to the high resource value analysis figure, the majority of the coastal zone of the Equatorial Atlantic is conserved under existing MPAs. There is also extensive coastal seagrass habitat and several stretches of salt marsh habitat and marine bird areas. Endangered and threatened species have ranges along most of the coast in this region as well (See Figure 1 below).

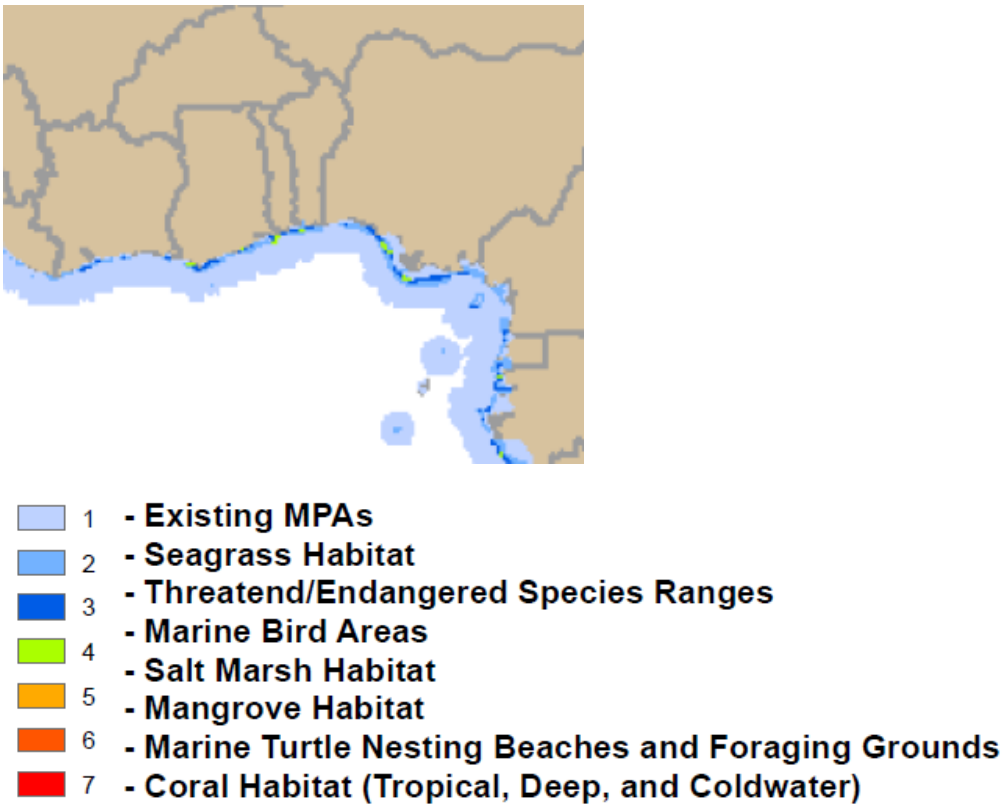

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

No information pertaining to marine archaeological sites in the Equatorial Atlantic was found; however, it has been noted that there is a need to initiate research on the sunken slave ships within the Nigerian ocean waters.[38] There are a number of slave ports such as the old Calabar, Bonny, Brass, Opobo, Lagos and Badagry along the coast of Nigeria.[39] In the early 1500's until 1787, at least 550,000 African slaves were transported to America from the ancient town of Badagry.[40] There are several historic properties, including forts and castles in Ghan,[41]as well as historic towns along the Equatorial Atlantic coastline.

Socio-economic and Tribal

Nigeria was chosen as the focus country to offer a unique perspective on the Equatorial Atlantic region. In 1956, after half a century of exploration, oil was discovered at Oloibiri in the Niger Delta by Shell-BP (the sole concessionaire in Nigeria). Exploration rights for both onshore and offshore areas adjoining the Niger Delta were extended to additional foreign companies.[42] In 2014, Nigeria is Africa's biggest economy with the oil sector accounting for 75 percent of government revenue and 95 percent of its exports. Since 2004, the Nigerian economy has expanded at an average rate of 7percent a year. Nigeria exports 2 million barrels of oil a day. Nigeria's oil is low in sulphur, making it highly desirable for refiners. Other fields are also producing low-sulphur oil. For example, in 2011, most of the 3 million barrels of daily production in America have also been low in sulphur. As a result, low-sulphur oil prices have fallen dramatically and it has been predicted

that Nigeria's exports in 2015 will drop 18 percent.[43] In November, 2014, Nigeria's Finance Minister Ngozi Okonjo-Iweala announced that a "6 percent drop in oil revenue would force the government to cut non-essential spending, raise more revenue and spend half of its $4.1 billion sovereign wealth fund - down from $11.5 billion at the start of 2013 -- to cover budgetary shortfalls." There have also been suggestions for the government to print more of its national currency, the naira, to lessen the impact of the recent oil price declines; as of November 2014, Okonjo-Iweala has rejected this suggestion. [44] No tribal issues pertaining to the Equatorial Atlantic region were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Ministry of Fisheries and Environment is the mandated body responsible for implementing and initiating environmental projects in Equatorial Guinea[45]. The Ministry of Environment and Protection of Nature of Cameroon is responsible for developing, implementing and monitoring environmental policy[46]. The Federal Ministry of Environment in Nigeria has emphasized environmental re-engineering as a tool to fight poverty, hunger and destructive economic development[47]. The Ministry of Environment, Habitat and Town Planning in Benin is mandated to define and implement environmental policy and enforce environmental regulation and compliance monitoring[48]. The Ministry of Environment and Forest Resource (MERF) in Togo is responsible for initiating the development of and implementing policies regarding the environment, forest resources, and wildlife[49]. The Ministry of Environment, Science, Technology and Innovation (MEST) in Ghana is tasked to ensure socio-economic development through the creation of policies and regulatory framework to promote the use of environmentally friendly, scientific, and technological practices[50]. The Ministry of Environment, Water and Forests in the Ivory Coast is the mandated body responsible for the implementation and monitoring of the nation's environmental policy, urban sanitation, improvement of quality of life, and sustainable development[51]. The Ministry of Environment, Infrastructures and Natural Resources of Sao Tome and Principe is the responsible body for environmental affairs[52]. An official website was not found for the Ministry.

Offshore and Others

The extent and types of responsibilities of national regulatory authorities in upstream hydrocarbon operations vary in Equatorial Atlantic region countries. Examples of cooperation in the region include collaboration between individual country ministries of environment with other stakeholders including international environmental organizations, non-governmental organizations (NGOs), and other intra-country Ministries (e.g. in Nigeria)[53]. Another source of cooperation is between national ministries to achieve sustainable energy (e.g. in Equatorial Guinea between the Ministry of Mines and the Ministry of Environment)[54]. Sources of conflict in the Equatorial Atlantic region include security problems (e.g. violence from militant groups and pipeline sabotage) and regulatory uncertainty (e.g. Nigeria) which have contributed to a delay in deep water projects and resulted in a trend for IOCs to sell their interests in onshore projects in the region. Regulatory

uncertainty in Nigeria surrounds the Petroleum Industry Bill (PIB), initially proposed in 2008[55]. The Bill is anticipated to alter the organization and financial terms of the oil/gas sectors (e.g. changes in taxes and royalties, increased oversight authority in the Minister of Petroleum Resources, and introduction of a required 10% of monthly profits contribution to the Petroleum Host Communities Fund)[56]. The Ministry of Petroleum Resources drafted a most recent version of the proposed PIB in July 2012. The delay in its passing has caused decreased investment in the oil/gas sectors.

Federal regulatory authorities in the realms of oil/gas financing, environment, and industrial safety and health were identified for Equatorial Atlantic region countries. Descriptions/background and contact information for environmental and oil/gas authorities are provided below.

Benin

Ministry of Mines, Energy, and Water

The Ministry of Mines, Energy, and Water of Benin is a primary regulator of hydrocarbon operations in the country, including authority in hydrocarbon contracting procedures[57].

Environmental Agency of Benin

The Benin Environmental Agency is the primary national regulatory body in the country, whose responsibilities include administration of environmental impact assessments[58].

Cameroon

Minister of Mines

Cameroon's Minister of Mines is charged with federal oversight of upstream oil/gas operations in the country, with responsibilities including granting of relevant licenses/authorizations and administration of offshore contracting procedures and agreements[59].

Ministry of Environment, Nature Protection, and Sustainable Development

Cameroon's Ministry of Environment, Nature Protection, and Sustainable Development (MINEPDED) is responsible for coordinating environmental affairs in the country, with the help of an interdepartmental committee, whose tasks include consideration of environmental concerns in matters of economic, land, and energy program implementation[60].

Equatorial Guinea

Ministry of Mines, Industry, and Energy

Equatorial Guinea's Ministry of Mines, Industry and Energy is the national oil/gas upstream operations regulatory authority, responsible for formation of hydrocarbon operations policies as well as auditing, supervision, and compliance administration[61].

Ministry of Fisheries and Environment

Equatorial Guinea's Ministry of Fisheries and Environment is a primary environmental regulatory body in the country[62].

Ghana

Minster of Energy and Petroleum and Ghana's national oil company, GNPC

Ghana's national oil company, the Ghana National Petroleum Corporation (GNPC) and the Minister of Energy have authority in regulation of upstream oil/gas operations in the country. The GNPC is tasked with collaborating with the Minster of Energy and Petroleum on petroleum operations oversight[63].

Environmental Protection Agency

Ghana's Environmental Protection Agency is the main environmental regulatory body in the country whose responsibilities include advising the Minister on all matters related to environmental protection, issuing environmental permits for water discharges, and ensuring compliance with environmental law[64].

Ivory Coast

Petroci Holding

The Ivory Coast regulates the oil and gas industry through its national oil company, Petroci Holding and three subsidiaries: Petroci Exploration-Production (upstream operations); Petroci-Gaz (gas sector); and Petroci Industries-Services (responsible for all other services)[65].

Ministry of Environment, Urban Health, and Sustainable Development

The Ministry of Environment, Water and Forests is the Ivory Coast's environmental regulatory agency with responsibilities including planning and control of environmental policy and supervision/monitoring of industrial activities[66].

Nigeria

Department of Petroleum Resources

Nigeria's Department of Petroleum Resources is the upstream regulatory body responsible for general compliance, leases and permits, and environmental standards in the country[67].

Ministry of Environment

The Nigerian Ministry of Environment is responsible for environmental policy, enforcement, and intervention in the country, as well as promotion of sustainable uses of natural resources[68].

San Tome and Principe

National Petroleum Agency

Sao Tome and Principe's National Petroleum Agency is the national petroleum sector authority in the country whose responsibilities include regulation and monitoring/compliance of upstream activities[69].

Directorate of Natural Resources and Energy

The Directorate of Natural Resources and Energy of Sao Tome and Principe is the country's environmental regulatory authority, with assigned responsibility to conduct and promote studies regarding the best/sustainable use of the state's natural resources[70].

Togo

Ministry of Energy and Ministry of Environment and Forest Resources

Both the Togolese Ministry of Energy and Ministry of Environment and Forest Resources are responsible for permitting environmental/labor/safety activities in the upstream oil/gas sectors in the country. The Ministry of Environment and Forest Resources of Togo is responsible for administration of environmental matters in the country and pollution prevention[71].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Benin

Ministry of Mines, Energy, and Water
Address: 01 BP 385, Cotonou, Benin
Telephone: +229 2131 8422; +229 9526 0207
Email: bansamari@yahoo.fr
Website: not identified in publicly available information

Cameroon

Ministry of Mines
Address: Boite Postale 1604 2nd Floor Buyamasi Building Yaounde Cameroon
Telephone: 00237 337 196 91
Email: info@cameroonminesministry.com
Website: www.cameroonminesministry.com

Cameroon Ministry of Environment, Nature Protection, and Sustainable Development
Contact information not identified in publicly available sources (Minstry website not functioning: http://www.minep.gov.cm/)

Ghana

Minster of Energy and Petroleum
Address: P. O .Box T40, Stadium Post Office Accra, Ghana
Telephone: (+233-302) 683961-4
Email: moen@energymin.gov.gh
Website: http://www.ghana.gov.gh/index.php/2012-02-08-08-18-09/ministries/248-ministry-of-energy-and-petroleum

Environmental Protection Agency (National Head Office)
Address: P.O. Box M.326 Accra, GR, Ghana
Telephone: 0302 664697-8 and 0302 662690
Email: info@epa.gov.gh
Website: http://www.epa.gov.gh/web/

Ivory Coast

Petroci Holding
Address: Immeuble les Hévéas - 14 boulevard Cadre – Plateau, BP V 194 Abidjan Côte d'Ivoire
Telephone: +225 20 202 500
Email: info@petroci.ci
Website: http://www.petroci.ci/index.php?numlien=150 (French)

Ministry of Environment, Water and Forests

Address: 20 BP 650 Cite Administrative - Tour D 19eme Etage, Abidjan, Ivory Coast
Telephone: +225 20219406
Email: http://www.environnement.gouv.ci/mail.php (email contact page - in French)
Website: http://www.environnement.gouv.ci/

Nigeria

Department of Petroleum Resources
Address: Ministry of Petroleum Resources
NNPC TOWERS, BLOCK D, Central Business District, P. M. B. 449,
Telephone: +234 805 829 8820
Email: servicomnodaloffice@yahoo.com
Website: http://www.nigeria.gov.ng/2012-10-29-11-06-51/executive-branch/104-federal-ministry-of-petroleum-resources/184-ministry-of-petroleum-resources?showall=1&limitstart=

Ministry of Environment
Address: Block C, Mabuchi, FCT, Abuja Abuja F.C.T Nigeria
Telephone: +234-09-5233611
Email: http://environment.gov.ng/index.php/contact-information (link to email contact form)
Website: http://environment.gov.ng/?view=featured

Sao Tome and Principe

National Petroleum Agency
Address: Av. Das de Nações Unidas, Caixa Postal N° 1048 Sao Tome - STP
Telephone: +239 2226940/+239 2243350
Email: anp_geral@cstome.net
Website: http://www.anp-stp.gov.st/pt/contactos/ (Portugese)

Ministry of Environment and Natural Resources
Contact information not identified in publicly available sources

Togo

Ministry of Energy and Mining
Address: Rue des hydrocarbures BP : 4227 Lomé Togo
Telephone: +228-221-20 04
Email: energie@energie.gouv.tg
Website: http://www.mme.tg/ (French)

Ministry of Environment and Forest Resources
Contact information not identified in publicly available sources

Equatorial Guinea

Ministry of Mines, Industry and Energy

Address: Carretera de Punta Europa, Malabo
Republica de Guinea Equatorial
Telephone: +(240) 333-093549
Email: shawd@rpsgroup.com (David Shaw – technical advisor)
Website: http://www.equatorialoil.com/

Ministry of Fisheries and Environment
Contact information not identified in publicly available sources

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Indian Ocean: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 49.5 billion bbl / year

Total Gas Production (onshore/offshore): 229 billion cubic feet/ year

The Indian Ocean is a body of water between Africa, Asia, Australia, and the Southern Ocean. The countries in the Indian Ocean regional grouping include South Africa, Kenya, Madagascar, Mozambique, Somalia, Tanzania, and Seychelles.

Exploration in Kenya is taking place in its four identified basins: Lamu (both onshore and offshore), Lokichar (Mandera), Anza, and the Tertiary Rift. In 2012, U.S-based Apache Corporation found gas in the offshore Mbawa-1 well. However, the well was plugged because it did not contain commercial amounts of oil or gas. In addition, Australian company Pancontinental Oil & Gas identified major oil and gas deposits play in offshore Kenya, and has since obtained exploration licenses for three areas: L6, L10A, and L10B[1].

Oil and gas exploration in Madagascar has been taking place for over a hundred years, mostly in the Morondava basin, home to one of the country's largest fields, the Tsimiroro oil field. Madagascar also has large "petroleum deposits of bitumen, also known as tar sands[2]." The Bemolanga Project, which takes place in the Morondava basin, is believed to contain about 8 trillion cubic feet of bitumen deposits. French company Total and Madagascar Oil (a publicly owned oil company based in Madagascar) were planning on extracting these bitumen deposits, but decided it would not be economically worthwhile because of the low recovery rate. Even with disappointing results with bitumen deposits, the offshore Morondava basin is still expected to have large hydrocarbon reserves. The United States Geological Survey predicts that the average "technically recoveries resources that are undiscovered in the offshore Morondava basin are 45 trillion cubic feet of oil and 167 trillion cubic feet (Tcf) of natural gas[3]."

Mozambique has had considerable offshore production since 2010, when natural gas was discovered in the offshore Rovuma basin. U.S.-based Anadarko and Italian company Eni have both "led exploration activities in their offshore license areas called Area 1 and Area 4." The first significant discovery in the Rovuma basin was made in 2010 by Anadarko: the Windjammer exploration well. This discovery led to dozens of other discoveries.

In addition, Norwegian oil and gas company Statoil and ExxonMobil of the United States have made several discoveries in Block 2 offshore Tanzania. In 2014, they discovered another well in Block 2, the Giligiliani-1 well, which is expected to have approximately 1.2 Tcf of natural gas. Other discoveries in this area include Zafarani-1, Lavani-1, Tangawizi-1, Mronge-1 and Piri-1, and Lavani-2[4].

Since the 1970s, most efforts have taken place at the geophysical exploration level in Seychelles. In 2010, state-owned company Seychelles Petroleum Company "approved an offer from PetroQuest International, an energy development firm based in the U.S. state Louisiana, to explore for oil and natural gas in about 12,000 square miles in the Seychelles southern shelf[5]," including the Constant and Topaz banks and the "waters surrounding the Farquhar and Coetivy island groups[6]."

Geology and Geophysics

The Indian Ocean expands for more than 6,200 miles "between the southern tips of Africa and Australia[7]," and has an area of about 28,360,000 square miles. The average depth is 12,990 feet.

The Indian Ocean has a complicated ridge topography that led to the "the formation of many basins that range in width from 200 to 5,600 miles[8]." Ocean basins are defined by "smooth, flat plains of thick sediment with abyssal hills at the bottom flanks of the ocean ridges[9]." These basins include the Arabian, Somali, Mascarene, Madagascar, Mozambique, Agulhas, and Crozet basins in the west, and the Central Indian, Wharton, and South Australia basins in the east.

Studies of the "oil seeps from coastal settings along the margin between Mozambique and Northern Tanzania showed that there were oil-prone sources[10]," that are believed to be Middle and/or Lower Jurassic. The rift margin "in northeast Madagascar contains large heavy oil accumulations generated from Triassic lacustrine sources and Lower-Middle Jurassic source rocks as well[11]."

Special Operating Conditions and New Cutting-Edge Technologies Utilized

The special operating condition used in the Indian Ocean region is deepwater drilling. For instance, Texas-based Vanco Energy Company signed a production sharing contract with Madagascar's state oil company, the Office of National Mines and Strategic Industries, for the Majunga Profond Block in the Majunga Basin "offshore Madagascar's northeastern coast adjoining the Mozambique Channel[12]." The block spans an area of 4 million acres and is in water depths of 3280 to 9842 feet. In addition, Anadarko has "drilled eight deepwater wells on Area 1 of Mozambique and acquired 2,896 square miles of 3D data[13]." This has resulted in six major discoveries containing about 15,000 billion cubic meters of gas.

Technologies used in this region include subsea equipment, which includes any kind of equipment used in offshore oil and gas developments. For example, in 2013, McDermott International, Inc, which is an international engineering, procurement, construction, and installation company, decided to pair up with offshore pipelay company Allseas, to "provide a project execution strategy for the front-end engineering and design of a subsea natural gas pipeline system and subsea infrastructure installment project for Anadarko Petroleum offshore Mozambique[14]." This project is to take place in the Area 1 offshore field in the Rovuma basin, and will assist in the transportation of natural gas from the Prosperidade offshore development (in Area 1) to a liquid natural gas facility.

Methods of Offshore Tender

The countries in this region follow offshore tendering methods that consists of either production sharing contracts, corporate income taxes, joint venture agreements, royalties, or a combination of these four options. For example, in South Africa, the petroleum fiscal regime consists of corporate income taxes of 28% and a royalty rate between 0.5% and 5%. Production sharing agreements are used in Kenya. The corporate income tax rate in this case is 30%, although other rates apply for foreign or new companies. Mozambique, Tanzania, Madagascar, and Somalia also use production sharing contracts. The corporate income tax rate in Mozambique is 32% and the royalties range from 6% to 10%. In Tanzania, the corporate income tax is 30% or 25% depending on certain guidelines, and the royalty rate is 15%. The income tax rate in Madagascar is 35%, and the royalties vary from 8% to 20%, depending on the amount of production. In addition, joint venture agreements, which involve "the national oil company entering a partnership with an oil company such that it is the joint venture itself that is awarded rights to explore, develop, produce, and sell petroleum[15]," are also used in Madagascar[16]. In Somalia, the royalty and income tax rate are outlined in the producing sharing contract[17].

Seychelles' Petroleum Mining Act "says that the state owns petroleum accumulations within Seychelles, and that the government can grant non-exclusive licenses to companies to carry out exploration services[18]." This act also allows the state to also have a production sharing agreement with the international oil company looking to explore in Seychelles. A royalty rate of 10% and an income tax of 35% is applied in Seychelles.

Environmental Overview and Development

The South African Development Community (SADC) is a region in Africa that contains 14 countries, 5 of which are part of the Indian Ocean grouping. These include South Africa, Madagascar, Mozambique, Tanzania and Seychelles (Seychelles withdrew from the SADC but is included in the handbook regardless). Since 1992, the implementation of the environmental impact assessment (EIA) process has made great progress within the region. All SADC member countries have legal framework in place for the allowance of an EIA; however, in order for the EIA tool to obtain its full potential in each country, there is a need to greatly strengthen the roles of the national and regional authorities, environmental assessment practitioners, developers, and the financial institutions who are involved in project finance[19]. The EIA process in Kenya, overseen by the National Environment Management Authority (NEMA), acts as a critical examination of the effects a project has on the environment. During this process the proponent will seek public opinion, focusing on those that will be affected by the project or program, and pays for the entire process[20]. Only one source was found of a Somalian-based authority performing an EIA[21].

Natural Resources

The Indian Ocean touches South Africa, Kenya, Madagascar, Mozambique, Somalia, Tanzania, and Seychelles. It is located on the eastern coast of Africa, extending past Madagascar towards India. There are a total of 186 marine protected areas found in the Indian Ocean including 53 in South Africa, 24 in Kenya, 51 in Madagascar, 7 in Mozambique, 5 in Somalia, 29 in Tanzania, and 1 in Seychelles. Together these MPAs make up about 4,800 square miles of protected ocean.

According to the high resource value analysis figure, there is significant evidence of salt marsh, seagrass, and mangrove habitat, marine bird areas, and endangered and threatened species ranges along the south coast of South Africa. Dappled along the continental eastern coast of

Africa, the western coast of Madagascar, and surrounding Seychelles are concentrations of seagrass, salt marsh, mangrove, coral habitat, marine bird areas, threatened and endangered species ranges, and marine turtle nesting beaches and foraging grounds (See Figure 1 below).

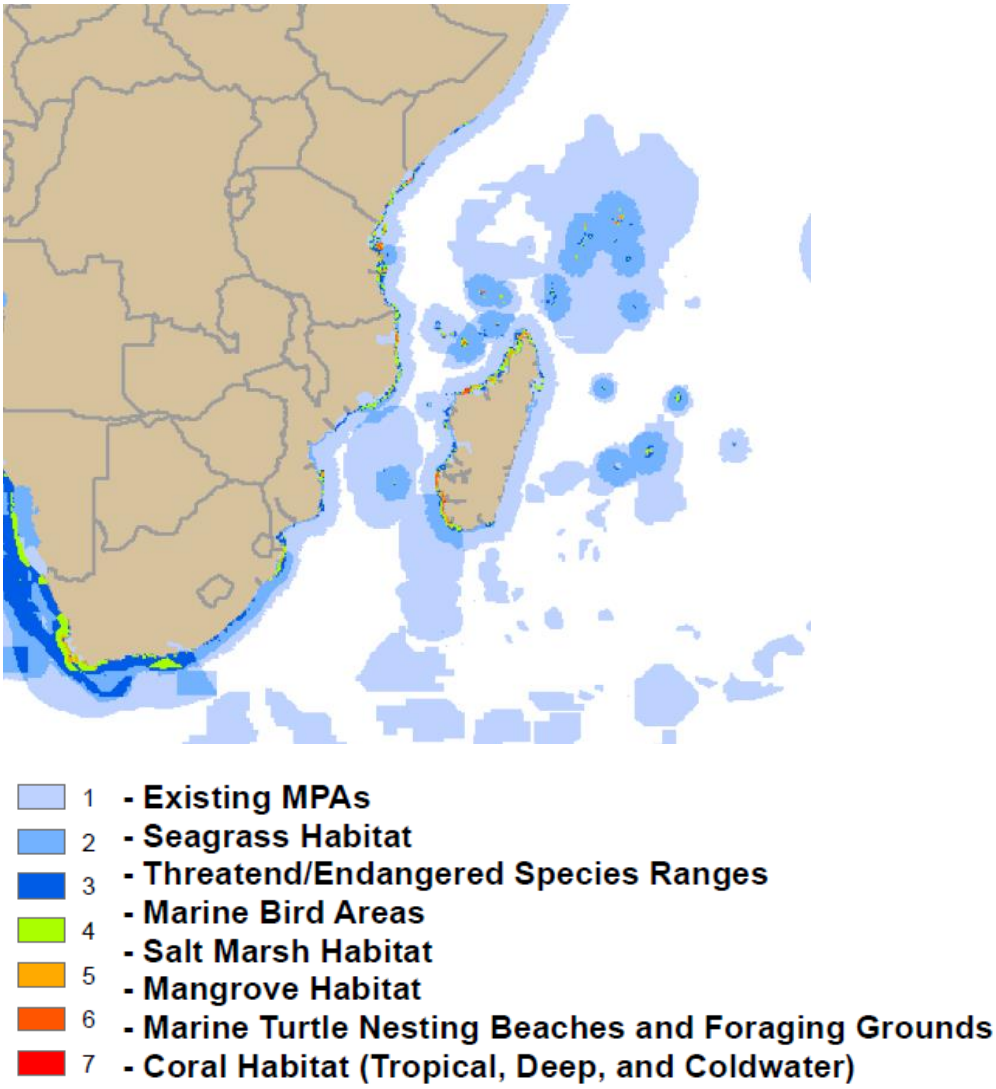

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There are several historic shipwrecks in the Indian Ocean. Santa Antonio De Tanna, a 17th century Portuguese shipwreck, sunk during a battle to free Fort Jesus in 1698, was found off the coast of Kenya. Artifacts such as Indian wares, Chinese porcelain, Martaban and Portuguese jars, canons, mortar shells and bronze medallions were recovered.[22] A shipwreck site, believed to date back to the 18th century, was discovered in Port Elizabeth on the Eastern Cape in South Africa.[23] On the Tanzania coast are the Ruins of Kilwa Kisiwani and the Ruins of Songo Mnara, two East African ports where much of the trade in the Indian Ocean between the 13th to the 16th

century occurred.[24] There are several historic properties and towns along the Indian Ocean coastline.[25]

Socio-economic and Tribal

South Africa was chosen as the focus country to offer a unique perspective on the Indian Ocean area. In 1967, offshore exploration of South Africa's waters started after the formation of South Africa's first oil company Soekor two years prior. Soekor remained the sole operator of offshore drilling from the mid-1970s until the end of apartheid.[26] In 2014, Total, a French multinational integrated oil and gas company, and its partner, Canadian Natural Resources International launched the first deep-water well in the Outeniqua Basin, south of Mossel Bay in the Western Cape. In addition, the Australian company Sunbird Energy is moving ahead in the development of a major gas project off the west coast. South Africa's Mineral Resources Minister Ngoako Ramatlhodi, believes that offshore drilling in South Africa has great potential for economic growth and job creation.[27] In November, 2014, Total halted oil exploration off the southern coast due to mechanical problems with a rig, and will not be able to resume exploration in the area before 2016. This is a big setback for South Africa, who anticipated the drilling of 30 exploration wells in the next 10 years in the attempt to reduce its heavy reliance on imported oil.[28] No tribal issues pertaining to the Indian Ocean were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Department of Environmental Affairs (DEA) in South Africa is the national entity delegated to ensure protection of the environment and natural resources, aligned with sustainable development and the rational utilization of natural resources. The DEA achieves these tasks through formulating, coordinating, and monitoring the implementation of environmental policies, programs and legislation[29]. The Ministry of Environment, Water and Natural Resources of Kenya is mandated to provide governance and institutional framework, protection and restoration of the environment, access to water and sanitation, partnership and collaboration for resource mobilization and capacity building, and research, development, and technology for the management of the environment[30]. The website for the Ministry of Environment, Water, Forests and Tourism of Madagascar is under construction[31]. According to United Nations Environment Programme (UNEP), the Ministry is responsive to programs encouraging environmental management, but make clear they need more funds to begin better management practices[32]. The Ministry of Coordination of Environmental Affairs (MICOA) and the National Directorate of Environmental Management (DNGA) are the regulatory bodies for Mozambique[33]. A translator is needed for the webpage. Somalia has both a Ministry of Environment and Protection and Ministry of Fisheries and Marine Resources[34]. It is unclear what either of their responsibilities are. Both websites are incomplete. The Ministry of Natural Resources and Tourism (MNRT) in Tanzania is responsible for the sustainable conservation of natural resources through the development of policies, strategies, and guidelines and the enforcement and monitoring of laws and regulations[35].

The Ministry of Environment and Energy in Seychelles is made up of four main divisions: Climate Affairs, Adaptation and Information (CAAI), Wildlife, Enforcement and Permits Division (WEP), Department of Risk and Disaster Management (DRDM), and Public Education and Community Outreach (PECO). Together, these four divisions work to protect all aspects of the Seychelles environment[36].

Offshore and Others

The objectives of the offshore licensing bodies and environmental protection agencies in the Indian Ocean region are diverse, however, no further instances of cooperation or conflict were identified. Descriptions of several of the main regulatory bodies are found below:

South Africa – Department of Environmental Affairs

The responsibility of this department is to "ensure the protection of the environment and conservation of natural resources, balanced with sustainable development and the equitable distribution of the benefits derived from natural resources[37]." Some of its functions include "protecting and improving the quality and safety of the environment, facilitating an effective national mitigation and adaptation response to climate change, and creating conditions for effective corporate and cooperative governance, international cooperation and implementation of expanded public works projects in the environment sectors[38]."

South Africa – Petroleum Agency

South Africa's Petroleum Agency "promotes exploration for onshore and offshore oil and gas resources and their optimal development on behalf of government. The Agency regulates exploration and production activities, and acts as the custodian of the national petroleum exploration and production database[39]."

Somalia– Ministry of Environment and Rural Development

The responsibilities of the Ministry of Environment and Rural Development include "promoting, developing pastoral economy, conserving, protecting and sustainably managing the environment and natural resources for the country's development[40]," with the goal of developing an environment "through policy, legal, and regulatory reforms for harmonization of environmental and pastoral governance[16]."

Somalia– Ministry of Petroleum and Mineral Resources

This ministry is in charge of managing hydrocarbons surveys and exploration, as well as implementing the country's petroleum regulations and environmental policies regarding the exploitations of hydrocarbons and minerals[41].

Kenya – Ministry of Environment, Water and Natural Resources

The goals of this Ministry are the following:

"-Governance and institutional framework: Provide policy, legal and integrated planning framework for sustainable management of the environment

-Protection and restoration of the environment: Protect and reclaim the environment in order to establish a durable and sustainable system of development

-Access to water and sanitation: Enhance access to water and sanitation in order to improve health, and to spur socio-economic growth and development

- Partnerships and collaboration for resource mobilization and capacity building:

Create partnerships and collaboration to mobilize resources and for capacity building necessary for sustainable management of the environment

- Research, development and technology: Promote research, development and the adoption of appropriate technology for the management of the environment[42]."

Kenya – Ministry of Energy and Petroleum

The objectives of this ministry are to "facilitate provision of clean, sustainable, affordable, reliable, and secure energy services for national development while protecting the environment[43]." It is also responsible for issuing oil and gas tenders.

Madagascar – Ministry of Environment, Water, Forests and Tourism

This ministry's mission is to develop and implement government policy in areas related to environmental protection.

Madagascar – The Office of National Mines and Strategic Industries

The Office of National Mines and Strategic Industries (OMNIS) is a state-owned company under the authority of the Ministry of Energy and Mines. It is responsible for the upstream hydrocarbon sector and for implementing the Petroleum Code, which "outlines the regulations for exploration, production, and transportation of liquid, as well as solid and gaseous hydrocarbons in Madagascar. OMNIS grants exploration, production, and transportation permits to foreign oil companies[44]."

Mozambique – Ministry for the Coordination of Environmental Affairs

"The Mozambican government through the Ministry for the Coordination of Environmental Affairs has the mandate of coordinating and fulfilling international initiatives on environment and biodiversity issues, as well as adopting the basic legislation that links to the national policy for environment[45]."

Mozambique – The National Petroleum Institute

The National Petroleum Institute is the regulatory body responsible for oil and gas exploration and production.

Tanzania – Ministry of National Resources and Tourism

The ministry's mission is to conserve natural resources and the environment through the development of "appropriate policies, strategies and guidelines, formulation and enforcement of laws and regulation, and monitoring and evaluation of policies and laws[46]."

Tanzania – Petroleum Development Corporation

“The Tanzania Petroleum Development Corporation (TPDC) is a Tanzanian State owned corporation through which the Ministry of Energy and Minerals implements its petroleum exploration and development policies. Its objectives are to: explore and produce petroleum, carry out standard activities of an oil company including distribution and storage facilities, to hold exploration and production rights, to contract, hold equity, or participate in oil concessions, franchises, and licenses, to manage parastatals or other legal entities transferred to the corporation, and to develop an adequate industrial base for the oil industry[47].”

Seychelles – The Ministry of Environment and Energy

This ministry’s objective is to develop and implement government policy in areas related to environmental protection.

Seychelles – Seychelles Petroleum Company

“The Seychelles Petroleum Company is a state-owned entity established in 1984 to implement petroleum policies and advise the Government in dealing with petroleum-related activities. It has also been active in publicizing the hydrocarbon potential of the Seychelles to the international oil community[48].”

Regulatory Contact Information

The regulatory contact information for several of the regulatory contact agencies in the Indian Ocean region were not available. In those cases, website links were given to connect the user to any pertinent information regarding the agency in question.

South Africa Department of Environmental Affairs

Address:
Environment House,
473 Steve Biko
Arcadia
Pretoria, 0083
South Africa
Telephone: + 27 86 111 2468
Email: callcentre@environment.gov.za
Website: https://www.environment.gov.za/content/home

South Africa Petroleum Agency

Visiting Address:
Tygerpoort Building
7 Mispel Street
Bellville 7530,
Cape Town
South Africa
Postal Address:
P.O Box 5111
Tygervalley 7536,
South Africa
Telephone: + 27 21 938 3500
Email: plu@petroleumagencysa.com
Website: http://www.petroleumagencysa.com/

Somalia Ministry of Environment & Rural Development

Telephone: 252-63-4424748
Email: info@slministryofenvironment.com
Website: http://slministryofenvironment.com/

Somalia Ministry of Petroleum and Mineral Resources

Email: fkurweyne@mopetmr.so
Website: http://mopetmr.so/

Kenya Ministry of Environment, Water and Natural Resources

Address:
NHIF Building, 12 Floor

Ragata Road, Upperhill
P.O Box 30126-00100
Nairobi
Kenya
Telephone: +254 20 2730808/9
Website: http://www.environment.go.ke/

Kenya Ministry of Energy and Petroleum

Address:
Ministry of Energy & Petroleum, Nyayo House
Kenyatta Avenue Nairobi
P.O. Box 30582 Kenya
Telephone: +254 020 310112
Email: info@energy.go.ke
Website: http://www.energy.go.ke/index.html

Madagascar Ministry of Environment, Water, Forests, and Tourism

Address: 13 rue Fernand Kasanga Tsimbazaza, B.P. 610 Antananarivo 101, Madagascar
Telephone: +261 20 22 624 42
Email: dgtour@meeft.gov.mg
Website: http://www.meeft.gov.mg/ (Link broken)

Madagascar Office of National Mines and Strategic Industries

Address: BP 1 Bis - 21, Làlana Razanakombana Ambohijatovo - Antananarivo 101 - Madagascar
Telephone: +261 20 22 242 83
Website: http://www.omnis.mg/en/

Mozambique Ministry for the Coordination of Environmental Affairs

Website: http://www.mpd.gov.mz/ (Link broken)

Mozambique National Petroleum Institute

Telephone: + 258 21 320 935
Email: info@inp.gov.mz
Website: http://www.inp.gov.mz/pt

Tanzania Ministry of Natural Resources and Tourism

Website: http://www.mnrt.go.tz/

Tanzania Petroleum Development Corporation

Website: http://www.tpdc-tz.com/tpdc/

Seychelles Ministry of Environment and Energy

Website: http://www.env.gov.sc/

Seychelles Petroleum Company

Website: http://www.seypec.com/

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Java Sea: Regional Offshore Exploration and Production Profile

Total Oil Production (2013 onshore and offshore): 1.6 million barrels/day

Total Gas Production (2013 onshore and offshore): 4.7 trillion cubic feet/day

Indonesia and Malaysia, the two top hydrocarbon producing countries in Southeast Asia, comprise the Java Sea regional grouping[1]. The first offshore oil production was reported in the Java Sea in 1971 from the Cinta and Ardjuna fields (West Java Sea)[2]. These maturing fields are still identified as the most important offshore production areas in the region[3]. Additional offshore production comes from western Indonesia, in the shallow water shelf of the Java Sea, known as the Sunda Shelf. Production in the East Java Sea began in 1993 at the Pagerungan gas field[4]. There are several small oil and gas fields located northwest of Madura Island, with operators including Pertamina, BP, CNOOC, Petrochina, and Santos. There is currently not a significant presence of deepwater drilling activities in the Java Sea based on available sources.

Geology and Geophysics

The Java Sea is a shallow body of water, with an average water depth of 130 feet[5]. In 2007, there were approximately four producing basins in the Java Sea identified as the Northwest Java, Northeast Java, Bona, and Sunda basins[6]. The US Geological Survey (USGS) completed a study titled "An Assessment of Undiscovered Oil and Gas Resources of Southeast Asia, 2010," which included portions of the Java Sea, known as the Northwest Java and East Java areas. The USGS estimated a mean value of 2,762 million barrels of undiscovered conventional oil reserves and 27 trillion cubic feet of natural gas reserves[7]. While this USGS estimates undiscovered hydrocarbon resources using a geology-based assessment, there is active recent seismic exploration in the Java Sea, which will provide further data on hydrocarbon resources in the area[8].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions in the Java Sea include monsoon weather, as well as geological hazards such as shallow gas formations (which can trigger a blowout), slope instability, and earthquake activity[9]. Examples of innovative technologies used in offshore exploration and production operations in the Java Sea include: horizontal drilling[10], smart and multilateral completions[11], subsea production systems[12], subsea hot tap operations for subsea pipeline repair[13], and down-hole electric submersible pumps to increase hydrocarbon production from reservoirs [14].

Methods of Offshore Tender[15]

Production sharing agreements (PSAs) are used in both Indonesia and Malaysia. In Malaysia, PSAs are established between the state national oil company, Petronas and offshore exploration/production companies, and royalty payments are paid based on hydrocarbon production. Exploration rights in Malaysia are typically issued for only a few years. If hydrocarbon resources are discovered, operators have roughly four years to proceed with development, before the rights to the resources return to Petronas[16]. In Indonesia, PSAs are made between the Ministry of Energy and Mineral Resources and the petroleum contractors and taxes including corporate income tax (25% rate) and branch profits tax (20% rate) are applied[17].

Environmental Overview and Development

Malaysia first introduced their environmental impact assessment (EIA) law under the Environmental Quality Act 1974 (EQA). The EIA process includes all government and private projects. The Department of Environment (DOE) (of the NRE) administers and reviews the various drafts and final EIA. After the final draft is reviewed by the DOE, there is no evidence of required judicial review or enforcement[18]. Many EIAs in Indonesia seem to fail to address the actual issues in the community due to the lack of public participation, the informality of the process, and the inadequacy of the techniques employed. The United Nations Environmental Programme (UNEP) is working with Indonesia to strengthen their EIA procedure[19].

Natural Resources

The Java Sea encompasses the island countries of Malaysia and Indonesia just south of the Gulf of Thailand. Together these two countries have a total of 462 marine protected areas (MPAs) – Malaysia having 166 and Indonesia having 296 –making up over 26, 450 square miles of preserved ocean[20].

According to the high resource value analysis figure, the entire Java Sea is protected under existing MPAs. All of the layers included in the figure are present in the Java Sea, including seagrass, salt marsh, mangrove, and coral habitats, marine turtle nesting beaches and foraging grounds, marine bird areas, and threatened and endangered species ranges. It is clear that this region has a high level of biodiversity and acute natural resources of high value (See Figure 1 below).

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

Several shipwrecks have been discovered in the Java Sea. The 10th century shipwreck of Intan was a locally made vessel that traded between Sumatra and Java, and portrayed the powerful empire of Srivijaya. Several Chinese coins, minted in the year 918 AD or shortly thereafter, with the classic sandalwood flower design and jewelry were recovered. [21] In 2013, remnants of a torpedoed Nazi sub was discovered off the main island of Java. It was the first German submarine to be found in the Java Sea and yielded an array of artifacts with Nazi insignias and 17 skeletons.[22] In 2014, a WWII USS Houston cruiser that sank during the Battle of the Sunda Strait on February 28, 1942 was discovered. The cruiser, nicknamed "The Galloping Ghost of the Java Coast", is the final resting place of some 700 sailors and marines.[23] There are several archaeological sites as well as historic properties and towns along the Java Sea coastline.[24]

Socio-economic and Tribal

Offshore oil production began in 1971 from the Cinta and Ardjuna fields in West Java Sea. This region is still the most important offshore producer, despite the decline in oil production. The presence of offshore platforms, oil tankers, floating vessels, and other marine activities have impacted economic growth through employments and other benefits.[25] Offshore oil rigs support local economies by providing a significant amount of primary, secondary and tertiary jobs.[26] An example is Chevron Pacific Indonesia (CPI), the largest producer of Indonesia's crude oil, supporting the education of the Sakai people, an indigenous tribe in Riau. CPI supplies books and provides teacher incentives and educational grants to thousands of Sakai children through the Sakai Foster Children Scholarship program. In addition, CPI has built and sponsored two polytechnic schools. CPI also supports programs that fight diseases such as HIV/AIDS, and promotes improvements in health care and health education. Additionally, CPI supports programs that offer training in small business development and agriculture.[27]

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Ministry of Natural Resources and Environment (NRE) of Malaysia is responsible for policies relating to environmental and climate changes, optimizes resources, as well as maintains international relationships regarding the environment through environmental conventions[28]. The Ministry of Environment in Indonesia assists the president with formulating policies, and managing the planning, implementation, and monitoring of the environment[29].

Offshore and Others

Both Indonesia and Malaysia have federal regulatory bodies with roles in offshore hydrocarbon activities management, as well as authoritative bodies in area of offshore financing/licensing, and

environmental and health and safety regulation. Background and contact information for primary oil/gas operations/environmental regulatory agencies are provided below.

Indonesia

Ministry of Environment and local governments

The Indonesia State Ministry of Environment is the federal environmental regulatory body in Indonesia responsible for planning and implementation of national environmental management policy, as well as issuing audits/investigations into non-compliance activities[30]. Thirty three provinces in Indonesia are subdivided in to 465 regencies or cities. Provinces and regency/city governments are responsible for implementing environmental policy and monitoring compliance with provincial/city boundaries[31].

Ministry of Energy and Mineral Resources

Indonesia's Ministry of Energy and Mineral Resources reports directly to the Department of the President. Its main functions are to create and implement policies and technical guidance in the energy and mineral resources sectors[32]. The Ministry of Oil and Gas and Mining Department in Indonesia merged with the Department of Mines and Energy in 1966.

Malaysia Ministry of Natural Resources and Environment/Department of Environment

Malaysia's Department of Environment is a subordinate federal agency within the country's Ministry of Natural Resources and Environment. Responsibilities of the Department of Environment include air and water quality monitoring, toxic/hazardous waste management, and administration of the Environmental Impact System[33].

Petronas

Malaysian Oil Company PETRONAS, wholly owned by the government of the Malaysia, is the primary regulator and licensing authority for upstream oil and gas operations in the country[34]. PETRONAS's responsibility in the upstream sector was established in the Malaysian Government's Petroleum Development Act of 1974[35].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Indonesia

State Minister for Environment
Address:Jl. DI Panjaitan Kav. 24, Jakarta Timur 13410
Telephone: +62 21-851 7184
Email: edukom@menlh.go.id
Website: www.menlh.go.id (Indonesian)

Ministry of Energy and Mineral Resources
Address:Jl. Merdeka Selatan 18, Jakarta 10110
Telephone: +62 21-380 4242
Email: pie@esdm.go.id
Website: www.esdm.go.id

Malaysia

Ministry of Natural Resources and Environment
Address: No. 25 Persiaran Perdana, Presint 4, 62574 Putrajaya, Malaysia
Telephone: +603 8000 8000
Email: webmaster@nre.gov.my/aduannre@nre.gov.my
Website: http://www.nre.gov.my/en-my/ContactUs/Pages/default.aspx

PETRONAS (national oil company & a main regulatory body)
Address: Petroliam Nasional Berhad (PETRONAS) (20076-K) Tower 1, PETRONAS Twin Towers Kuala Lumpur City Centre 50088 Kuala Lumpur Malaysia
Telephone: 603 2051 5000 / 2026 5000
Email: http://www.petronas.com.my/Pages/contact-us.aspx
Website: http://www.petronas.com.my/Pages/default.aspx

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Mediterranean: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 1.78 billion bbl / year
Total Gas Production (onshore/offshore): 3.96 trillion cubic feet/year

The Mediterranean Sea is an expansive region almost entirely surrounded by land and only connected to the Atlantic Ocean through the strait of Gibraltar. The 17 countries in this regional grouping include: Spain, France, Italy, Algeria, Tunisia, Morocco, Greece, Croatia, Montenegro, Albania, Libya, Cyprus, Turkey, Israel, Lebanon, Syria and Egypt. Some of the key offshore production endeavors in this region are in Israel in the Levant Basin. "The discovery of the Noa field in 1999 and the Mari-B field in 2000 and discoveries in 2009 (Dalit and Tamar), 2010 (Leviathan), and 2011 (Aphrodite and Tanin)[1]" by U.S. oil and gas exploration and production company Noble Energy, established the existence of large amounts of gas in the Levant Basin. The most prominent offshore discovery in the eastern Mediterranean region so far has been the Leviathan field, which is situated about 80 miles off the coast of Israel "in water that is more than 5,000 feet[1]." This field is expected to have approximately 18 trillion cubic feet (Tcf) of hydrocarbon resources.

Noble Energy has also made natural gas discoveries in Cypriot waters. For instance, the Aphrodite field off the southern coast of Cyprus in exploratory drilling block 12 was discovered in 2011 and is expected to contain approximately 7 Tcf of natural gas. An offshore bidding round in Cyprus took place in 2012, "with awards going to a diverse group of international companies[2]." For instance, Italian company Eni and South Korean company Korean Gas Corporation won the bid for blocks 2, 3 and 9, while the French firm Total was awarded Blocks 10 and 11[3]."

Another field, the Aprodite-2 field is located on "the Israeli side of the maritime boundary with Cyprus[4]," and is expected to have similar geologic characteristics. Cyprus' Aphrodite field could potentially hold up to 3 Tcf of hydrocarbon reserves. The Gaza Marine field in the maritime boundary between Israel and the Palestinian territories may have 1 Tcf of hydrocarbons. Although the Palestinian Authority and Israeli government discussed development in the offshore Gaza region, no agreements have been established.

A formal offshore licensing round in Lebanon took place in May 2013. The offshore potential in Lebanon is expected to be around 25 Tcf. In Syria, a bidding round for offshore blocks was supposed to be completed in 2011, but was postponed due to political conflicts.

In Greece, a study by Athens-based Flow Energy conducted in 2011 "estimated $788 billion worth of offshore natural gas in Greece over 25 years[5]." In 2012, the Norwegian Petroleum Geo-Services ASA started a seismic survey of the Ionian Sea and water south of Crete, an area that covers 84,942 square miles. After a completed survey in 2013, Greece is planning a licensing round for further exploration. In addition, British company Cairn Energy is currently "exploring off

the coast of Spain and bidding for licenses in Cyprus[2]." There also "appears to be prospects in the waters around Malta, with geologists believing that the oil-rich geology of nearby Libya extends northward underneath the sea[2]."

In 2009, the French government "awarded two 5-year exploration permits to two oil companies, Houston-based Marex Petroleum Corporation and Australia's Roc Oil Company, to explore offshore Juan de Nova, a tiny island possession between Madagascar and Mozambique[6]." The companies are in charge of conducting 2D and 3D seismic exploration surveys, and drilling wells during the fourth or fifth years of their permits.

Italy enacted an offshore drilling ban in 2010, following the Deepwater Horizon oil spill in the United States Gulf of Mexico. Since then, Italy has lifted the ban for certain offshore projects, although the government continues its ban on drilling in certain areas near the coast.

Geology and Geophysics

The petroleum system in the Mediterranean region is known as the Mesozoic-Cenozoic Composite Petroleum System, and includes source rocks such as the Triassic, Jurassic, Lower Cretaceous, Upper Cretaceous, Miocene, and Plio-Plesitocene ages. Three "assessment units", which are defined as "mappable volumes of rock within a petroleum system that encompass fields which share similar geologic traits[7]," have been defined within the composite petroleum system[8].

The Levant Margin Reservoir Assessment Unit includes "all reservoirs, from basement rocks to the Pleistocene. Reservoirs include Jurassic and Cretaceous shelf-margin carbonates near shore marine sandstones, and deepwater slope and fan sandstones[3]."

The Levant Sub-Salt Reservoirs Assessment Unit is made up of reservoirs "within and below continuous Messinian-age salt[3]." The reservoirs mostly consist of "Mesozoic and Paleogene sandstones ranging from incised valley deposits to deep-water slope and fan sandstones[3]."

The Plio-Pleistocene Reservoirs is made up of reservoirs younger than the Messinian-age and the reservoirs are incised channels, or channels that have been formed due to environmental degradation, and deep-water slope and fan sandstones.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

The main feature in the Mediterranean Sea is the presence of deepwater conditions in offshore areas. For instance, although initial offshore exploration in Israel took place in water depths less than 656 feet, recent offshore exploration is in water depths greater than 3280 feet. Both the Tamar and Dalit fields, discovered in 2009, 50 miles off the shore of Israel, are deepwater offshore endeavors.

Furthermore, BG International (an international exploration and production company) and Operator Noble Energy "have signed a non-binding letter of intent[9]" to transfer gas from the deepwater Leviathan field in offshore Israel to BG's Liquid Natural Gas facility in Idku, Egypt. This project is supposed to "supply 200 billion cubic feet per day over 15 years[4]." The gas is expected

to be transported from a floating production, storage and offloading unit (FPSO), which are floating vessels used for the production, processing, and storage of hydrocarbons, to the "Leviathan field through a subsea pipeline to Idku[4]."

FPSO units are also used in both Tunisia and Libya, while fixed platforms are used in Israel. The Tamar platform in the Tamar gas field is an example of a fixed platform.[10] [11]

In addition, semi-submersible rig technology is also used in the Mediterranean region. For example, the semi-submersible rig "Noble Paul Romano" in the Sidi Moussa block spudded on July 2014 approximately 40 miles offshore the west coast of Morocco in 990 meters of water. The Sidi Moussa block covers an offshore area that is around 1930 miles squared, and the potential reservoirs are Lower Tertiary, Upper and Lower Cretaceous, and Jurassic age.

Methods of Offshore Tender

The offshore tendering method used by the majority of countries in the Mediterranean region consist of royalties, corporate income taxes, and production sharing agreements.

For instance, the oil and gas industry in Spain consists of a "corporate income tax of 35% for the exploration, investigation, and exploitation of hydrocarbons[12]." In Italy, the corporate income tax is 27.5%, and oil and gas companies are also required to pay certain concessions to the Italian government, as well as royalties that vary depending on the profit production. In Morocco, the corporate income tax is 30% and royalties are 10%. Israel's tax regime "consists of royalties, profit-based special taxes, and corporate income taxes[7]." The corporate income tax is currently set at 26.5%.

The Syrian oil and gas fiscal regime consists of royalties and corporate income taxes that are 7% and 28%, respectively. The production sharing agreement is signed between the Syrian General Petroleum Corporation, the state-owned petroleum company, and the oil and gas contractor. Egypt follows a similar fiscal regime in which a production sharing agreement is signed between its state-owned company, the Egyptian General Petroleum Corporation, and the licensee. The profit tax on oil exploration and production in this case is 40.55%. Production sharing contracts are also used in Algeria, Tunisia, and Libya. The royalty rate in Algeria generally 20%, even though it can be decreased to 16.25% and 12.5% depending on which Algerian territory the exploration is taking place in. In some cases, the Algerian Ministry of Finance can decrease the royalty rate to 10%. The income tax "at the rate of 28% applies to the profit made by a foreign partner[7]."

In Tunisia, production sharing contracts along with "royalties, corporate profits tax, and export duties on crude oil products and natural gas that vary according to the nature of the hydrocarbons,[7]" are issued. Likewise, in Libya, production sharing contracts along with a corporate income tax rate of 20% and a royalty rate of 16.67% of production is used. Currently, in Cyprus, taxes specific to hydrocarbon exploration and production are not used. Instead a general corporate tax of 12.5% is applied. The plan of the Cypriot government, however, is to develop a production sharing contract system with licensees and gain a certain percentage of the profit hydrocarbons.

Environmental Overview

Due to the size of the Mediterranean Sea regional grouping and the complexity of the parameters in the region, the environmental, sociological, archaeological aspects have been divided between the north and the south Mediterranean.

1) North Mediterranean Sea

Environmental Overview and Development

As member states of the EU, Spain, France, Italy, Greece, and Croatia, are required to comply with the EU's EIA Directive introduced in 1985. It applies to a wide range of public and private projects where the developer may request the competent authority in each country what is required in the EIA by the developer. The developer must provide a report of the impacts of the project on the environment. The environmental authority and the public is informed and consulted, the authority decides if the project is approved and the public has an opportunity to challenge the decision in court. Each country of the EU must have a competent environmental authority, which is discussed in the section above (Regulatory Bodies)[13]. The Law on Strategic Impact Assessment in Montenegro was passed in 2005 and states the conditions, methods and procedures for SEAs of defined plans or programs that have a significant impact on the environment[14]. Albania utilizes an environmental and social impact assessment (ESIA) process which is conducted by the developer and approved by the Ministry of Environment[15]. Turkey's EIA Regulation came into effect in 1993 through the Environmental Law[16].

Natural Resources

The Mediterranean Sea touches 8 southern European countries that together have set aside at least 435 marine protected areas (MPAs) in the Mediterranean. This includes 183 in Spain (over half of which are on the Mediterranean Sea), over 50 in France (only a third of its coast borders the Mediterranean), 180 in Italy, 82 in Greece, 25 in Croatia, 2 in Montenegro, 11 in Albania, and 15 in Turkey. This makes up over 15,000 square miles of protected ocean[17].

According to the high resource value analysis figure, much of the Mediterranean Sea is protected, concentrated in the northern and western parts of the sea. There is considerable seagrass habitat off the northwest coast of Italy and southeast coast of France. In this area there is a range of threatened and endangered species territory as well. Surrounding Sicily, Corsica, and Sardinia, there is noticeable marine bird area as well as possible salt marsh habitat and some patches of coral habitat (See figure 1 below).

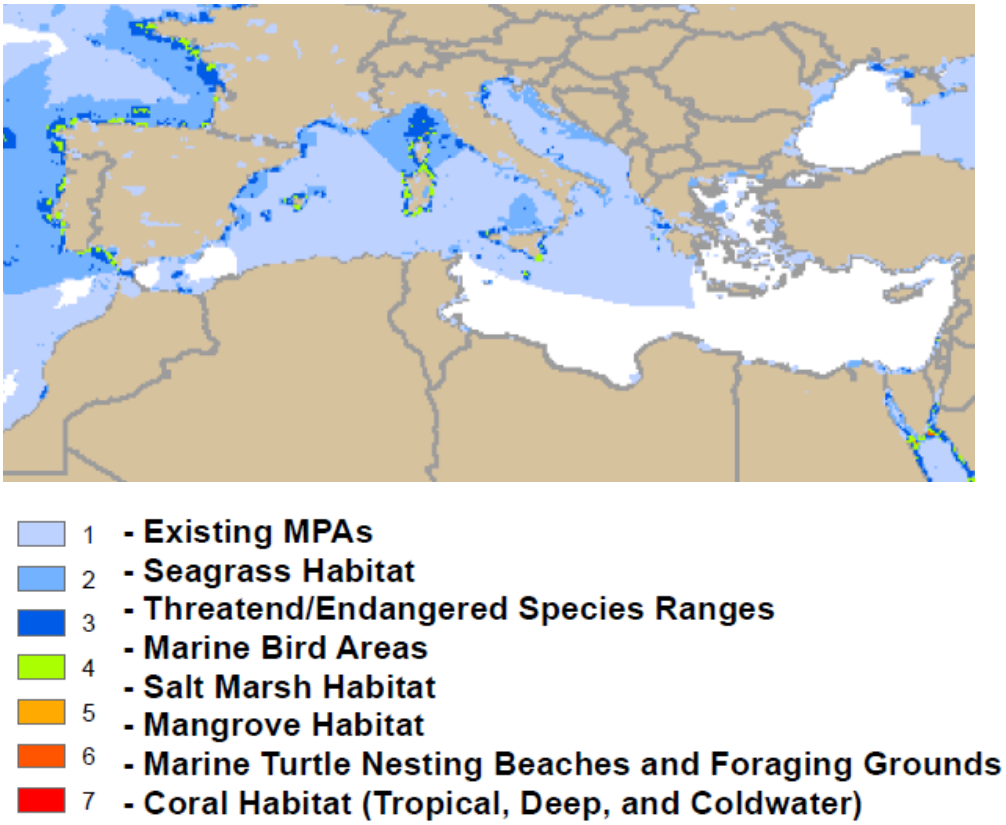

Figure 1: High Resource Value Analysis Overview for the North Mediterranean Sea

North Mediterranean – Environmental Regulatory Bodies of Note

Spain's Ministry of Agriculture, Food and Environment is the overarching regulatory body responsible for environmental impact assessments (EIAs) along with federal policies regarding climate change, biodiversity, marine resources, etc.[18]. The Ministry of Ecology, Sustainable Development and Energy is the regulatory body in France. It is responsible for executing and enforcing environmental policies relating to climate change, water, biodiversity, risk prevention, management of the coast and sea, transportation, and sustainable development[19]. The regulatory body for Italy is the Italian Ministry for the Environment, Land and Sea (IMELS). Its responsibilities include sustainable development, appraisal of environmental impact, nature conservation, waste cleanup, and the protection of seas and inland waters[20]. The regulatory body for Greece is the Ministry of Environment, Energy and Climate Change. It is responsible for environmental policy regarding protection of nature, environmental management systems, environmental permitting of industrial installations and the protection from pollution, etc.[21] The Ministry of Environmental and Nature Protection is the regulatory body of Croatia responsible for administrative environmental protection activities relating to the climate[22]. The Ministry of Sustainable Development and Tourism is the regulatory body of Montenegro and is responsible for the administration and approval of strategic environmental assessments (SEAs)[23]. The regulatory body for Albania is the Ministry of Environment, responsible for the entire process of drafting policies and plans, and for implementing legislation related to the environment[24]. The regulatory agency in Turkey is the Republic of Turkey Ministry of Environment and Urbanisation, tasked to ensure the implementation of marine conservation, pollution prevention or disposal, and to identify the principles and procedures needed to retain the integrity of the natural environment[25].

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There are several historical shipwrecks in the Mediterranean Sea (North). In 2009, five well-preserved Roman shipwrecks dating from between the 1st century B.C. and the 4th century were discovered off the coast of Ventotene, an island off Italy's west coast between Rome and Naples. Artifacts recovered include: vases used for holding wine and olive oil, pots and other large intact objects yet to be identified.[26] Coastal archaeological sites of great importance include Pompei, Herculaneum and Torre Annunziata in Italy.[27] Additionally, there are multiple coastal archaeological sites as well as historic properties and towns along the Mediterranean Sea (North) coastline.[28]

Socio-economic and Tribal

Italy was chosen as the focus country to offer a unique perspective on the Mediterranean Sea (North) region. In 2014, Italy's government increased its efforts to boost domestic oil and gas output as tension in Russia and North Africa raised concerns of disruption to energy imports. Italy's Prime Minister, Matteo Renzi, gave the government a mandate to push ahead economic reforms to double oil and gas output by 2020, and generate investments worth $20 billion over that period. In 2013, Italy spent 65 billion dollars on its energy bill and imported around 90 percent of its overall energy needs. The majority of their gas, 70 percent, was imported from Russia, Algeria and Libya.[29] The Italian government is striving to clear the path for its own oil company, Eni S.p.A, and other major oil companies, to proceed with drilling in Basilicata, which has long been called the Texas of Italy for oil reserves, resulting in job creation and economic growth. The Italian government hopes that by offering regional and local governments greater share of the revenue, that opposition to drilling will subside.[30] No tribal issues pertaining to the Mediterranean Sea (North) were found.

2) South Mediterranean Sea

Environmental Overview and Development

The EIA process in Algeria is relevant for all types of works, land planning, and projects. There is no requirement for implementation monitoring[31]. The EIA process in Tunisia is regulated by the National Agency for Protection of the Environment (ANPE). Official guidelines are found in the Handbook/Terms of Reference issued by the ANPE. ANPE directorate of control undertakes pollution monitoring, no other requirements for implementation monitoring are included in the decree[32]. Morocco has legislation for an EIA process, but more emphasis needs to be put on it. Currently, it is inconsistent and lacks requirements for specific projects and installations[33]. The Environment General Authority (EGA) is responsible for the EIA process in Libya. The EIA process is outlined in Law No. 15 of 2003[34], it is unclear how successful the EIA tool is in protecting the environment in Libya. Cyprus is a member state of the European Union (EU), so their EIA process, headed by the Department of Environment, must comply with the EU's EIA Directive[35]. Israel amended their EIA process in 2003 to incorporate environmental consideration in earlier stages of the process and encourage sustainable development principles[36]. Lebanon has an EIA process in place, and is working with the international community to implement a strategic environmental assessment (SEA) for urban planning projects, Lebanon's biggest threat to their environmental health[37]. Syria's EIA process lacks several components needed for an effective EIA. Some examples of shortcomings are: weak environmental institutions and authorities, lack

of experience and awareness, lack of environmental data, lack of cooperation, and the absence of public opinion[38]. Egypt requires an EIA to be done on all governmental and private projects. EIAs are administered and approved by the EEAA. The projects are monitored, and the guidelines state that the party implementing a project "shall keep a written record of the impact of his establishment on the environment (Environmental Record). . ." that is followed up with a review by the EEAA[39].

Natural Resources

The Mediterranean Sea touches 9 northern African countries that together have set aside about 136 marine protected areas (MPAs) in the Mediterranean. This includes 22 in Algeria, 29 in Tunisia, 43 in Morocco, 7 in Libya, 10 in Cyprus, 12 in Israel, 6 in Lebanon, 3 in Syria, and 4 in Egypt (on the Mediterranean side). These MPAs make up a total of about 600 square miles[40].

According to the high resource value analysis figure, the southern edge of the Mediterranean Sea does not have extensive existing MPAs. Morocco, Algeria, and Tunisia have the most extensive MPAs, while the remaining northern African countries have MPAs exclusively in the coastal zone. Other than off of Morocco, where there are some threatened and endangered species and coral habitat, there is no indication of any of the included map layers (See Figure 2 below).

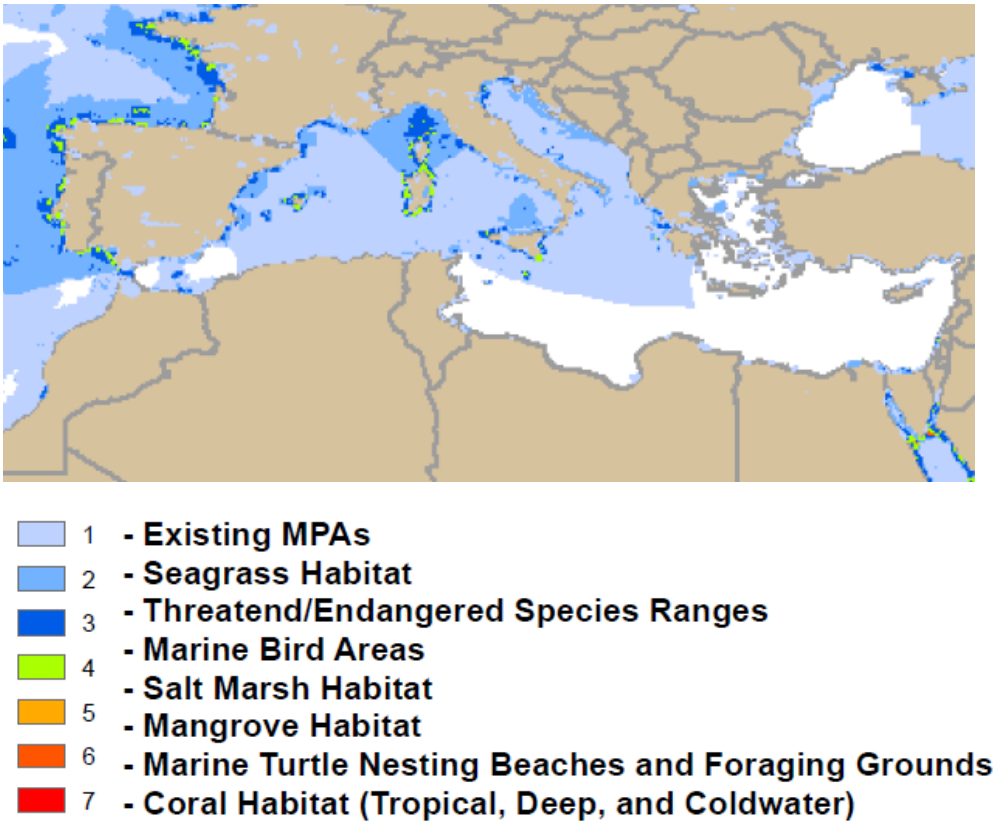

Figure 2: High Resource Value Analysis Overview for the South Mediterranean Sea

South Mediterranean – Environmental Regulatory Bodies of Note

The Ministry of Land-Use Planning and Environment is the environmental regulatory body in Algeria[41]. It is the main administrative body for environmental impact assessments (EIAs)[42]. The Ministry of Environment in Tunisia is responsible for environmental policies which help to support

the protection of Tunisia's natural resources[43]. The regulatory body in Morocco is the Ministry of Energy, Mining, Water and the Environment[44]. The regulatory body for Libya is the Ministry of Agriculture, Animal and Marine Wealth[45]. The regulatory body in Cyprus is the Department of Environment under the Ministry of Agriculture, Natural Resources and Environment. The Department of Environment is responsible for implementing and enforcing legislation regarding the environment[46]. The regulatory body for Israel is the Ministry of Environmental Protection (MoEP). The MoEP is responsible for the formulation of a national, integrated, inclusive policy for the protection of the environment[47] The Lebanese Ministry of Environment is the governmental body responsible for activation of Environmental Risk Management and the implementation of environmental laws and policies in support of preserving Lebanon's natural resources[48]. Syria's Ministry of State for Environmental Affairs heads the country's environmental programs and initiatives[49]. The Egyptian Environmental Affairs Agency (EEAA) under the Ministry of Environment has collaborated with national and international development partners to define environmental policies, set priorities and implement initiatives with the goal of supporting a sustainable environment[50].

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There have been several shipwrecks discovered in the Mediterranean Sea (South). Remains of a fleet of early-19th century ships and ancient harbor structures were discovered near the Israeli city of Akko, one of the major ancient ports during the Hellenistic period (third to first century B.C.).[51] The Mazotos Shipwreck, a commercial ship that dates back to the classical period was located in the sea area of Mazotos. The Mazotos, is the first shipwreck located in Mediterranean carrying Chian amphorae, and may provide information pertaining to the sea routes and trade relations between the peoples of the Aegean and the S.E Mediterranean during the classic period.[52] The submerged dwelling of Atlit-Yam Haifa in Israel dates from around 7000 BC and is one of the largest and oldest submerged human dwellings ever discovered. In 1999, the ancient ruins of Herakleion and Canopus (the twin cities guarding the gateway to Egypt 1200 years ago) were discovered 20-23 feet deep in the Mediterranean Sea. The ruins yielded several temples, statues and other dwellings.[53] There are several archaeological sites as well as historic properties and towns along the Mediterranean Sea (South) coastline.[54]

Socio-economic and Tribal

Libya was chosen as the focus country to offer a unique perspective on the Mediterranean Sea (South) region. Libya has the largest reserves of oil in North Africa, and joined the Organisation of the Petroleum Exporting Countries (OPEC) in 1962.[55] Oil production in Libya began its resurgence in 2011, following the "deposition of Col. Mu'ammar al-Qadhafi's regime and the gradual consolidation of control over most parts of the country by the Transitional National Council (TNC) and affiliated rebel militias." In 2012, it was estimated that crude oil production to is at least 1.4 million barrels per day (bbl/d). According to the U.S. Department of State, the Libyan economic recovery in the energy industry will be an important determinant of the country's economic wealth. In 2011, oil accounted for approximately, "95 percent of Libya's export earnings, 75 percent of its government receipts, and 25 percent of its gross domestic product prior to the political upheaval." [56] The Libyan Investment Authority (LIA) was established in 2006 with the aim to manage the country's oil revenues and invest the funds in "financial assets." After the civil war in 2011, the government was unable to access the funds due to the "misconduct and misappropriation" under

the al-Qadhafi regime. As of 2013, the government has regained access to most of the LIA's assets and plans to spend a portion on restoring the country's damaged infrastructure.[57] No tribal issues pertaining to the Mediterranean Sea (South) were found.

Offshore and Other Regulatory Bodies of Note

Even with the large size and diverse nature of the Mediterranean regional grouping, there was no further identified cooperation or conflict identified between regulatory agencies beyond the standard industry groups such as OPEC. Information on most of the environmental and offshore licensing bodies for the countries in this region are below. Where there was no or little information for specified regulatory agencies for a country, it was noted and the information was kept brief or left out entirely.

Israel – The Ministry of Environmental Protection

This ministry was established in 1988 and "is responsible for the formulation of a nationwide, integrated, and inclusive policy for the protection of the environment[58]." Some of this agency's more specific objectives include "protecting, rehabilitating, and preventing the misuse of ecosystems, natural resources, and open spaces, protecting the public and the environment from pollution, preparing for adaptation to climate change, and promoting sustainable growth and development[59]"

Israel – Ministry of National Infrastructures, Energy and Water Resources

The Ministry of National Infrastructures, Energy and Water Resources has many different areas of responsibility in the energy sector, including electricity, energy conservation, fuels, liquid petroleum gas safety, natural gas, mine and quarries, as well as oil and gas exploration. This is the body in charge of granting petroleum prospecting rights before an operator can execute any exploration and production in Israel.

Any holders of petroleum rights in Israel are expected to submit reports to this ministry describing their exploration activities as well as environmental guidelines they are going to follow while exploiting the region for hydrocarbons.

Spain - Ministry of Environment, Rural and Marine Affairs

"This ministry is the government agency in Spain in charge of both developing and executing governmental legislation on environmental topics, including climate change, protection of natural heritage, and agricultural resources, just to name several[60]."

Spain - Ministry of Industry, Energy and Tourism

"The Spanish Ministry of Industry, Energy and Tourism has an energy department that is responsible for implementing policy related to electrical energy, nuclear and radioactive facilities, energy and sustainable development, as well as energy production and consumption for natural gas and liquefied petroleum gas. They also collect information on the supply of oil products and mining and explosives[61]."

France – French Environment and Energy Management Agency

“The French Environment and Energy Management Agency is an industrial and commercial undertaking that works directly with France’s Ministers of Environment, Energy and Research that works with major corporations, local and regional authorities, and similar organizations outside of France. ADEME is responsible for limiting emissions of greenhouse gases and pollutants. ADEME does this by evaluating environmental, social and societal issues that directly impact the ability to reduce greenhouse gases. ADEME achieves its mission by giving advice, demonstrating best practices, financing, and training information[62].”

France - Bureau Exploration-Production des Hydrocarbures

"This agency is responsible for managing the hydrocarbons mineral domain in France, which involves attribution of exploration and production licenses for oil and gas, and monitoring of the related activities. It also makes available to the public all data concerning oil-and-gas exploration and production in France, such as mineral rights, geophysical data, well-drilling data and production data[63].”

Italy - Ministry of Environment

“The Ministry of Environment in Italy was established in 1981 and is responsible for environmental issues in Italy, including issues related to water, air, land, energy, and nature[64].”

Algeria - Ministry of Land-Use Planning and Environment

"This agency is in charge of contributing to the development of environmental laws and regulations. They are also in charge of initiating any studies, research, and action promoting prevention against pollution[65].”

Algeria - Ministry of Energy and Mining

"This ministry is responsible for the development of research policies, strategies, production and exploitation of hydrocarbon resources, and implementation of laws and regulations related to the hydrocarbons sector[66].”

Tunisia - Ministry of Equipment, Land-Use Planning and Sustainable Development

"The duties and functions of the Ministry of Environment are as follows:

- To propose the general policy of the government in the areas of environment protection, nature conservation and promotion of the quality of life;
- To lay the foundations for development sustainability in the general and sectorial policies of the government in collaboration with concerned ministries and agencies; and to ensure that these policies are implemented.
- To promote the laws on environment protection and nature conservation and to make every effort to integrate the concept of development sustainability into national strategies and plans by taking measures of a general or special nature in the various environment- and development-related fields and by drawing up specifications of the concept of equilibrium in the natural environment.
- To improve environmental conditions and the living environment; to limit or eliminate the dangers threatening man, environment and natural resources; to protect and develop the spaces assigned to wildlife and landscape development; and to protect and develop the open spaces needed for the growth of future generations.
- To lay down environment-friendly rules for the management of all sectors of activity and natural resources; to take all necessary measures with all concerned parties to protect and guard against environmental risks; and to face potential or anticipated environmental problems without waiting for their actual occurrence[67].”

Tunisia - Ministry of Industry, Energy and Mines

"The Ministry of Industry , Energy and Mining 's mission is to develop and implement government policy in areas relevant to the industry, food industry, related services to industry , energy , mining, industrial cooperation and industrial safety, energy and mining[68]."

Morocco – Ministry of Energy, Mining, Water, and Environment

The Ministry of Energy, Mining, Water, and Environment of Morocco is the national regulatory body with authority in national environmental policy[69].

Morocco – National Office of Hydrocarbons and Mining

"Morocco's domestic oil policy is set by the Office of Hydrocarbons and Mining (ONHYM). In Hydrocarbon Domain, ONHYM focused on the study and the reinterpretation of the geological and geophysical data of several promising areas in various onshore and offshore sedimentary basins. Their goals are to: increase the level of petroleum and mining exploration in Morocco, strengthen opening on the world market and the development of partnerships with foreign investors as integral part of ONHYM's policy of promotion of petroleum and mineral wealth of the country, give ONHYM a substantial international level of credibility resulting from an efficient promotion policy, and establish a performance-oriented management culture[70]."

Greece - Ministry of the Environment, Physical Planning and Public Work

"The Ministry, as the main body for handling environmental policy, has launched a broad range project to deal with the problems that concern the quality of life. Thus, apart from the well-known and widely discussed problems, such as atmospheric and water pollution, noise problems and waste disposal management, issues such as physical and urban planning and cadaster, will also be addressed by implementing the necessary measures for integrated and sustainable development. The objectives, guidelines, proposals and options for a National Project for the Protection of the Environment, the preservation of the Ecological Balance and the upgrading of the quality of life, which are incorporated in the Project and Planning Strategies of the 3rd European Union Support Framework, include:

- Integrating the Economy with the Environment and incorporating principles, values, ecological awareness and priorities for sustainable development.
- Implementing Physical and Urban Planning systems and completing of the National Cadastre.
- Improving the Urban Environment with a focus on atmospheric pollution and noise control in major cities as well as the integrated and proper management of municipal waste and industrial toxic waste through the recycling of Raw Materials and Eventual Waste Disposal on Landfills.
- Conserving and recovering balance, harmony and diversity in Greek Wildlife and ecosystems (protection of forests, reforestation and planting of trees in State Areas). The CHART of Greek biodiversity, the formation and implementation of Management Plans for the Protection of National Parks, Wetlands, Marine Parks, Coasts and Monuments of Nature and Sensitive Areas.
- The integrated and rational management and control in the protection of the quality and quantity of Water Resources of Greece as water is a Natural Commodity, a renewable Natural Resource, useful and irreplaceable in the Balance of Ecosystems, for the Water Supply of the Cities and communities or agricultural Irrigation, for Industrial and Tourist

- Development and as an alternative, for the support of Energy Resources.
- Developing Environmental Education - updating and increasing ecological awareness through training.

Cooperating with Organizations and Ecological, Environmental and Life Quality Movements as well as motivating all citizens to participate creatively and play an active role in activities[71]."

Greece - Ministry of Environment, Energy and Climate Change

"This ministry is in charge of administering tenders for the exploration and exploitation of hydrocarbons in Greece[72]."

Croatia - Croatian Environment Agency

"Croatian Environment Agency is an independent public institution established by a decision of the government of the Republic of Croatia to collect, integrate, and process environmental data. The need to establish the Croatian Environment Agency as a focal institution into which all relevant environmental data will be channeled has been defined:

- In the basic strategic environmental protection document - the Environmental Protection Strategy of the Republic of Croatia, which dedicates a separate section to the need for establishment of an independent and specialized Agency and its objectives, defining it as a central professional body and a potential promoter of sustainable development;
- By Implementation Plan for the Stabilization and Association Agreement between the European Community and its Member States and the Republic of Croatia (Article 81 on establishment of the Croatian Environment Agency);
- By the need to upgrade the infrastructure necessary for efficient enforcement of the environmental policy (Ministry, Agency, Fund);
- Through harmonization of the Croatian legal and institutional environmental protection framework with that of the European Union[73]."

Croatia - Croatian Hydrocarbons Agency

"This agency is in charge of administering tenders for the exploration and exploitation of hydrocarbons in Croatia[74]."

Montenegro - Environmental Protection Agency

The goal of this ministry is to protect the environment through environmental monitoring and the issuing of environmental permits[75].

Oil and Gas Montenegro

"The responsibility of Ministry is keeping records of concluded concession contracts, collecting and managing data and documentation related to the exploration and production of hydrocarbons, calculation of the concession fee for exploration, calculation of the concession fee for produced oil and gas, establishing fulfilment of requirements for carrying out works in accordance with the mandatory work program, development and production program, and the decommissioning plan.

Also, the Ministry establishes fulfilment of facilities requirements for exploration and production of hydrocarbons and approval of the use thereof, control over the execution of obligations undertaken under the concession contract, as well as other issues in accordance with the Law on exploration and production of hydrocarbons.

Pursuant to a decision of the Government, the Ministry announces a public invitation for submitting applications for the award of rights to exploration and the conclusion of exploration concession contract, as well as a public invitation for submitting bids for awarding production rights and entering into a production concession contract for one or more blocks[76].”

Albania - Ministry of Environment

"The Ministry of Environment (MoE) is the main institution responsible for the entire process of drafting policies and plans, and for implementing measures related to climate change in Albania. The MoE is the focal point and main institution responsible for implementing activities related to climate change in Albania within the framework of the United Nations Framework Convention on Climate Change and the Kyoto Protocol. As designated national authority, the ministry follows and implements Clean Development Mechanism projects under the Kyoto Protocol[77].”

Albania - Ministry of Energy and Industry

"The mission of this agency is to develop and implement policies aimed at ensuring the country's energy supply, utilization of energy and mineral resources in view of sustainable economic development and public usefulness, promoting industrial development standards more environmentally friendly[78].”

Libya – National Oil Corporation

“The National Oil Corporation (NOC) is in charge of carrying out exploration and production operation through its own affiliated companies, or in participation with other companies under service contracts or any other kind of petroleum investment agreements. They are also responsible for marketing operations of oil and gas, locally and abroad. For this purpose, NOC has its own fully owned companies which carry out exploration, development and production operations, in addition to local and international marketing companies. NOC also has participation agreements with specialized international companies.[79]”

Cyprus - Department of Environment

"The Department of Environment apart from implementation and enforcement of legislation which is a result of the harmonization with the environment European acquis, is also the focal point for most of the U.N Conventions regarding global and regional environmental issues, amongst which the Barcelona Convention for the Protection of the Mediterranean has a prominent role[80].”

Cyprus - Ministry of Energy, Commerce, Industry and Tourism

"The Energy Service of the Ministry of Commerce, Industry and Tourism has the overall responsibility of Energy in Cyprus and specifically for: Monitoring and coordinating the supply and availability of sufficient energy capacity for domestic needs, monitoring and participating in the formation of the European Policy for energy issues, suggesting ways for the implementation of the European Acquis, assists in the preparation of Laws, Regulations, Rules etc. and implements programmed for their promotion, preparing and implementing programmed for energy conservation, the promotion of renewable energy sources (RES) and the developing of

technologies for the utilization of RES, assisting the Government in the formation of the national energy policy for Cyprus in coordination with all other bodies involved. This agency is also in charge of licensing rounds[81]."

Turkey - Ministry of Environment and Urban Planning

"This ministry is in charge of protecting Turkey's environment through state policies[82]."

Turkey - Energy Market Regulatory Authority

"The Energy Market Regulatory Authority is responsible for the regulation and supervision of downstream oil and gas market activities. EMRA is authorized to issue secondary legislation, issue downstream licenses, as well as apply sanctions if necessary[83]."

Israel - The Ministry of Environmental Protection

"The Ministry of Environmental Protection is responsible for the formulation of a nationwide, integrated, and inclusive policy for the protection of the environment. The ministry was established in December 1988 by Govt. Decision No. 5. This proved a landmark in Israel's environmental development and in the government's determination to tackle environmental issues. At the national level, the ministry is responsible for developing an integrated and comprehensive governmental policy, as well as strategies, standards, and priorities for environmental protection. To this end, the ministry has professional divisions and departments that deal with a myriad of environmental issues, as well as with its administrative mechanisms and public relations[84]."

Israel - Ministry of National Infrastructures, Energy and Water Resources

"The Ministry of Energy and Water Resources is responsible for the energy economies and national resources of the State of Israel: electricity, fuel, cooking gas, natural gas, energy conservation, water, sewer mains, oil exploration, ores, scientific research of soil and the sea and more. One of their areas of interest is oil and gas exploration[85]."

Lebanon - Ministry of Environment

- "The Ministry of Environment of the Government has the following objectives: Ratify environmental conventions and protocols
- Issue key environmental laws and decrees
- Adopt key strategies for the well-being of the citizens
- Support environmental governance
- Protect the natural resources of Lebanon
- Reinforce the management of environmental risks[86]."

Lebanon - Petroleum Administration

"This agency is in charge of administering tenders for the exploration and exploitation of hydrocarbons in Lebanon[87]."

Syria - Ministry of Local Administration and Environment

"The Council for Environmental Protection and Sustainable Development is the overall environmental authority in Syria and has the responsibility of setting national policy and coordinating environmental activities and the adoption of environmental legislation, regulations and action plans. It is composed of representatives from all sectorial ministries as well as representatives from important non-governmental stakeholders. The Ministry of Local

Administration and Environment (MoLAE) is assisted by a number of technical consultative and secondary committees, and operates through two executive agencies:

- The General Commission for Environmental Affairs (GCEA), which is the technical arm of the ministry and advises the ministry on policy and technical issues at both the central and local levels. GCEA works through several central directorates, including those on biodiversity, water safety, land safety, climate change, atmospheric safety, chemical safety, Environmental Impact Assessment (EIA), public awareness, etc.
- The Environmental Studies Centre (ESC), which is the scientific arm of the ministry and has the authority to conduct pollution control, monitoring and research and to coordinate with national and international research organizations.

The MoLAE has established environmental directorates in all 14 governorates, as part of the local administration. They are presently being equipped with stationary and mobile laboratories as well as specialized equipment, aimed to implement the environmental policies[88]."

Syria – Syrian Petroleum Company

"The Syrian Petroleum Company (SPC) is responsible for all activity related to oil and gas industry including exploration activities, oil and gas production as all exploration and drilling works, reservoir, production, gathering and development studies[89]."

Egypt - Ministry of Environment/Egyptian Environmental Affairs Agency

"The goals of this ministry are to: introduce and integrate environmental dimensions in all national policies, plans, programs relevant to protection of human health and management of natural resources, preserve the natural resource base, national heritage and biodiversity within a context of sustainable development, and to reduce current pollution levels and thereby minimizes health hazards and improves quality of life[90]."

Egypt - Ministry of Petroleum

"The Ministry of Petroleum is the Egyptian authority that supervises exploration, production, marketing and distribution of oil, gas and other natural resources. The petroleum sector in Egypt consists of 6 state-owned entities. These are: Egyptian General Petroleum Corporation (EGPC), Egyptian Natural Gas Holding Company (EGAS), Egyptian Petrochemicals Holding Company (ECHEM), Ganoub El Wadi Petroleum Holding Company (GANOPE), and Egyptian General Authority for Mineral Resources[91]."

Regulatory Contact Information

Due to the large size of the Mediterranean regional grouping, complete sets of contact information could not be given for all regulatory agencies. Examples are given for the first two agencies of Israel. However, for all remaining agencies, website links were given to connect the user to any pertinent information regarding the agency in question.

Israel – The Ministry of Environmental Protection

Email: pniot@environment.gov.il
Website: http://www.sviva.gov.il/English/Pages/HomePage.aspx

Israel – Ministry of National Infrastructures, Energy and Water Resources

Address: P.O Box 33541 Haifa 31334
Telephone: 972-4-8644024
Email: pniot@energy.gov.il
Website: http://energy.gov.il/English/ContactUs/Pages/ContactUs.aspx

Spain Ministry of Environment, Rural and Marine Affairs

Website: http://www.magrama.gob.es/en/

Spain - Ministry of Industry, Energy and Tourism

Website: http://www.minetur.gob.es/en-US/Paginas/index.aspx

France – French Environment and Energy Management Agency (ADEME)

Website: http://www.ademe.fr/connaitre/priorites-strategiques-missions

France - Bureau Exploration-Production des Hydrocarbures (BEPH)

Website: http://www.beph.net/

Italy – Ministry of Environment

Website: http://www.minambiente.it/

Algeria - Ministry of Land-Use Planning and Environment

Website: http://www.mate.gov.dz/

Algeria - Ministry of Energy and Mining

Website: http://www.mem-algeria.org/francais/index.php

Tunisia - Ministry of Equipment, Land-Use Planning and Sustainable Developing

Website: http://www.environnement.gov.tn/index.php?id=199&L=1#.VK1ULCvF8QE

Tunisia – Ministry of Industry, Energy and Mines

Website: http://www.tunisieindustrie.gov.tn/

Morocco – Ministry of Energy, Mining, Water and Petroleum

Website: http://www.environnement.gov.ma/index.php/fr/ministere/le-ministre

Morocco - Office National des Hydrocarbures et des Mines

Website: http://www.onhym.com/en/

Greece - Ministry of the Environment, Physical Planning and Public Work

Website: http://www.minenv.gr/welcome_en.html

Greece - Ministry of Environment, Energy and Climate Change

Website: http://www.ypeka.gr/Default.aspx?tabid=766&locale=en-US&language=el-GR

Croatia - Croatian Environment Agency

Website: http://www.azo.hr/English

Croatia - Croatian Hydrocarbons Agency

Website: http://www.azu.hr/hr-hr/

Montenegro - Environmental Protection Agency

Website: http://epa.org.me/

Oil and Gas Montenegro

Website: http://www.petroleum.me/index.php?IDSP=223&jezik=eng

Albania - Ministry of Environment

Website: http://www.locsee.eu/index.php?page=ministry-of-environment-forests-and-water-administration-moefwa-albania

Albania - Ministry of Energy and Industry

Website: http://www.energjia.gov.al/

Libya - Ministry of Oil and Gas

Website: http://www.eia.gov/countries/cab.cfm?fips=ly

Cyprus - Department of Environment

Website:
http://www.moa.gov.cy/moa/environment/environment.nsf/index_en/index_en?OpenDocument

Cyprus - Ministry of Energy, Commerce, Industry and Tourism

Website: http://www.mcit.gov.cy/mcit/mcit.nsf/dmlenergyservice_en/dmlenergyservice_en?OpenDocument

Turkey - Ministry of Environment and Urban Planning

Website: http://www.csb.gov.tr/turkce/index.php

Turkey - Energy Market Regulatory Authority (EMRA)

Website: http://www.emra.org.tr/

Israel - The Ministry of Environmental Protection

Website: http://www.sviva.gov.il/English/AboutUs/Pages/AboutUs.aspx

Israel - Ministry of National Infrastructures, Energy and Water Resources

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Lebanon - Ministry of Environment

Website: http://www.moe.gov.lb/The-Ministry/Work-Plan.aspx

Lebanon - Petroleum Administration

Website: http://www.lpa.gov.lb/

Syria - Ministry of Local Administration and Environment

Website: http://www.mla-sy.org/

Syria – Syrian Petroleum Company

Website: http://www.spc.com.sy/en/production/activities1_en.php

Egypt - Ministry of Environment/Egyptian Environmental Affairs Agency

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North Atlantic: Regional Offshore Exploration and Production Profile

Offshore Oil Production (2012):
15 million barrels/year

Offshore Gas Production (2012):
200 billion cubic feet/year

The North Atlantic regional grouping includes three countries: France, Portugal, and Spain. Not covered in this regional profile document but located in the North Atlantic are Denmark and Iceland, which have their own priority country documents. France, Spain, and Portugal have little domestic hydrocarbon production, compared to their respective national demands. France and Spain are nearly 99% dependent on oil imports to satisfy consumption[1,2]. Portugal and France are prospective offshore hydrocarbon producers, with offshore exploration beginning in these two countries in the mid-1960s/1970s[3,4]. Spain is the only non-priority North Atlantic region country with actual offshore production, accounting for 0.25% and 0.08% of the total European Union oil and gas production, respectively[5]. Spain's offshore oil production is concentrated at the Ebro Delta region in the Mediterranean Sea[6]. Main companies participating in offshore exploration and production operations in the North Atlantic include Vermillion Energy (France) and Repsol-Yacimientos Petrolíferos Fiscales, or -YPF (Spain).

Geology and Geophysics

The Aquitaine and Paris basins are the main hydrocarbon basins in France. Offshore exploratory activity in the French northeast Atlantic is located in the Bay of Biscay, within the Aquitaine basin, off the southwest coast of the country. Offshore exploration in the Bay of Biscay began in the mid-1960s, and 24 wells had been drilled by 1995[7]. The French Bureau of Hydrocarbon Exploration and Production states one dry exploratory well was drilled in 2007, and most recent reported data indicates continued seismic exploration in the area[8,9]. In Portugal, offshore exploration history and data is available from the national hydrocarbon regulatory agency – the General Directorate for Energy and Geology[10]. Data from 2007 shows exploration contracts were signed for offshore areas in the Alentejo, Peniche, and Lusitanian basin, and in nearly 12,000 km of two dimensional seismic data were collected[11]. As of 2008, approximately 30 offshore exploratory wells have been drilled in Portugal, primarily along the western coast[12].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions in the North Atlantic region include potential for deep (greater than 1,000 feet water depth)/ultra-deep (greater than 5,000 feet water depth) hydrocarbon resources.[13] In Portugal, there is recent two dimensional (2-D) and three dimensional (3-D) seismic survey operations in deep water offshore areas, although no drilling operations have begun[14]. Cutting edge technologies used in offshore operations in the region include subsea tiebacks at the Casablanca platform, off the Spanish Mediterranean coast[15]. France, Portugal, and Spain are members of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), a legal entity for prevention and elimination of water pollution in the northeast Atlantic. Regarding abandonment/disposal of offshore platforms, OSPAR Decision 98/3 "prohibits dumping, and the leaving wholly or partly in place, of disused offshore installations within the

maritime area." Since this ban came into force in 1999, 122 offshore installation have been transported to shore for disposal and five structures have received permits to be left in place[16].

Methods of Offshore Tender

License/concession agreements are used in all three North Atlantic regional countries for upstream hydrocarbon operations. In Spain, national and international companies are required to pay taxes for operations and hydrocarbon production from licensed exploration/production blocks[17]. In France, hydrocarbon concessions holders are required to make royalty payments to the government, based on hydrocarbon production rates prior to and after January 1st, 1980. Regarding natural gas, operators are pay a 30% royalty payment on natural gas produced from facilities installed prior to 1980 and a 5% royalty payment on natural gas produced from facilities installed after 1980[18]. Regarding oil, royalty payments rates ranging from 0-12% and 8-30%, respectively, apply to oil produced from facilities installed prior and subsequent to January 1, 1980. In Portugal, exploration and production licenses are granted via public tender or direct negotiation for an initial period of 8 years; if commercially viable hydrocarbons discoveries are made, exploration and production license periods can be extended by 25 years, and for a maximum total exploration and production period of 40 years[19]. Royalty charges on produced oil in Portugal range from 0% (annual production less than approximately 700,00 bbl) to 10% (for shallow water offshore facilities with greater than approximately 3.7 million bbl/day production rate).

Environmental Overview and Development

As member states of the EU, France, Portugal, and Spain are required to comply with the EU's EIA Directive introduced in 1985. It applies to a wide range of public and private projects where the developer may request the appropriate authority in each country to identify what is required in the EIA. The developer must provide a report of the anticipated impacts of the project on the environment. The environmental authority and the public are informed and consulted; the authority decides if the project is approved, and the public has an opportunity to challenge the decision in court. Each country of the EU must have an appropriate environmental authority, which is discussed in the section below (Regulatory Bodies)[20].

Natural Resources

The North Atlantic is bordered by France, Spain, and Portugal with over 350 total marine protected areas (MPAs). This includes about 200 in France, 72 in Portugal, and about 80 in Spain, totaling around 5,600 square miles in protected ocean.

According to the high resource value analysis figure, most of the North Atlantic is protected. There is an apparent MPA spanning from the east coast of the United States across the Atlantic to the coasts of Portugal and Spain, with a separate MPA off the coast of France overlapping it. It is unclear whether the medium blue color represents the 2 MPAs overlapping, or seagrass habitat. Right along the coasts of all three group countries are threatened and endangered species ranges, marine bird areas, and salt marsh habitat. The figure does not present visible evidence of mangrove habitat, coral habitat, or marine turtle nesting beaches and foraging grounds (See Figure 1 below).

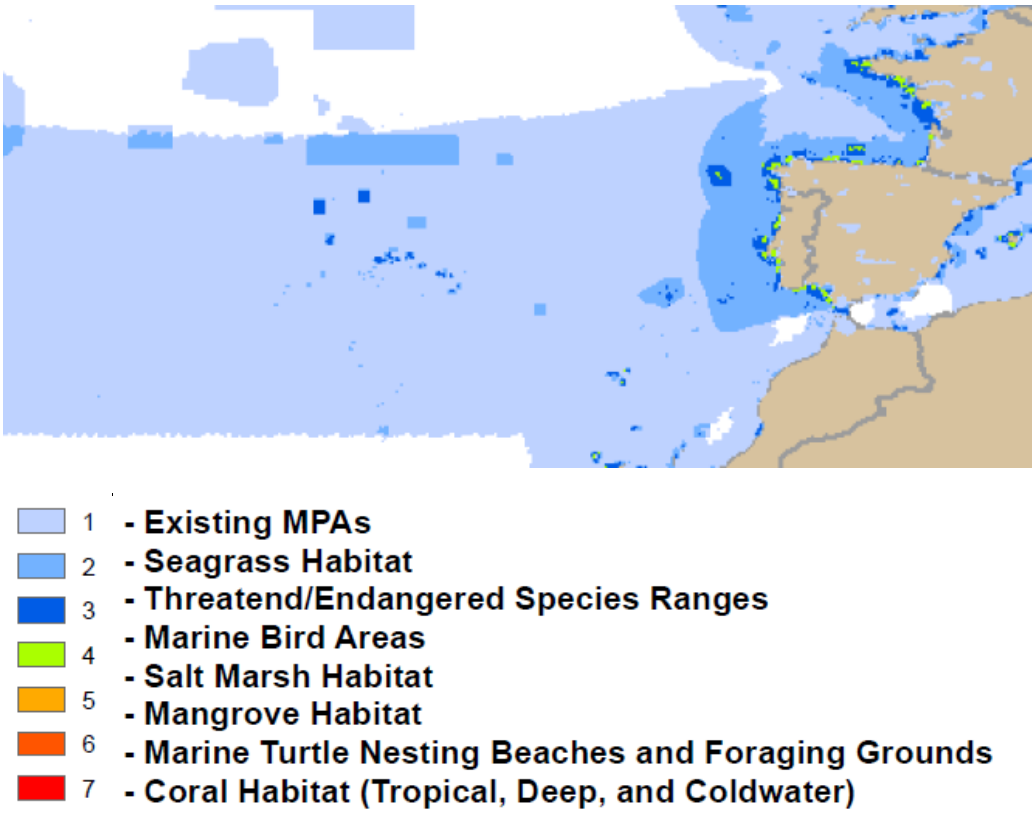

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There are several historical shipwrecks in the North Atlantic.[21] One notable wreck is the British Naval ship HMS Zinnia (Corvette of the Flower class), that was torpedoed and sunk by a German submarine west of Portugal in 1941[22] There are several coastal archaeological sites along the North Atlantic. Sites such as the Cave of Altamira and Paleolithic Cave Art of Northern Spain, depicts the apogee of Paleolithic cave art that developed across Europe from 35,000 to 11,000 BC.[23] In addition, there are several historic properties and towns along the North Atlantic coastline.[24]

Socio-economic and Tribal

Spain was chosen as the focus country to offer a unique perspective on the North Atlantic region. Spain is one of the western countries that is highly dependent on foreign oil. In 2014, Spain authorized offshore oil drilling off the coast of the Canary Islands, an UNESCO biosphere reserve and top European winter destination, in hopes to propel its economic recovery. The Canary Islands' regional government as well as environmental groups such as the Greenpeace opposes offshore drilling. A poll conducted in 2014, indicates that 84 percent of Lanzarote residents are also opposed to oil drilling. Additionally, protests had erupted at gas stations on the island that belong to Repsol, the Spanish oil company.[25] Repsol argues that the field off the coast of the Canary Islands has the potential to supply 10% of Spain's oil needs, which will significantly assist with the economy recovery. In support of offshore drilling activities, the central government in

Madrid changed the law to allow fracking regardless of regional legislation.[26] No tribal issues pertaining to the North Atlantic region were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Ministry of Ecology, Sustainable Development and Energy is a main regulatory body in France. They are responsible for executing and enforcing environmental policies relating to climate change, water, biodiversity, risk prevention, management of the coast and sea, transportation, and sustainable development[27]. The Ministry of Environment, Spatial Planning, and Energy[28] and the Portuguese Environmental Agency[29] are the two regulatory bodies for Portugal. The Ministry of Environment, Planning, and Energy is the regulatory body in Portugal, with the Portuguese Environment Agency (under the Ministry) responsible for proposing, developing, and monitoring public policies for the environment and sustainable development associated with: air, water, waste, climate change, chemicals, noise, protection of the ozone layer, genetically-modified organisms, citizen participation, environmental assessments, environmental economics and green growth, and environmental risks. Spain's Ministry of Agriculture, Food and Environment is the overarching regulatory body responsible for environmental impact assessments (EIAs) along with federal policies regarding climate change, biodiversity, marine resources, etc.[30]

Offshore and Others

European Union Directive 2013/30 "on safety of offshore oil and gas operations" outlines responsibilities/cooperation of member state offshore regulatory bodies[31]. The directive provides guidelines on operations oversight (including "inspections, investigations, and enforcement actions") and establishment/assessment of offshore operations reporting. Countries with upstream offshore operations are bound to implement these measures by 2015.

One source of cooperation between North Atlantic region European Union member countries is outlined in Chapter VI, article 27 of the 2013 EU Directive "on safety of offshore oil and gas operations." This section prescribes actions for EU Member States to work with the European Commission in the administration of offshore oil/gas operations, including regular exchange of information/experiences through the European Union Offshore Oil and Gas Authorities Group (EUOAG)[32]. A second form of cooperation between North Atlantic region countries is participation in OSPAR. The OSPAR Convention entered into force in 1998 and serves a forum for member countries to prevent and eliminate pollution in the North East Atlantic, including from oil/gas operations[33]. France, Portugal, and Spain are located within Region IV of the North East Atlantic, consisting of the Bay of Biscay and the waters of the Iberian coast.

Once source of conflict is between the Spanish oil company Repsol and the Canary Islands regional government. The Spanish government recent approved offshore drilling at the Canary Islands, a Spanish archipelago located off the southwest coast of Morocco, which is opposed by

the local Canary Islands government on the grounds that oil/gas activities will negatively affect the tourism sector[34].

Federal regulatory authorities in the realms of oil/gas financing, environment, and industrial safety and health were identified for North Atlantic region countries. Descriptions/background and contact information for environmental and oil/gas authorities are provided below.

France

Bureau of Hydrocarbon Exploration and Production

The French Bureau of Hydrocarbon Exploration and Production is a governmental body responsible for managing French hydrocarbon exploration and production activities, including exploration and production licenses and field monitoring[35].

Ministry of Ecology, Energy, and Sustainable Development

The French Ministry of Ecology, Energy, and Sustainable Development is the federal environmental regulatory and compliance body in France[36].

Portugal

General Directorate for Energy and Geology

The General Directorate for Energy and Geology of Portugal is the national oil/gas body within the Ministry of Economy, charged with supervising and promoting Portugal's energy and natural resources sectors. The Portuguese Maritime Authority is responsible for oversight of safety in offshore areas and water resources protection/pollution prevention[37].

Ministry of Environment, Spatial Planning and Energy

Portugal's Ministry of Environment, Spatial Planning, and Energy is a primary federal regulatory body charged with environmental law administration and enforcement. Additional regulatory bodies with influence in environmental matters in the country include: Regional Development and Coordination Committees, the Water and Waste Service Regulatory Entity, the Environment Portuguese Agency, and the Agriculture, Sea, Environment, and Spatial Planning General Inspectorate[38].

Spain

Ministry of Industry, Energy, and Tourism

The Ministry of Industry, Energy, and Tourism of Spain, along with the Ministry of Agriculture, Food, and Environmental have roles in regulation of the oil/gas sectors. One specific responsibility of the Ministry of Industry, Energy, and Tourism is to award titles for offshore exploration/production areas in the country[39].

Ministry of Agriculture, Food, and Environment

Spain's Ministry of Agriculture, Food, and Environment is the country's primary agency with responsibilities in environment/natural resources protection, including formation of laws regarding environmental quality and assessment, marine life, climate change, and water quality[40].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

France

Bureau of Hydrocarbon Exploration and Production -
Contact information not identified in publicly available English language sources.

Ministry of Ecology, Energy, and Sustainable Development
Address: Grande Arche Tour Pascal A et B, FR-92055 Paris La Defense CEDEX, France
Telephone: +33-140-8121-22
Email: ministere@developpement-durable.gouv.fr
Website: http://www.developpement-durable.gouv.fr

Portugal

General Directorate for Energy and Geology
Address: Avenida 5 de Outubro, #87, PT-1069-039, Lisbon, Portugal
Telephone: +351 217-922-700
Email: energia@dgeg.pt
Website: http://www.dgeg.pt/

Ministry of Environment, Spatial Planning, and Energy
Address: not identified in publicly available sources
Telephone: not identified in publicly available sources
Email: http://www.portugal.gov.pt/pt/os-ministerios/ministerio-do-ambiente-ordenamento-do-territorio-e-energia/contactos.aspx (email contact webpage - in Portugese)
Website: http://www.portugal.gov.pt/pt/os-ministerios/ministerio-do-ambiente-ordenamento-do-territorio-e-energia/sobre-o-ministerio-do-ambiente-ordenamento-do-territorio-e-energia.aspx (in Portuguese)

Spain

Ministry of Industry, Energy, and Tourism
Address: P° de la Castellana 160. 28046 Madrid, España
Telephone: 91 349 4640/902 44 60 06
Email: informacion@oepm.es
Website: http://www.minetur.gob.es/en-us/Paginas/index.aspx

Ministry of Agriculture, Food, and Environment
Address: P° Infanta Isabel, 1 28014 Madrid (Communications Director – D. Jesús María Mellado Morales
Telephone: 91 347 45 80
Email: gprensa@magrama.es (Communications Director)
Website: http://www.magrama.gob.es/en/ministerio/

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North Sea: Regional Offshore Exploration and Production Profile

Offshore and Onshore Oil Production (2014): 126 Thousand barrels per day (Mbbl/d)

Offshore and Onshore Gas Production (2014): 440 Billion cubic feet per year (Bcf/y)

The North Sea regional grouping contains the countries Belgium, France, Germany, and Ireland. The North Sea is a potentially significant source of hydrocarbons, with multiple countries having claims to resources in the waters. Hydrocarbon reserves are primarily identified in shallow to medium depth water basins, but there are select deep water exploration wells located in the region.[1] Along the English Channel, a sub-set of the North Sea, the UK and France have performed exploration activities in the past. Currently, the UK has found hydrocarbons north of the Purbeck-Isle Wight (central southern tip of the UK), but no further economic discoveries have been made across the English Channel Basin to this date.[2]

In the North Sea region, the UK, Norway, Denmark, and the Netherlands are producing large quantities of oil and gas and have invested in offshore exploration and production technologies such as subsea pipelines and drilling equipment[3]. Norway and the United Kingdom are the largest producers of offshore oil and gas within this region. Of the four countries considered in this regional grouping (Belgium, France, Germany and Ireland), Germany produces the largest oil and gas quantities while Belgium does not produce either. Most of Germany's offshore production takes place on the Mittelplate platform (off the north-western coast of Germany) in the tidelands of Schleswig Holstein and the A6-A platform in Entenschnabel (middle of the North Sea and northern most point of Germany's offshore territory).[4] Ireland produces significantly less oil and gas than Germany and currently has only 5% of its offshore areas licensed. France also does not have significant production quantities and currently produces roughly 1% of the oil it consumes.

Geology and Geophysics

The main sedimentary basins of this region can be broadly divided into 4 separate provinces, based on petroleum geology and position. These include the North Sea Oil Province, the North Sea Gas Province, the Irish Sea, and the Atlantic Margin. The reservoir ages within this region include the Jurassic and Triassic with most of Germany's production taking place with reservoirs from the Jurassic period.[5] Field and well-level data for geologic ages, reservoir and water depths are reported in Ireland and available for public review.[6] Geophysical evaluation of the seismic surveys conducted in Ireland along with if the records were released are available online on Ireland's Department of Communications, Energy, and Natural Resources website.[7] Belgium currently is producing no oil or gas. While France does have minimal oil and gas production, information pertaining to the geology was not identified in available sources.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

As evident from UK, Norway, Netherlands and Denmark, this region utilizes a variety of technologies for regions with shallow or deep water reserves, high pressure-high temperature conditions, and with hydrogen sulfide present. Germany, in their largest oil field, utilizes

extended reach drilling technology, and has drilled 7 extended reach wells drilled horizontally through the Busum salt dome.[8] Other technologies comparable to the UK, Norway, Netherlands, and Denmark are utilized in this region.

Methods of Offshore Tender

Offshore licensing/concessions and royalties apply to oil/gas financing regulations/practices of countries included in the North Sea grouping. Germany collects royalties based on an amount that may deviate established by the Federal State.[9] Ireland has established a tax regime that has both a profit resources rent tax (PRRT) and corporate tax. The corporation tax is a flat 25%[10], while the PRRT varies depending on the profit ratio of the well. The PRRT applies to licenses provided after January 1 2007.[11] Belgium currently is producing no oil or gas and a designated oil and gas regulatory body was not identified in available sources. While France does have minimal oil and gas production, information pertaining to the offshore tendering was also not identified in available sources.

Environmental Overview and Development

All four countries that border the North Sea have environmental impact assessment (EIA) requirements. As Belgium, France, Germany, and Ireland are all part of the EU, they must comply with the EU's EIA Directive of 1985 (85/337/EEC). It applies to a wide range of public projects and includes all Member States[12]. In 2011, Belgium was reprehended by the Court of Justice because of their deficient implementation of the EIA Directive. They are working to comply with the Directive guidelines as of March 2013[13].

Natural Resources

The North Sea includes Belgium, France, Germany, and Ireland. The coast is heavily protected by various forms of marine protected areas (MPAs). Belgium has established 4 MPAs, France has 24, Germany has over 100, and Ireland has 2. Almost 9,660 square miles are protected through these MPAs.[14]

As shown in the high resource value analysis figure, it appears that the entire English Channel is included in an existing MPA. There are some marine seabird areas and seagrass habitat which is home to a wealth of organisms, as well as threatened and endangered species (See Figure 1 below).

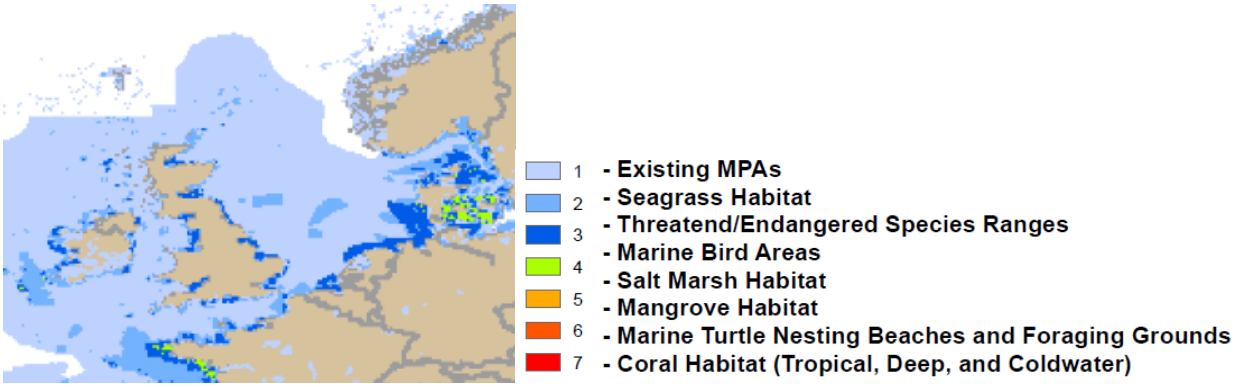

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

In 2009, 267 shipwrecks were discovered in the English Channel. Several of the wrecks are historic dating back to hundreds of years. Submarines from the two world wars were also recovered; among the submarines is a World War II German U-boat.[15] The abundance of shipwrecks in the English Channel illustrates the importance of the region for maritime trade, transport, warfare and defense.[16] In addition, erosion on the English Channel floor dating back to 8,000 years reveals the remains of a busy Stone Age settlement.[17] There are several archaeological sites as well as historic properties and towns along the English Channel coastline[18]

Socio-economic and Tribal

It is believed that there is a significant amount of oil and gas generated in the English Channel. As of 2014, a total of 23 exploration and appraisal wells have been drilled in the UK sector of the English Channel.[19] There is a continued pattern of interest for oil exploration off the Dorset Coast; as of 2012, 19 offshore exploration wells have been drilled in a total of 9 blocks at various intensity. Compared to the North Sea, offshore oil exploration off the coast of Dorset has been well explored.[20] The only wells drilled south of the Central English Channel High have been in French waters; unfortunately no data is available to the success or dearth of oil discovery.[21] No tribal issues pertaining to the English Channel was found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The overarching regulatory body for Belgium is the Flemish Environment Agency (VMM)[22]. They are working to improve their environmental impact assessment (EIA) process[23]. The regulatory body for France is the French Agency for Food, Environmental and Occupational Health & Safety (ANSES). They evaluate project impacts on the health and safety of the environment and French citizens[24]. The central federal agency on environmental matters in Germany is the Federal Environmental Agency (UBA). They provide scientific support to the Government, implement environmental laws, and publish public information about environmental protection[25]. In Ireland, the central environmental agency is the Environmental Protection Agency (EPA). The EPA assesses environmental impact statements (EISs) when companies are applying for licenses[26].

Offshore and Others

Oil and gas regulatory bodies manage various aspects of offshore exploration and production activities in the each country located within the North Sea regional grouping. The European Commission have issued directives to ensure the highest standard pertaining to health and safety practices across Europe.[27] Further details on some of the oil and gas regulatory bodies in Germany, Ireland, Belgium, and France are provided below.

Ireland - Department of Communications, Energy and Natural Resources

The Department of Communications, Energy and Natural Resources (DCENR) is responsible for protecting, regulating and developing natural resources in Ireland. One of DCENR's departments, the Exploration and Mining Division is responsible for encouraging responsible development of minerals, while increasing the attractiveness for investment. Another division, the Petroleum Affairs Division is responsible for maximizing the benefit to the state from petroleum resources, ensuring safety, and protecting the environment.[28]

Ireland - Environmental Protection Authority

The Environmental Protection Authority is in charge of protecting the environment by environmental licensing, enforcing environmental laws, regulating greenhouse gas emissions, monitoring, guidance, and research and development.[29]

France – Bureau of Hydrocarbon Exploration and Production

The French Bureau of Hydrocarbon Exploration and Production is a governmental body responsible for managing French hydrocarbon exploration and production activities, including exploration and production licenses and field monitoring[30].

France – Ministry of Ecology, Energy, and Sustainable Development

The French Ministry of Ecology, Energy, and Sustainable Development is the federal environmental regulatory and compliance body in France[31].

Germany – Local State Mining and Environmental authorities

In Germany, oil/gas legislation, licensing, and financial matters fall under purview of local state authorities[32, 33]. For example, Schleswig-Holstein is one of two German states (other is Mecklenburg-Vorpommern) located on the Baltic Sea. Responsible mining and environmental agencies for this state are the State Office of Mining, Energy, and Geology, and the State Agency for Agriculture, Environment, and Rural Areas, respectively.

Germany – The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)

BMUB is responsible for protecting the environment, while ensuring a responsible use of raw materials. This agency is also responsible for ensuring action on behalf of maintain the climate.[34]

Belgium –Federal Public Service for Health, Foods Chain Safety and Environment

The Federal Public Service for Health, Food Chain Safety and Environment is in charge of ensuring a better environment and make policies that help maintain a healthy environment across Belgium.[35]

A designated oil and gas regulatory body was not identified based on available sources.

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Ireland - Department of Communications, Energy and Natural Resources:

29-31 Adelaide Road, Dublin 2, Ireland
Telephone: +353-1-6782000
Website: http://www.dcenr.gov.ie/
Email: customer.Service@dcenr.gov.ie

Ireland - Environmental Protection Agency:

PO Box 3000
Johnstown Castle Estate
Wexford
Telephone 053-916 0600
Website: http://www.epa.ie/about/contactus/query/#.VKqew9LF-So

France - Ministère de l'Economie, du Industrie et du Numérique

Bâtiment Necker - Télédoc 792
120 rue de Bercy
75572 Paris cedex 12
Website: http://www.cgeiet.economie.gouv.fr/PagesTextes/00Contact.html
Email: contact.cgeiet@finances.gouv.fr

France – Ministry of Ecology, Energy, and Sustainable Development

Address: Grande Arche Tour Pascal A et B, FR-92055 Paris La Defense CEDEX, France
Telephone: +33-140-8121-22
Email: ministere@developpement-durable.gouv.fr
Website: http://www.developpement-durable.gouv.fr

Germany – State Authorities

Website:
http://www.lbeg.niedersachsen.de/download/1235/Legislation_Licensing_and_Fiscal_regime_for_oil_and_gas_exploration_and_production_in_Germany.pdf

Germany – The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
11055 Berlin
Germany
Contact Page: https://secure.bmub.bund.de/en/service/buergerforum/bmu-english-contact/
Website: http://www.bmub.bund.de/en/bmub/addresses/

Belgium – State Authorities

Website: http://www.health.belgium.be/eportal/Aboutus/ourorganisation/index.htm

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Persian Gulf: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 7.12 billion bbl / year
Total Gas Production (onshore/offshore): 12,746 billion cubic feet/year

The Persian Gulf (or Arabian Gulf) is a "600-mile long body of water which separates Iran from the Arabian Peninsula[1]." The Persian Gulf regional countries include Saudi Arabia, Oman, Kuwait, Iran, Iraq, and the United Arab Emirates (U.A.E). Some of the Persian Gulf's largest oil fields are in Saudi Arabia and include Safaniya, Zuluf, Manifa, Marjan, and Abu Safah, "which have approximately 58.6 trillion barrels of oil in reserves[2]." As of 2012, the production rate of Saudi Arabia's largest oil field, Ghawar, is 890 thousand barrels per day[2]. The Karan gas field was discovered in 2012 and began production in 2012, producing approximately 1.8 billion cubic feet per day of gas that is delivered to the Khursaniyah gas plant through a 68-mile subsea pipeline. In addition, the Wasit Gas Program is a project scheduled to take place in 2014, which consists of the "development of two offshore natural gas fields, the Arabiyah and Hasbah fields, and the construction of the Wasit Gas Plant, which is capable of processing 2.5 billion cubic feet per day of natural gas from these fields[2]."

Most of the offshore production in Oman comes from the Oman Basin, although some of it also comes from smaller fields in the Musandam Peninsula[3]. A new offshore development in Oman is the Block 52 field, which contains approximately 5.34 trillion barrels of oil in the field. However, production from this field has not yet started.

Kuwait is a member of the Organization of the Petroleum Exporting Countries (OPEC) and shares territory with Saudi Arabia, known as the Partitioned Neutral Zone (PNZ). The Kuwait Gulf Oil Company (KGOC) and the Aramco Gulf Operations Company (AOGC) established a combined company, Al-Khafji Joint Operations Company (KJO), to oversee offshore production in the PNZ area. The offshore oil production from the PNZ area is approximately 1 million cubic feet per day and comes mostly from the Khafji, Safaniyah, and Hout fields (in Saudi Arabia), as well as Durra, "which is an extension of Iran's Arash and shared with Saudi Arabia[4]."

The UAE is one of the "largest oil and gas producers in the world and is also a member of OPEC and the Gas Exporting Countries Forum (GECF)[5]." The offshore production in Abu Dhabi is produced in the "Adma-Opco's Umm Shaif and Lower Zakum fields and Zadco's Upper Zakum field[4]." In 2012, offshore production in Abu Dhabi amounted to approximately 5 million cubic feet per day. Smaller amounts of offshore production takes place in Dubai and Sharjah's fields. A new offshore development in the UAE is the Zora gas field owned by Dana Gas (an independent gas company located in Sharjah), and located off the coast of the Sharjah Coastline. Production from this field is expected to start in 2015 and is predicted to produce approximately 60 million cubic feet of gas per day.

In Iran, the Doroud 1&2, Salman, Abuzar, Foroozan, and Sirri fields contribute to most of the country's offshore oil production[1]. The largest gas field in Iran is South Pars and is located in the center of the Persian Gulf, and is responsible for approximately 40% of Iran's natural gas reserves[6].

In Iraq, the Iraqi Crude Oil Export Expansion Project (ICOEEP) has been planned and developed by the Ministry of Oil. It consists of a 153 mile pipeline located in the Persian Gulf of Iraq that will increase Iraq's "export capacity to the existing offshore facilities[7]." The ICOEEP facilities will include "an offshore platform, metering station, single point moorings, and subsea pipelines[15]."

Geology and Geophysics

The Persian Gulf Basin is one of the most hydrocarbon-rich areas in the world. According to estimates, the Persian Gulf Basin "contains 55-68% of recoverable oil reserves and more than 40% of gas reserves[8]." More than 70% of Middle Eastern oil is produced from Jurassic-Cretaceous sediments. Some of the most common source rocks in the Persian Gulf include the "Sargelu Formation (Middle Jurassic, 150-200m thick in type locality), Garau Formation (Lower Cretaceous, over 800m thick), Gadvan Formation (Lower Cretaceous, 100m thick), and Kazhdomi Formation (Middle Cretaceous, 200m thick) in the Zagros Basin of south-west Iran. Age-equivalent limey-shale formations are also found in Iraq and the Persian Gulf areas[9]."

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Several countries in the Persian Gulf operate in deepwater, hydrogen sulfide rich, and high pressure / high temperature (HPHT) environments for offshore production. For instance, oil and gas company Total "signed an exploration and production-sharing agreement for deepwater Block 41 located off the northern Omani coast with the country's Ministry of Oil and Gas[10]." Although Total has some experience with deepwater projects off the coastlines of West Africa, the North Sea, and the Gulf of Mexico, this is the first time they are exploring parts of Oman. Furthermore, FOS Energy LLC, a service provider for Oman's oil industry, "has drilled and tested several HTHP wells in Oman[11]." In addition, the Persian Gulf region in general has high quantities of sour oil and gas deposits.

Some of the technologies that the Kuwait Oil Company is employing to deal with "deep, sour, and HPHT drilling conditions, include high-resolution and wide-azimuth seismic surveys, direct hydrocarbon indicators and reservoir property measurements, fracture detection and mapping, pore pressure prediction, multi-component seismic surveys, and full field 4D seismic surveys[12]." Saudi Aramco uses electrical submersible pumps to increase production rates from its fields[13]. In 2000, Saudi Aramco also completed "its first multi-lateral completion well[14]" in the Berri field, which is located on the western section of the Persian Gulf. The Berri field contains both oil-rich and gas-rich reservoirs, and was Saudi Arabia's "first horizontal well and first multilateral producer[13]."

Examples of subsea production systems, which generally consist of offshore wells with flowlines connected to fixed platforms, floating vessels, or some other kinds of onshore installations, also exist in the Persian Gulf. For instance, the Bukha oil and gas field in Oman consists of a "well tied-back to a fixed platform situated in 295 feet of water[15]." Another field, the West Bukha oil and

gas field, between Oman and Iran is another subsea development consisting of “two wells tied-back to the West Bukha fixed platform through a flow line[14].”

Methods of Offshore Tender

In Saudi Arabia, petroleum concession agreements are used in the petroleum and natural gas industry. These agreements consist of royalties that vary according to the particular concession agreement and a corporate income tax rate that is 85% for oil production and 30% for natural gas investment activities[16]. These tax laws apply both to both Saudi and non-Saudi companies exploring hydrocarbons in Saudi Arabia.

In Oman, the oil and gas exploration and production fiscal regime consists of production sharing contracts and a corporate income tax of 55%. Production sharing contracts and service contracts are used in Iraq, and the corporate income tax rate is set at 15%. In Kuwait, the tax regime for oil and gas consists of royalties (15%) and income tax rates (15%).

In the United Arab Emirates, hydrocarbon taxation varies on the specific emirates. For instance, in Abu Dhabi, a corporate tax between 55%-85% is applied to oil and natural gas activities[17].

In Iraq, production sharing and technical service contracts are used. A corporate income tax rate of 35% is applied to upstream oil and gas activities. A withholding tax consisting or an interest rate of 15% and royalties of 15% is also imposed[16]. Service contracts are also used in Iran[18], and the “corporate income tax is 35% on net taxable profits[19].” Buyback contracts are also used in Iran, in which the Iran Oil Corporation acts as a contractor “that is paid back capital expenditure and associated financing costs plus an agreed upon profit over a specified time period[19].”

Environmental Overview and Development

Most of the countries, bordering the Persian Gulf have EIA requirements, however, they are upheld more rigorously in some countries than in others. Saudi Arabia has an EIA process, but it lacks judicial review and enforcement[20]. The EIA process in Oman is an established and important tool, but is not sufficient on its own to achieve sustainable development[21]. Kuwait has the beginning stages of the EIA process in place, but lacks the mitigation, monitoring, and managing components[22]. UAE also has a strong legal basis for EIAs, but lack alternative designs, and monitoring, mitigation and managing components[23]. There is no evidence of a formal system monitoring the EIA legislation and compliance in Iran. Some informal monitoring by environmental agencies has taken place, and the agencies are helping to improve the EIA process[24]. The United Nations Environment Programme (UNEP) has been working with Iraq to draft the framework of an environmental law[25]. Iraq does not appear to have EIA framework in place.

Natural Resources

The Persian Gulf is bordered by Saudi Arabia, Oman, Kuwait, United Arab Emirates (UAE), Iran, and Iraq. It is situated in the Middle East directly south of the Caspian Sea. There are a total of 113 marine protected areas (MPAs) in the Persian Gulf, including 61 in Saudi Arabia, 3 in Oman, 23 in Kuwait, 12 in United Arab Emirates, 14 in Iran (exclusively on the Persian Gulf side, there are not any MPAs on the Caspian Sea in Iran), and none in Iraq. Together these MPAs make up a total of over 2,260 square miles[26].

According to the high resource value analysis figure, most of the Persian Gulf is preserved through existing MPAs. There is also significant evidence of marine turtle nesting beaches and foraging grounds, coral habitat, seagrass habitat, salt march habitat, and marine bird areas (See Figure 1).

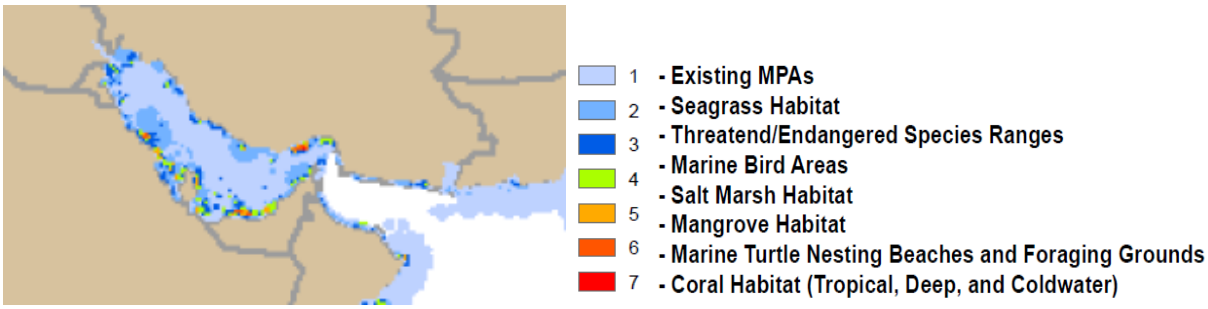

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

In 2006, remnants of a merchant ship belonging to either the Parthian (248 BCE - 224 CE) or Sassanid (224-651 CE) dynastic empires were discovered 230 feet below the waters of the Persian Gulf.[27] In 2012, a series of underwater excavations were commenced to identify the ruins of the historical port of Siraf located in the northwestern part of Bushehr Province in southern Iran.[28] There has been evidence of human settlements: a well-built stone house, elaborately decorated pottery, domesticated animals, and long-distance trade networks along the shores of the Persian Gulf dating to about 7,500 years ago.[29] There are several archaeological sites as well as historic properties and towns along the Persian Gulf coastline[30]

Socio-economic and Tribal

Iran was chosen as the focus country to offer a unique perspective on the Persian Gulf region. In 1908, Iran was the first country in the Persian Gulf to discover oil and it has been the primary industry in Iran since the 1920s. The Iranian oil and gas industry is still the primary source of economic growth, despite Tehran's attempts to diversify the economy. In 2008-2009, oil revenues accounted for 65 percent of government revenues although it only comprised around 10 percent of the gross domestic product.[31] In 2012, the North Drilling Company (NDC) has commissioned Iran's first wholly owned drilling rig in the Persian Gulf; prior, all the rigs installed in the Persian Gulf in the last 29 years had been rented. Iran has invested $153 million in building, transporting and commissioning the drilling rig.[32] Additionally, in 2012, The National Iranian Oil Company's (NIOC) announced its goal to drill 500 offshore wells and export technical and engineering services to different countries.[33] No tribal issues pertaining to the Persian Gulf were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental

The environmental regulatory body for Saudi Arabia is the Presidency of Meteorology and Environment (PME). The PME is responsible for implementing the General Environmental Law of 2001, as well as upholding the environmental protection standards[34]. The regulatory body for Oman is the Ministry of Environmental and Climatic affairs; the Ministry is tasked with managing and implementing principles of sustainable development and forging relationships regarding environmental and climatic issues with the international community[35]. Kuwait's regulatory body is the Environment Public Authority (EPA). The EPA is responsible for enforcing the basic rules for the protection of the environment, which includes minimizing the risks arising from industrial and economic development[36]. The United Arab Emirate Ministry of Environment & Water (MOEW) was established in 2006 to enhance the sustainability of the environment and uphold the laws put in place to support this goal[37]. The regulatory body for Iran is the Department of Environment (DOE). The DOE is responsible for ensuring environmental law compliance, issuing punishment for violations, and implementing relevant measures to maintain the environment[38]. The regulatory agency for Iraq is the Ministry of Environment. Their responsibilities are similar to those of Iran in that they ensure environmental law compliance, issue punishment for violations, and implement necessary measures to maintain the environment[39].

Offshore and Others

The federal regulatory bodies within the Persian Gulf region are diverse, with roles in offshore hydrocarbon activities, as well as areas of licensing, health, and safety. Even with the active nature of the region, there were no specific instances of regulatory cooperation or conflict between the various agencies in the region with respect to offshore drilling. Overviews and descriptions of some key regulatory bodies are found below:

Saudi Arabia – Ministry of Petroleum and Mineral Resources

This ministry is one of the main governmental agencies in Saudi Arabia and is responsible for any policies related to oil, gas, and mineral resources. The Ministry of Petroleum and Mineral Resources, with the help of the Supreme Council for Petroleum and Minerals, oversees the activities of Saudi Aramco.

Saudi Arabia – Presidency of Meteorology and Environment

This agency is responsible for evaluating existing industrial and urban activities in Saudi Arabia and ensuring that they are operating properly and not negatively impacting the health and safety of the people, as well as Saudi Arabia's environment. This entails ensuring that environmental quality standards are not exceeded and that pollution control technologies, practices, and guidelines are being followed accordingly.

Kuwait – The Ministry of Oil/Kuwait Oil Company

The Kuwaiti Ministry of Petroleum is responsible for executing any policies related to "upstream and downstream operations in the oil and natural gas sector[4]." The Kuwait Oil Company is a government-owned company that is responsible for both domestic and foreign oil and gas investments in Kuwait. They have developed an Electronic Tendering Portal that allows contractors to submit and view tender applications and status online.

Kuwait – Environment Public Authority

Kuwait's Environment Public Authority is in charge of implementing public policies that protect the environment and exploit the country's natural resources while maintaining certain environmental and health standards.

Oman – Ministry of Oil and Gas

The Ministry of Oil and Gas in Oman is the country's offshore licensing body. It is the agency responsible for preparing the Tendering Procedures Guidelines for all operators having any concession areas in Oman.

Oman – Ministry of Environment and Climatic Affairs

This ministry is in charge of "setting up the general policies, preparing plans and programs for protecting the environment, controlling pollution and nature conservation, and managing, implementing, and evaluating the climatic affairs for better consequences, ensuring the safety of the environment, pollution control and preservation of ecosystems in the context of the various fundamental objectives of sustainable development, protecting the wildlife, conserving nature, preserving the renewable resources, and working on utilizing them for sustainable uses[40]." In addition, this agency cooperates with other agencies and organizations concerned with the environment and climate and participates in international and regional conferences focused on environmental issues.

U.A.E – The Abu Dhabi National Oil Company (ADNOC)

In Abu Dhabi, petroleum policies are established by the Supreme Petroleum Council (SPC). The Abu Dhabi National Oil Company (ADNOC), "operates 15 subsidiaries throughout the oil, gas, and petrochemical industry and leads the day-to-day operations and implementation of SPC directives, and is the main shareholder in nearly all upstream activity in the country[5]." Some of ADNOC's subsidiaries in the oil and gas industry include the Abu Dhabi Company for Onshore Oil Operations (ADCO), the Abu Dhabi Marine Operating Company (ADMA-OPCO), the Zakum Development Company (ZADCO), and the Abu Dhabi National Tanker Company (ADNATCO). The Dubai Supreme Council of Energy (DSCE) is responsible for managing Dubai's energy development and has representatives from several agencies, including the Emirates National Oil Company (ENOC), the Dubai Petroleum Establishment (DPE), and the Dubai Nuclear Energy Committee (DNEC).

U.A.E – Ministry of Environment and Water

The U.A.E Ministry of Environment and Water is responsible for developing strategies and policies concerned with "the environment, water resources, agriculture, livestock, fisheries, desertification, and biodiversity conservation[41]." In addition, this agency promotes the sustainable development of resources by proposing appropriate legislative regulations.

Iran – National Iranian Oil Company (NIOC)

In Iran, the government-owned National Iranian Oil Company (NIOC) is in charge of upstream oil and gas projects, under the direction of Iran's Ministry of Petroleum. Even though Iranian state laws do not allow the foreign or private possession of natural resources, international oil companies are allowed to partake in exploration and production through buyback contracts, defined as "provisions in a contract requiring the seller to buy the property back for a stated price if certain conditions are met within a specified time period[42]."

Iran – Department of Environment

The main responsibilities of this environment are protecting the country's environmental resources, assessing the sustainable use of resources, and implementing policies to protect the environment.

Iraq – Ministry of Oil

The Iraqi Ministry of Oil manages oil and gas in all of Iraq (except for the Kurdish territory) through "its operating entities, including the North Oil Company (NOC) and the Midland Oil Company (MDOC) in the north and central regions, and the South Oil Company (SOC) and the Missan Oil Company (NOC) in the southern regions[43]."

Iraq – Nature Iraq

This is a non-governmental agency, "accredited to the United Nations Environment Programme[44]." Its main responsibilities include "developing a scientific database of environmental conditions and trends within Iraq through environmental monitoring and research programs focusing on water resources, ecology, and biodiversity, developing environmental education programs[21]," and encouraging the sustainable use of Iraq's natural resources and environment.

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Saudi Arabia Ministry of Petroleum and Mineral Resources

Telephone: 966114787777
Email: info@mopm.gov.sa
Website: http://www.mopm.gov.sa/Arabic/Pages/default.aspx

Saudi Arabia Presidency of Meteorology and Environment

Telephone: +966126536321
Email: dms@pme.gov.sa
Website: http://www.pme.gov.sa/en/env_prot.asp

Kuwait Ministry of Oil

Address:
P.O. Box: 5077
13051- Kuwait
Email: alnaft@moo.gov.kw
Website: http://www.moo.gov.kw/Home.aspx

Kuwait Oil Company

Address:
Kuwait Oil Company (K.S.C.)
P.O. Box 9758 Ahmadi
61008 Ahmadi, Kuwait
Email: kocinfo@kockw.com
Website: https://www.kockw.com/sites/EN/Pages/Default.aspx

Kuwait Environment Public Authority

Address:
Off 4thRing Road
Same entrance to GulfBank
Besides Ministry of Information
Shuwaikh Industrial Area
Kuwait
Telephone: 24828658- 24846518
Website: http://www.epa.org.kw/en-us/

Oman Ministry of Oil and Gas

Address:
Al-Khuwair, Ministry Streets, Opposite Sultan Qaboos Street
P.O Box: 551 Postal Code: 100 Muscat - Sultanate of Oman

Telephone: +968 24640640, +968 24640670, +968 24640669
Email: info@mog.gov.om
Website: http://www.mog.gov.om/english/tabid/54/Default.aspx

Oman Ministry of Environment and Climatic Affairs

Telephone: 800 777 77
Website:
http://www.oman.om/wps/portal/index/!ut/p/a1/04_Sj9CPykssy0xPLMnMz0vMAfGjzOKNDdwNDPwtPX29Q3wdDYyMw9y8LH3MjF1cTPSDU_P0C7IdFQHddPcP/

Abu Dhabi National Oil Company

Address:
Abu Dhabi National Oil Company
P.O. Box: 898. Abu Dhabi
United Arab Emirates
Telephone: +971-2-6020000
Website: http://www.adnoc.ae/

UAE Ministry of Environment and Water

Address:
Abu Dhabi Main Office:
Old Airport Road
Behind Carrefour
Opposite Abu Dhabi Retirement Pensions & Benefits Fund
P.O. Box 213

Dubai Main Office:
Deira
Abu Hail
Abu Hail Street
P.O. Box 1509

Telephone:
Abu Dhabi: 971 02 4444740
Dubai: 971 04 2148424

Email:
Abu Dhabi: adarchieve@moew.gov.ae
Dubai: archieves@moew.gov.ae
Website: http://www.moew.gov.ae/en/home.aspx

National Iranian Oil Company

Telephone: +98 (21) 61622211-3
Email: info@nioc-intl.ir
Website: http://en.nioc.ir/Portal/Home/

Iran Department of the Environment

Address:
Tehran, north of Highway martyr wise, fazlollah and legacy of Sheikh Imam, Nature Park campus, EPA
Telephone: +98 42781000-021
Email: info@doe.ir
Website: http://www.doe.ir/Portal/Home/Default.aspx

Iraq Ministry of Petroleum

Address:
Iraq
Baghdad
Port Saaed St.
Oil Complex Building (H.Q)
Zayouna Post Office
P.O.Box: 19244
Telephone: 00964-8177000**,** 00964-7270711**,** 00964-8177033
Email: minister.office@oil.gov.iq
Website: http://www.oil.gov.iq/en/

Nature Iraq

Visiting Address:
Nature Iraq
House 25, Street 27
Ashti District 104, Sulaimani
Kurdistan Region, Iraq
Mailing Address:
Nature Iraq, P.O. Box 249, Sulaymaniyah, Iraq
Telephone: +964 53 329 2007
Website: http://www.natureiraq.org/

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Red Sea: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 150.86 million barrels /year
Total Gas Production (onshore/offshore): 2411 billion cubic feet/year

The Red Sea is an extension of the Indian Ocean, and is located between Africa and Asia. The countries included in the Red Sea regional grouping are Djibouti, Eritrea, Somalia, Yemen, Egypt, and Saudi Arabia. Offshore oil and gas exploration and production in the Red Sea region is varied and diverse. For instance, in Djibouti, only oil and gas offshore exploration is taking place; currently there is no production. In 2011, Djibouti's government awarded UK based Oyster Oil & Gas exploration company 4 offshore blocks "covering an area of 5 square miles[1]." Oyster exploration company predicts that there are oil-bearing basins in the region, specifically in the Guban and Red sea basins. Out of the 4 blocks, "the mainly onshore block 1, which covers an area of 1300 square miles, extends into the shallow water of the Gulf of Aden and is located in the Guban basin[1]." Block 3 is in the deepwater part of the Red Sea basin and has an area of 900 square miles. In 2014, Djibouti entered into a Phase II of the Production Sharing Contract with Djibouti covering offshore blocks 1 and 3. Phase II consists of 2D seismic acquisitions and drilling[2].

Eritrea is generally considered to be a politically unstable country due to its wars with Ethiopia. As a result oil and gas has been underexplored for many years. In 2008, the Defba Oil Share company signed concession agreements for the Bahri and Defnin fields. In 2010, Canada's Centric Gas and Oil Company signed an exploration agreement with an onshore-offshore Dahlak block located in northeastern Eritrea. Other offshore exploration in Eritrea includes seismic acquisition surveys in the Zula block in central offshore Eritrea by U.S. company Anadarko[3].

In 2007, Yemen had 11 offshore blocks, "three of which were in the Red Sea, four in the Mukalla Sayhut area off the south-east coast, and four more in the Socotra Island[4]." As of 2007, 10 exploration wells were drilled in the Mukalla-Sayhut Basin. In addition, in 2013, the Yemen Ministry of Oil and Minerals provided a list off offshore blocks that are open for tender opportunities.

In 2014, Somalia was planning to produce offshore oil and gas for the first time in six years. The Somalian government was "in talks with companies including Royal Dutch Shell Plc, Exxon Mobil Corp., BP Plc and Chevron Corp. about reactivating dormant contracts in the country[5]." Even though there are no proven oil reserves in the country, it is anticipated that Somalia's geology is similar to Yemen's, which has 11 trillion cubic feet of oil reserves, and may prove economically feasible[4]. Also in 2014, international oil and gas company Mubadala Petroleum "signed a cooperation agreement with the Ministry of Petroleum and Mineral Resources of the Federal Republic of Somalia in order to help the development of the Somali petroleum sector[6]." During

the same time British Petroleum signed concession agreements with Somalian authorities to explore hydrocarbons in the Puntland province[7].

Egypt and Saudi Arabia have also explored oil and gas reserves in the Red Sea as well. BP Egypt has found significant amounts of gas in 2013 during its "deepwater Salamat exploration well in the East Nile Delta[8]." In addition, on August 23, 2014, BP announced gas discoveries from the DEKA project in offshore Egypt, which "is centered on the Denise and Karawan gas fields[9]."

Saudi Arabia's Aramco started conducting geophysical surveys in the Red Sea in 2009, primarily "in the shallow waters off the Tabuk province[10]." In 2013, "deepwater oil field Al-Haryd and a gas field" were found in the region, and Saudi Aramco also conducted "its deepwater drill test at its Duba -1 gas field in the northern Red Sea at a depth of 2,126 ft[10]." Deepwater depths revealed the presence of tight gas reservoirs in the region.

Geology and Geophysics

The Red Sea is a "narrow strip of water extending southeastward from Suez, Egypt for approximately 1,200 miles to the Bab el-Mandeb Straits, which connects with the Gulf of Aden and the Arabian Sea[11]." The Red Sea separates the Egyptian, Sudanese, and Eritrean coasts on the west to the Saudi Arabian and Yemenite coasts on the east. The Red Sea covers an area of 174,000 square miles, has a width of 190 miles, as well as depths as deep as 9,974 feet.

The Red Sea Salt basin "originated as an Oligocene cratonic rift between the northeastern part of the African continent and the Saudi Arabian peninsula[12]." The source rocks in this region include "Miocene and some Pliocene shales ranging from marine to terrigenous depositional settings[10] and typically average 1 to 4 weight percent Total Organic Carbon (TOC). The reservoir rocks include "Miocene and younger sandstones and carbonates from depositional environments ranging from deep marine to deltaic, coastal, and subaerial[10], and the average porosity is about 22 percent and the permeability is about 1 Darcy[*]"

Special Operating Conditions and New Cutting-Edge Technologies Utilized

The Egyptian Petroleum Research Institute describes instances of hydrogen sulfide mitigation technologies currently being implemented in the Red Sea, suggesting the presence of hydrogen sulfide in the region[13]. In addition, in 2014 BP announced its drilling of the Atoll-1 well offshore Egypt, which is a high pressure / high temperature well in Damietta city.

Special technologies used in the Red Sea include floating production, storage and offloading (FPSO) units, which are floating vessels used in the offshore oil and gas industry for both the production and processing of hydrocarbons. As of 2014, Egypt had one FPSO unit[14]. Other technologies include fixed platforms and subsea production systems. For instance, "specialist offshore services provider HSOG was awarded a major contract to deliver a range of works on the Simian CPI fixed platforms as part of the West Delta Deep Marie project, which is located 56 miles from the Nile Delta shoreline[15]." This project is the first deepwater project in the Eastern Mediterranean Sea and is anticipated to hold 4 trillion cubic feet of gas.

[*]A Darcy has a dimensional unit in length for permeability.

In addition, the Denis-Karawan (DEKA) project is a joint project between BP Egypt and Eni's International Egyptian Oil Company (IEOC). Production from this project is expected to start in 2015 and is supposed to consist of "5 subsea wells, installation of subsea production systems, and sea lines to the El Gamil onshore gas plant[9]." Technologies being applied in the Red Sea region of Saudi Aramco include "extended reach horizontal, complex horizontal maximum reservoir contact drilling, and shallow exploration drilling projects[16]." Deep water is also a new area of interest to Saudi Aramco. Aramco is currently evaluating several deep water plays in the Red Sea. Extended reach horizontal and complex horizontal maximum reservoir contact (MRC) well drilling is also a growing focus for the company both offshore and onshore, and in 2011, Saudi Aramco began the first shallow-water exploration drilling project in the Red Sea.

Methods of Offshore Tender

The fiscal regimes and methods of offshore tender for most of the countries in the Red Sea region are widely inaccessible based on available sources. However, Egypt's petroleum industry's method of offshore tender consists of production sharing contracts[17]. The production sharing agreement is the main document signed by the potential licensee and the Egyptian General Petroleum Corporation, which is Egypt's national oil company. Additionally, other features of Egypt's fiscal regime include income tax rates, which is "40.55% for profits on oil exploration and production[17]."

In Saudi Arabia, petroleum concession agreements are used in the petroleum and natural gas industry. These agreements consist of royalties that vary according to the particular concession agreement and a corporate income tax rate that is 85% for oil production and 30% for natural gas investment activities[18]. These tax laws apply both to both Saudi and non-Saudi companies exploring hydrocarbons in Saudi Arabia.

Information on the fiscal regimes of the other countries in this region was not identified in available sources.

Environmental Overview and Development

All countries bordering the Red Sea have EIA requirements. Many of the countries' EIA tools are in the process of being developed. Djibouti has an environmental management plan (EMP) equipped with implementation guidelines for an EIA, and stresses the importance of mitigation and the periodical review of the EIA and mitigation[19]. Eritrea has developed National Environmental Assessment Guidelines and Procedures, a Biodiversity Stocktaking Assessment Report, an Economic Assessment of Biodiversity Resources, and has written a draft for their Environmental Law[20]. Only one source was found of a Somalian based authority performing an EIA[21]. The World Bank is responsible for the administration of EIAs for all projects in Yemen. They also undertake the environmental screening of each proposed project to determine the appropriate extent and type of EIA[22]. Egypt requires an EIA to be done on all governmental and private projects. EIAs are administered and approved by the EEAA. The projects are monitored, and the guidelines state that the party implementing a project "shall keep a written record of the impact of his establishment on the environment (Environmental Record). . ." that is followed up with a review by the EEAA[23]. Saudi Arabia has an EIA process, but it lacks judicial review and enforcement[24].

Natural Resources

The Red Sea is bordered by Djibouti, Eritrea, Somalia, Yemen, Egypt, and Saudi Arabia. It is located between the northeast coast of Africa and the west coast of the Middle East, east of the Persian Gulf. There is a total of 79 marine protected areas (MPAs) in the Red Sea, including 3 in Djibouti, 1 in Eritrea, 5 in Somalia, 6 in Yemen, 3 in Egypt, and 61 in Saudi Arabia. Together these MPAs make up over 1,980 square miles of protected ocean[25].

According to the high resource value analysis figure, the majority of the Red Sea is preserved under existing MPAs. There is noticeable seagrass habitat, as well as mangrove habitat, sea bird areas, marine turtle nesting beaches and foraging grounds, and some coral habitat (See Figure 1 below).

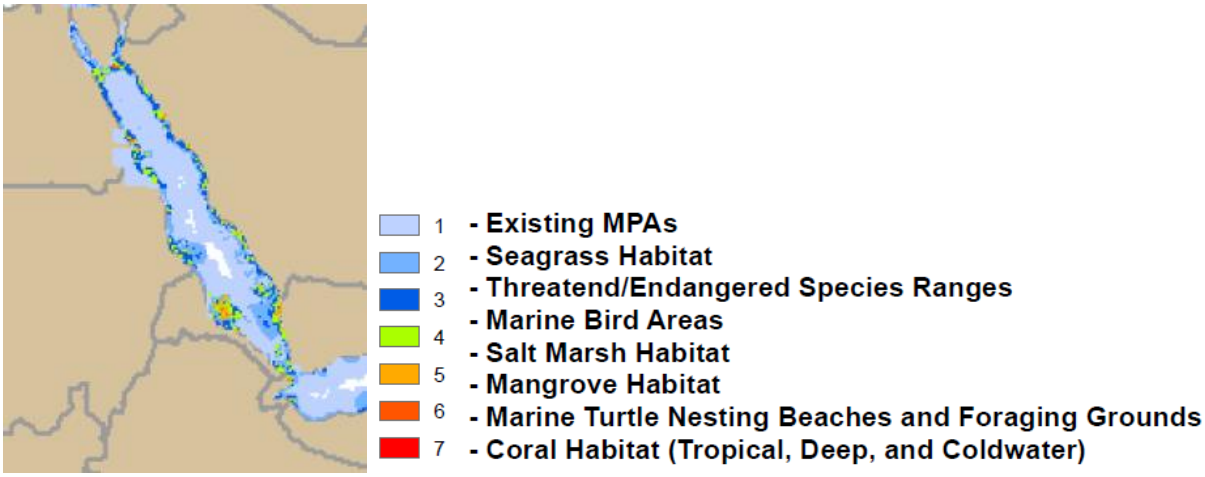

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

There have been several shipwrecks discovered in the Red Sea.[26] The most notable is the SS Thistlegorm, a seagoing merchant ship, which was sunk by German bomber planes in World War II. The SS Thistlegorm was discovered in Gubal in the Northern Red Sea.[27] In 2000, what was believed to be the earliest well-dated evidence for human adaptation to a coastal marine environment was discovered on the Red Sea coast of Eritrea. The artifacts, emerged on a reef terrace, date back to the Middle Stone Age.[28] There are several archaeological sites as well as historic properties and towns along the Red Sea coastline.[29]

Socio-economic and Tribal

Saudi Arabia was chosen as the focus country to offer a unique perspective on the Red Sea region. As of 2014, Saudi Arabia was the world's largest holder of crude oil proved reserves and the largest exporter of petroleum liquids in 2013. Additionally in 2013, Saudi Arabia was the world's second-largest petroleum liquids producer and the world's second-largest crude oil producer. Saudi Arabia's economy is heavily dependent on petroleum, accounting for 85% of total Saudi export revenues in 2013.[30] In 2014, Saudi Arabian Oil Company (Saudi Aramco) discovered three oil and two gas fields in the deepwater oil field Al-Haryd in the Red Sea. [31] The Saudi petroleum pipeline and export network has been a terrorist target in the past. In June of 2014, oil prices had fallen by more than 40 percent. No tribal issues pertaining to the Red Sea was found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

Djibouti has been struggling with a severe drought and environmental degradation for years. Their Ministry of Urbanism, Housing, and the Environment is making an effort to combat the environmental strain through the implementation of environmental and energy projects[32]. Eritrea's Ministry of Land, Water and Environment is the governmental body responsible for the conservation of land and water resources. They control the environmental impact assessment (EIA) process and put together a set of guidelines and procedures for this process. The Ministry of Marine Resources manages Eritrea's coastal zone and implements policies and proclamations regarding the coast[33]. Somalia has both a Ministry of Environment and Protection and Ministry of Fisheries and Marine Resources[34]. It is unclear what either of their responsibilities are. Both websites are incomplete. Yemen has a Ministry of Water and Environment (MWE) that aims to develop water resources through integrated water resource management and to protect the environment from pollution and desertification through the adoption and enforcement of relevant legislation[35]. The Egyptian Environmental Affairs Agency (EEAA) under the Ministry of Environment has collaborated with national and international development partners to define environmental policies, set priorities and implement initiatives with the goal of supporting a sustainable environment[36]. The environmental regulatory body for Saudi Arabia is the Presidency of Meteorology and Environment (PME). The PME is responsible for implementing the General Environmental Law of 2001, as well as upholding the environmental protection standards[37].

Offshore and Others

The regulatory bodies in the Red Sea region vary from offshore licensing agencies to ministries responsible for environmental protection. However, even with the diverse nature of these agencies, there were no examples of cooperation or conflict between them in this region. Descriptions of several of the main regulatory bodies are found below:

Somalia– Ministry of Petroleum and Mineral Resources

This ministry is in charge of managing hydrocarbons surveys and exploration, as well as implementing the country's petroleum regulations and environmental policies regarding the exploitations of hydrocarbons and minerals[38].

Somalia– Ministry of Environment and Rural Development

The responsibilities of the Ministry of Environment and Rural Development include "promoting, developing pastoral economy, conserving, protecting and sustainably managing the environment and natural resources for the country's development[39]," with the goal of developing an environment "through policy, legal, and regulatory reforms for harmonization of environmental and pastoral governance[16]."

Eritrea– Ministry of Energy, Mining, and Water

In Eritrea, the relevant environmental and energy agencies appear to be combined into one agency called The Eritrean Ministry of Energy, Mining, and Water. It was established in 1993 and its goal is to develop and conserve energy and mineral resources in the country, "ensure proper management in the implementation, exploration, promotion and utilization of energy and mineral resources in the country, develop national policies and strategies for the seconds of Energy and Mines setting short and long-term standards of development plans for the sectors, and developing and issuing laws that govern and guide the activities of the two sectors[40]."

Yemen- Ministry of Oil and Minerals

The Yemen Ministry of Oil and Minerals is in charge of managing oil and gas concessions. In addition, the ministry is responsible for administering oil and gas policies and handling relations with foreign licensees. Yemen General Corporation for Oil, Gas, and Mineral Resources, the national oil company, "guides a number of state-owned subsidiaries that handle daily operations and deal with energy sector revenues."

Yemen- Ministry of Water and Environment

The purpose of this Ministry is to implement policies that protect and conserve Yemen's water resources. In addition, this agency is in charge of "protecting the environment from pollution and desertification, conserving natural resources and rationalizing their exploitation, all through the adoption and enforcement of relevant legislations and the implementation of awareness-raising programs[41]."

Egypt– Egyptian Natural Gas Holding Company

The Egyptian Natural Gas Holding Company (EGAS) manages the "development of production, production, and marketing of natural gas[42]." EGAS is also in charge of awarding gas and oil exploration licenses and working with other international companies to develop natural gas fields and to operate gas processing plants.

Egypt– Ministry of Petroleum

The Ministry of Petroleum is the agency in charge of supervising the exploration and production of hydrocarbon resources. The petroleum industry in Egypt is made up of six state-owned corporates: The Egyptian General Petroleum Corporation (EGPC), Egyptian Natural Gas Holding Company (EGAS), Egyptian Petrochemicals Holding Company (ECHEM), Ganoub El Wadi Petroleum Holding Company (GANOPE), and the Egyptian General Authority for Mineral Resources.

Egypt– Ministry of Environment / Environmental Affairs Agency

The Egyptian ministry of environment was established in 1997 and its goals are to develop national policies and regulations to protect human health and ensure the sustainable use of natural resources. In addition, this agency aims to decrease current pollution levels through regulations and promote "environmental relations between Egypt and other States, as well as Regional and International Organizations[43]." The policies developed by the Ministry of Environment are executed by the Environmental Affairs Agency, which is a subdivision of the Ministry.

Egypt– Ministry of Finance

The Egyptian Ministry of Finance is responsible for "preparing legislation, planning revenues and expenditures, managing and supervising the budgetary spending process, and preparing a framework for economic policy and development[44]." In addition, this ministry is also responsible for developing and implementing "tax policies, customs duties and tariff policies, and other types of public income[19]."

Saudi Arabia – Ministry of Petroleum and Mineral Resources

This ministry is one of the main governmental agencies in Saudi Arabia and is responsible for any policies related to oil, gas, and mineral resources. The Ministry of Petroleum and Mineral Resources, with the help of the Supreme Council for Petroleum and Minerals, oversees the activities of Saudi Aramco.

Saudi Arabia – Presidency of Meteorology and Environment

This agency is responsible for evaluating existing industrial and urban activities in Saudi Arabia and ensuring that they are operating properly and not negatively impacting the health and safety of the people, as well as Saudi Arabia's environment. This entails ensuring that environmental quality standards are not exceeded and that pollution control technologies, practices, and guidelines are being followed accordingly.

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Somalia Ministry of Petroleum and Mineral Resources

Email: fkurweyne@mopetmr.so
Website: http://mopetmr.so/

Somalia Ministry of Environment & Rural Development

Telephone: 252-63-4424748
Email: info@slministryofenvironment.com
Website: http://slministryofenvironment.com/

Eritrea Ministry of Energy, Mining, and Water

Address:
Ministry of Energy and Mines
Asmara
Maekel
Eritrea
5285
Telephone: 291-1-120089
Website:
http://www.moem.gov.er/index.php?option=com_content&task=view&id=93&Itemid=70

Yemen - Ministry of Oil and Minerals

Website: http://www.mom.gov.ye/en/

Yemen - Ministry of Water and Environment

Email: essaaltalbi@yahoo.com
Website: http://www.yemen.gov.ye/portal/moew/الرئيسية/tabid/2037/Default.aspx

Egyptian Natural Gas Holding Company

Address:
85 Nasr Road, 1 st District, Nasr City, Cairo, Egypt
Telephone: +(202) 24055845/6/7/8
Email: egas@egas.com.eg
Website: http://www.egas.com.eg/home.aspx

Egypt Ministry of Petroleum

Address:
1 A, Ahmed El Zomor St., 8th District, Nasr City, Cairo
Egypt

Telephone: +202- 670 6401/2/3/4
Email: contact@petroleum.gov.eg
Website: http://www.petroleum.gov.eg/en/Pages/default.aspx

Egypt Ministry of Environment / Environmental Affairs Agency

Address:
30 Misr Helwan El-Zyrae Road, Maadi, Cairo, Egypt
Telephone: (202) 25256452
Email: eeaa@eeaa.cloud.gov.eg
Website: http://www.eeaa.gov.eg/english/main/about.asp

Egypt Ministry of Finance

Address:
Ministry of Finance Towers, Nasr city, Extension of Ramsis Street, Abbassiya, Cairo
Telephone: 02- 23427984
Email: finance@mof.gov.eg
Website: http://www.mof.gov.eg/english/Pages/Home.aspx

Saudi Arabia Ministry of Petroleum and Mineral Resources

Telephone: 966114787777
Email: info@mopm.gov.sa
Website: http://www.mopm.gov.sa/Arabic/Pages/default.aspx

Saudi Arabia Presidency of Meteorology and Environment

Telephone: +966126536321
Email: dms@pme.gov.sa
Website: http://www.pme.gov.sa/en/env_prot.asp

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South Pacific: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 178 thousand barrels/day
Total Gas Production (onshore/offshore): 445 billion cubic feet/year

The South Pacific regional grouping includes two South American countries: Chile and Peru. Peru and Chile both currently have offshore exploration and production operations, though not nearly as developed as other countries in South America, namely, Brazil. In Peru, offshore production operations are located off the northwest coast of the country in the Tumbes and Talara basins. One recent production project is at the shallow water (average depth of 200 ft.) Corvina oil/gas field in the Gulf of Guayaquil, where two fixed production platforms are in operation[1]. Chile's offshore hydrocarbon production is located at country's southern tip in the Strait of Magallanes, with 50 production platforms in operation[2]. While Peru has exploration and production operations in the South Pacific, Chile has yet to find commercially viable hydrocarbon resources in this body of water[3]. Petroleum operators in the region include Empresa Nacional de Petróleo (ENAP- Chilean state oil company), Petroperú (Peruvian state oil company), BPZ (operates in northern offshore Peru).

Geology and Geophysics

The United States Geological Survey (USGS) performed an assessment of hydrocarbon resources in 2000 in the Magallanes basin, which includes offshore areas in the southern portion of Chile. Mean undiscovered offshore hydrocarbon resources identified in the assessment were 205 million barrels of oil and approximately 4 trillion cubic feet of natural gas[4]. In Peru, offshore production is centralized on the northern coast in the Tumbes and Talara basin, although there are six additional basins with offshore hydrocarbon potential, including: the Sechura, Trujillo, Salaverry, Lima, Pisco, and Mollendo basins[5]. Oil and gas companies are interested to further explore offshore basins in the South Pacific region and there is active offshore seismic exploration in the area, including collection of approximately 7,800 miles of two dimensional (2-D) data off along the northwest coast of the Peru[6].

Special Operating Conditions and New Cutting-Edge Technologies Utilized

New technologies used in drilling and production operation in the South Pacific include subsea production pipelines and the world's first buoyant drilling and production platform[7]. Additional special operation conditions or cutting-edge technologies utilized were not identified based on available sources.

Methods of Offshore Tender

License/concession contracts are used in Chile and both license/concessions and service contracts are used in Peru. In Chile, the oil and gas industry is generally subject to the same tax structure as any other industrial business/operation in the country; applicable taxes includes corporate income tax (20%) and an upstream operations tax (up to 50% of gross hydrocarbon revenues)[8]. In Peru, upstream operations are performed under license or service contracts. Under a hydrocarbon license contract, operators are required to pay corporate income taxes (20%) and

royalties on produced hydrocarbons (ranging between 5-20%), whereas under a service contract operators are remunerated by the Peruvian government for work performed[9].

Environmental Overview and Development

In Chile, an environmental impact statement (DIA) and having an environmental impact assessment system (SEIA) in place are required. These instruments are used as procedures to determine if the environmental impact of an activity or project complies with prevailing regulations. The environmental impact assessment (EIA) process in Peru is an instrument for environmental management and policy implementation and enforcement. It ensures the public's right to information and is a tool for effective decision-making. A qualified authority or contractor performs the follow-up, evaluation, and oversight. The authority is not specified[10].

Natural Resources

The South Pacific is bordered by Peru and Chile. They both have extensive coastlines with a total of 67 marine protected areas (MPAs), 32 in Peru and 36 in Chile equaling over 4,400 square miles of protected coast and ocean[11].

According to the high resource value analysis figure, Chile's sea beyond the coastal zone has far-reaching existing marine protected areas (MPAs) in the north, and coastal MPAs to the south. There is a notably large patch of seagrass habitat in the central coastal zone of Chile, and a smaller one farther south. There is not significant evidence of salt marsh, mangrove, or coral habitat, nor do many threatened and endangered species have ranges in the South Pacific. Marine bird areas and marine turtle habitat is not apparent on the figure (See Figure 1 below).

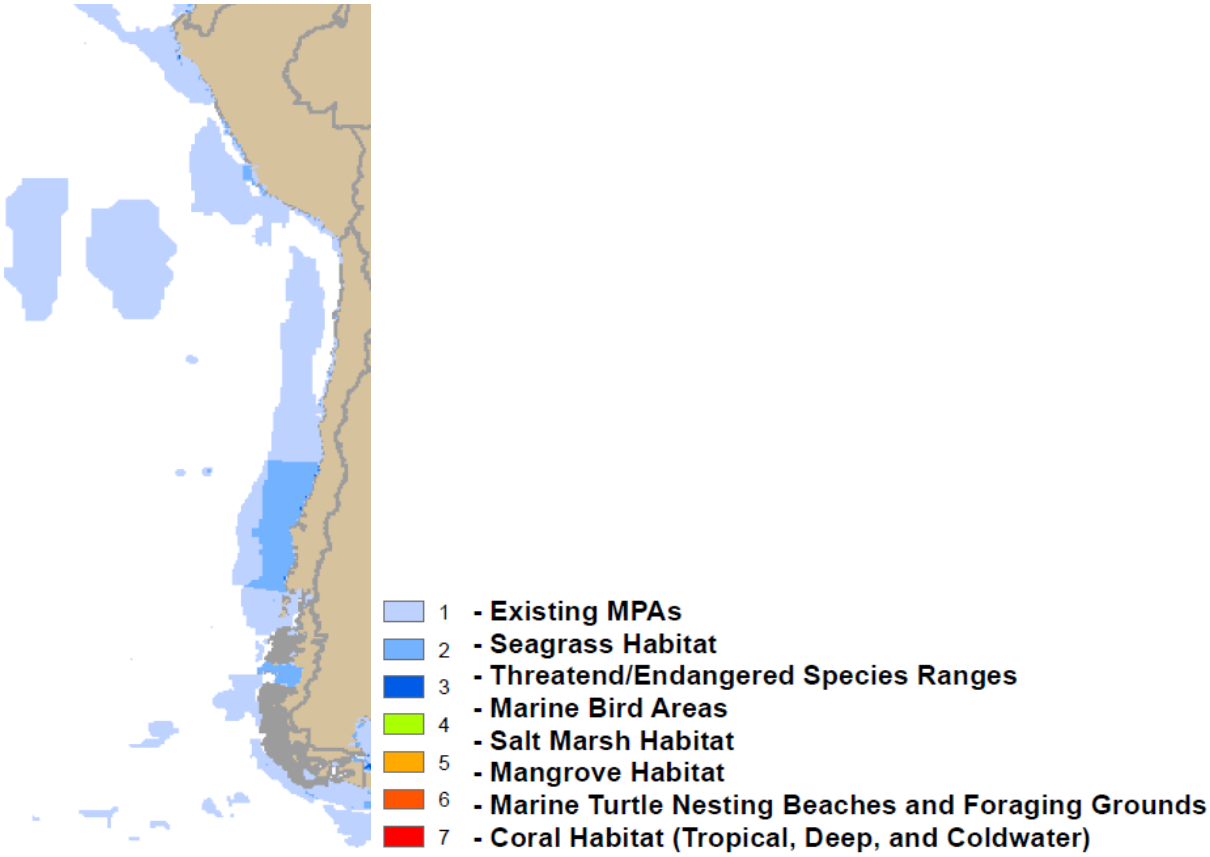

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There are several historic shipwrecks in the South Pacific. The Santa Ana and the San Francisco, two 17th century Spanish War Ships were discovered off the coast of Peru. Artifacts recovered include: artillery, ammunition, glass and ceramics.[12] Off the coast of Valparaiso, Chile, the Buen Jesus and San Juan Bautista, dating back to 1600 were discovered.[13] The Sacred City of Caral-Supe in Peru dates back to the Late Archaic Period and is the oldest center of civilization in the Americas.[1415] In addition, there are several historic properties and towns along the South Pacific coastline.[16]

Socio-economic and Tribal

Peru was chosen as the focus country to offer a unique perspective on the South Pacific area. Corvina Oil and Gas Field, along with the Albacora, Barracuda, Delfin and Piedra Redonda fields were discovered during the 1970s and 1980s. Five out of 18 wells tested positive for oil and/or gas. The wells were deemed not economically viable to produce and trade natural gas and were either suspended or abandoned. In November 2010, the Corvina field entered commercial production and in 2011, contracts to establish the second platform at Corvina field were finalized.[17] In 2014, seismic data and geological-geophysical evaluations have identified several prospects off the north coast of Peru, making offshore exploration a “highly attractive frontier region.”[18] BPZ Energy, an independent oil and gas exploration and production company, started production from

a well in the Corvina Oil and Gas Field.[19] The oil sector is becoming increasingly competitive in Peru and the revenues have the potential to become a major contributor to the economy. Over the next 10 years, it is forecasted that investment in oil and natural gas will be approximately US$23 billion. In order to advance and support the oil industry, the Peruvian government has begun the process of improving the permitting process and developing the appropriate infrastructure to support offshore drilling.[20] No tribal issues pertaining to the South Pacific region were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental and Others

The regulatory bodies in Chile are the National Environmental Commission (CONAMA) and the Regional Environmental Commission (COREMA), as well as all agencies with environmental and sectoral responsibilities. They evaluate projects and activities in Chile.[21] The Ministry of Environment in Peru promotes a sustainable environment through conserving, protecting, restoring, and safeguarding healthy environmental conditions, ecosystems, and natural resources[22].

Offshore and Others

Federal regulatory authorities in the realms of oil/gas financing, environment, and industrial safety and health were identified for the South Pacific region countries. An example of cooperation in the region is between Chiles's Ministry of Energy, a primary regulator of hydrocarbon activities and the state oil company ENAP, in collaborating on plans for developing the country's oil/gas resources[23]. One source of conflict in the region is between private industry and the government. In Peru, further development of the hydrocarbon sector is impeded by the lack of federal investment in infrastructure, which prevents industry from delivering hydrocarbon products to the market[24]. Descriptions/background and contact information for environmental and oil/gas authorities are provided below.

Chile

Ministry of Energy (Ministerio de Energía)

Chile's Ministry of Energy is the primary federal regulatory body responsible for energy planning, development and policy in the country[25].

Ministry of Mining

In Chile, CEOPs are contracts that "entered into by and between the state (represented by the Mining Ministry) and a contractor for the exploration, exploitation, or other beneficial use of hydrocarbon deposits, the requirements and conditions of which are determined by a Supreme Decree of the President of Chile[13]." In order to get exploration and exploitation rights, the contractor has to prepare a proposal outlining the contract area of interest, "investment commitments, periods of exploration and retribution/compensation term[13]." The Mining Ministry is then responsible for discussing the proposal with other groups such as the National Boundaries and Limits Authority and the Ministry of Defense to ensure that the potential area is suitable for exploration and production. Before the CEOP is issues, Chile's internal tax authority, Servicio de Impuestos Internos, provides its recommendation on how the tax regime should be executed.

Ministry of Environment (Ministerio de Medio Ambiente)

The Chilean Ministry of Environment is country's primary environmental regulatory body. Its responsibilities include design and implementation of Chile's environmental policy, plans, and programs, and well as protection and conservation of biological diversity and natural resources[26].

Peru

Ministry of Energy and Mines – Hydrocarbons Directorate

The Hydrocarbon Directorate, a subordinate agency within Peru's Ministry of Energy and Mines, is responsible for national regulation of hydrocarbons industrial operations, including permitting of operations[27].

Environmental Assessment and Enforcement Agency

Peru's Environmental Assessment and Enforcement Agency's responsibilities include supervision of hydrocarbon production operations, as well as assessment of sanctions/fines for incompliance.

Ministry of Environment (Ministerio del Ambiente)

Peru's Ministry of Environment is the country's primary federal environmental regulatory agency. Its functions include planning and formulation of the national environmental policy, environmental policy compliance monitoring/evaluation, and provision of technical support to other regions with assigned environmental regulatory responsibilities[28].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Chile

Ministry of Energy
Address: Alameda 1449, Pisos 13 y 14, Edificio Santiago Downtown II, Santiago de Chile
Telephone: (+56-2) 2 -365-6800
Email: http://www.gob.cl/escribenos/ (contact page – Spanish)
Website: http://www.minenergia.cl/ (Spanish)

Ministry of Mining
Address:
Teatinos No. 120, 9th Floor
Santiago de Chile
Telephone: (56-2) 2473 3000
Website: http://www.minmineria.gob.cl/

Ministry of Environment
Address: San Martin 73, Santiago, Chile
Telephone: (56-2) 25735600 (Reception)
Email: http://portal.mma.gob.cl/contacto/ (contact page – Spanish)
Website: http://portal.mma.gob.cl/vision-y-mision/ (Spanish)

Peru

Environmental Compliance and Enforcement Agency
Address: Av. República de Panamá Norte 3542, San Isidro, Lima, Perú
Telephone: 713-1553/1556
Email: ayudainformatica@oefa.gob.pe
Website: http://www.oefa.gob.pe/en/que-es-el-oefa

Ministry of Energy and Mines
Address: Av. De Las Artes Sur 260, San Borja 15036, Lima, Peru
Telephone: +511 – 411-1100
Email: http://www.minem.gob.pe/_contactos.php (contact page – Spanish)
Website: http://www.minem.gob.pe/

Ministry of Environment
Address: Av. Javier Prado Oeste 1440, San Isidro, Lima, Perú
Telephone: 511-6116000
Email: minam@minam.gob.pe
Website: http://www.minam.gob.pe/?el-ministerio=mision-y-vision

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Southeast Atlantic: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 712 billion bbl /year
Total Gas Production (onshore/offshore): 113 billion cubic feet/year

The countries in the Southeast Atlantic regional grouping include Angola, South Africa, the Democratic Republic of Congo, the Republic of Congo, Namibia, and Gabon. Most of the oil and gas production in this region is performed offshore. Angola is the "second-largest oil producer in Sub-Saharan Africa, after Nigeria[1]," and is also a member of the Organization of the Petroleum Exporting Countries (OPEC). The majority of the oil production in Angola comes from "offshore fields off the coast of Cabinda and deepwater fields in the Lower Congo basin[2]." The most important hydrocarbon discoveries have been made in Blocks 14, 15, 17, and 18 since the mid 1990's, and some of the most active foreign oil companies that explore and produce in Angola include U.S company ChevronTexaco and ExxonMobil, France-based Total, UK's BP, UK / Dutch Shell, and Italy's Agip / Eni company.

South-Africa is not very active in offshore drilling; "it has limited reserves of oil and natural gas and instead uses its large coal deposits to meet most of its energy needs[3]." South Africa has a coastal area of "12 nautical miles and an Exclusive Economic Zone, which contains 350 nautical miles of water surrounding the country and any islands owned by South Africa[4]." The Orange Basin is South Africa's largest offshore basin, however, it is generally underexplored. Two fields in the Orange basin with "multi-trillion cubic feet potential natural gas reserves[5]" have been discovered, namely the Ibhubesi and the Kudu gas fields. Currently, there are "14 offshore operators spread over 16 concessions and seven applications for offshore gas exploration rights[6]." Most of the exploration in South Africa is made by the Petroleum Oil Gas and Gas Corporation of South Africa Limited. This state-owned company is also in charge of the Oribi and Oryx oil fields located in Block 9.

Most of the Democratic Republic of Congo's oil and gas production comes from offshore fields. One of the most significant discoveries is the Mibale field, discovered in 1973 by Chevron, containing "48% of the Coastal Basin's recoverable reserves[7]." The Republic of Congo is a major oil producer as well, and heavily relies on offshore production to meet its country's needs. In the Republic of Congo, Eni has operated since 1968. In 2014, Eni signed an agreement to explore for hydrocarbons in the Republic of Congo's Madingo, Marine and Marine V1 and VII fields[8].

There has been interest in Namibia's continental shelf, which is located south of the Walvis Ridge (a ridge in the southern Atlantic Ocean), ever since the 1960s.Chevron explored the area in 1974, and discovered Kudu 9A-1, which was drilled in Block 2814A, located approximately 110 miles northwest from the city of Oranjemund. This discovery confirmed the presence of hydrocarbons in Namibia. Since then, 14 other offshore wells have been drilled, and seven of those have been

in the Kudu gas field. Most of these wells have not yielded commercial quantities of hydrocarbons[9]. In 2013, however, oil was extracted from the Wingat-1 well in the Walvis Basin[10].

Gabon is a major oil producer on the coast of West Africa, and has recently become interested in offshore exploration because it is geologically similar to Brazil, which has had several instances of offshore deepwater discoveries[11]. The Nkembe block in Gabon, which spans an area of 467 miles squared in water depths of about 0.3 miles, is located approximately 19 miles off the coast of Gabon in the Gabon basin. Significant amounts of offshore oil and gas exploration have taken place in this block. Recently, Total also began exploring the Arouwe block next to Nkembe[12].

Geology and Geophysics

The United States Geological Services (USGS) has defined one of its geological provinces as the Orange River Coastal, which is one of the longest rivers in the world traversing South Africa, and forming some of the borders between South Africa and Namibia. Thus, the Orange River Coastal geological analysis is a good representation of the geology in the Southeast Atlantic region.

The petroleum system is described as being cretaceous composite. The Orange basin, Luderitz basin, and Walvis basin are all believed to contain "sand and sandstone reservoirs from the Cretaceous and Tertiary deltaic deposits[13]." In addition, the reservoir rocks are mostly cretaceous sandstones. In addition, the offshore basins in Angola are believed to contain "early Cretaceous organic-rich source rocks[14]," while some of the most significant source rocks in Gabon include "the Neocomian and Aptian shales[15]."

Special Operating Conditions and New Cutting-Edge Technologies Utilized

The Southeast Atlantic region has special operating conditions, such as deepwater drilling. Some of the deepwater exploration is in presalt hydrocarbon systems, which consist of geological layers that accumulated before salt layers were laid down. For example, in 2014, U.S based Cobalt International Energy Inc and partners made a discovery "in the Bicuar 1A presalt deepwater exploratory well drilled offshore Angola[16]." Presalt wells are geological layers that accumulated before a salt layer was laid down. This well was drilled to a depth of approximately four meters. In addition, in 2014, Total and Canadian Natural Resources International "launched the drilling operation for South Africa's first deepwater well in the Outeniqua Basin, south of Mossel Bay in the Western Cape[17]."

Other technologies used in the region include subsea technology, such as semisubmersible ships, which are marine vessels used in offshore operations like drilling. In 2013, semisubmersible *Transocean Marianas,* owned by Brazil's company HRT Walvis, "started drilling a second exploration well in the Walvis basin in Namibia, located about 137 miles northwest of the Walvis Bay in water depths of about one mile.[18]"

Subsea development has also taken place in the Lianzi oil field, which is located in a zone shared by Angola and the Republic of Congo. This unitized area includes sections of the Block 14 License and the Haute Mer Permit, approximately about 65 miles offshore. The field "uses a subsea production system, comprising of three subsea production and subsea water injection wells[19]."

In addition, two companies, Technip and Heerema Marine Contractors, which carry out engineering and construction projects for energy companies, were awarded a contract in 2013 by Total "for the engineering, procurement, construction, installation and pre-commissioning for the SURF (subsea umbilicals, rivers, and flowlines) part of the Kaombo project, located in Block 32 offshore Angola in water depths up to about one mile[20]."

Methods of Offshore Tender

The offshore tendering method for the majority of the countries in this region consist of production sharing agreements, royalties, and corporate income taxes.

In Angola, production sharing agreements and risk service contracts are used. Risk service contracts are a type of contract in which a company "supplies services (i.e. technical, financial, managerial, or commercial services) and know-how to the state from exploration through production phases for the government in exchange for an agreed-on fixed fee or some other form of compensation[21]." A petroleum production tax of 20% and 70% is applied to production sharing agreements and risk service contracts, respectively.

Production sharing agreements are used in the Democratic Republic of Congo, but the royalty and corporate income tax rates are dependent on the contract agreements. In Namibia, companies are not required to participate in a production sharing contract with the state oil company: the National Petroleum Corporation of Namibia (NAMCOR). However, NAMCOR can take part in production sharing agreements if that is agreed upon during the negotiation phase. "NAMCOR's interests are carried during the exploration phase, but it contributes fully from the development phase onward[22]." A corporate income tax rate of 35% is applied, and royalties are 5% of gross revenues.

In Gabon, production sharing contracts that are "between two-thirds and four-fifths in favor of the state are used[23]." The royalty rate is between 6% and 12% of production, and the corporate income tax rate is 35%-40% for companies under a production sharing agreement and 73% for licensees under a concession.

The oil and gas fiscal regime in South Africa consists of "corporate income taxes, various indirect taxes, and a mineral and petroleum royalty[24]." The current corporate income tax rate is 28% for both domestic and foreign countries, and the minimum royalty percentage is 0.5% while the maximum is 7%. Production sharing contracts are used in the Republic of Congo. The royalty rate is 15% and the "corporate income tax burden is factored into the allocation of the profit from oil production between the State and the oil companies[25]."

Environmental Overview and Development

The South African Development Community (SADC) is a region in Africa that contains 14 countries, 4 of which are part of the Southeast Atlantic grouping. These include Angola, South Africa, Namibia, and the Democratic Republic of Congo (DRC). Since 1992, the implementation of the environmental impact assessment (EIA) process has made great progress within the region. All SADC member countries have legal framework in place for the allowance of an EIA; however, in order for the EIA tool to obtain its full potential in each country, there is a need to greatly strengthen the roles of the national and regional authorities, environmental assessment

practitioners, developers, and the financial institutions who are involved in project finance[26]. The EIA process in the Republic of Congo is regulated through the Constitution, and headed by the Directorate General Environment (DGE) under the MDDEFE. There is no national legislation that outlines environmental standards, however the legislation makes clear that when national standards are missing one should defer to international standards[27]. There is an EIA requirement in Gabon, but the EIA is not required to be published, nor is there a freedom of information law[28].

Natural Resources

The Southeastern Atlantic is bordered by Angola, South Africa, the DRC, Republic of Congo (Congo), Namibia, and Gabon. It is located to the west of the African continent, just south of the Equator. There are a total of 30 marine protected areas (MPAs) in the Southeastern Atlantic, including 4 in Angola, about 3 on the Atlantic side of South Africa, 2 in DRC, none in Congo, 8 in Namibia, and 13 in Gabon. Together these make up over 1,500 square miles of protected ocean[29].

According to the high resources value analysis, the west coast of Africa that touches the Southeastern Atlantic is well covered by existing MPAs, save for few stretches of coast in southern Angola. A significant MPA stretches off the western coast of South Africa and southern Namibia. Upon close examination, there is evidence of mangrove habitats in South Africa and northern Angola, as well as endangered and/or threatened species ranges, seagrass and salt marsh habitat, and marine bird areas along the coasts of South Africa (significant), Namibia (significant), Angola, DRC, and Gabon with some seagrass habitat off the shores of Congo (See Figure 1 below).

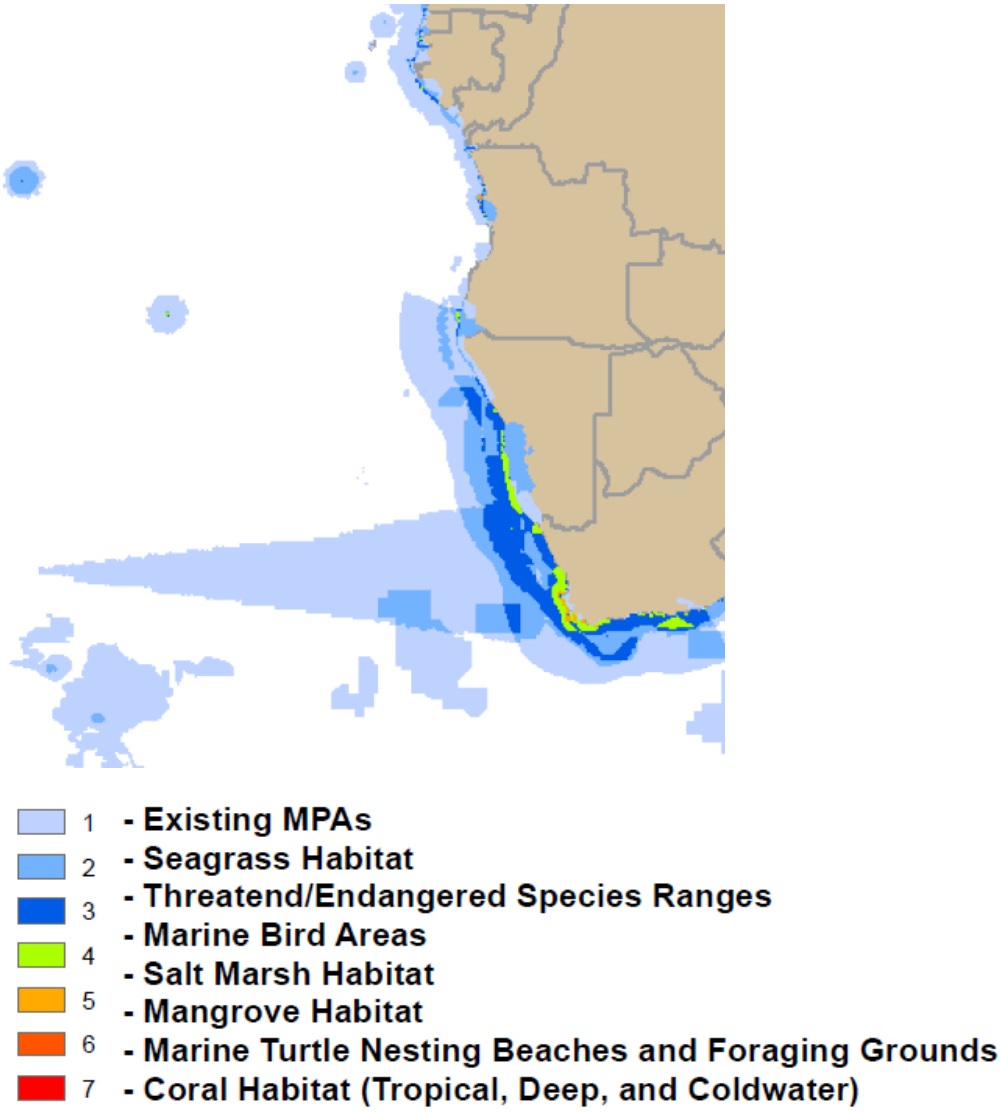

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There are several shipwrecks off the Southeast Atlantic coast. Shipwrecks such as the Dunedin Star, The Seal, and Luanda have been discovered along the northern coast of Namibia and the southern coast of Angola. This coastal region is referred to as the "Skeleton Coast" by locals[30]. Twyfelfontein or /Ui-//aes in Namibia, is one of the largest concentrations of petroglyphs and rock engravings in Africa dating from the Late Stone Age. The petroglyphs depict the links between the ritual and economic practices of hunter-gatherers in the region for at least 2,000 years.[31] There are several historical properties and towns along the Southeast Atlantic coastline.[32]

Socio-economic and Tribal

Angola was chosen as the focus country to offer a unique perspective on the Southeast Atlantic region. Angola is the second-largest oil producer in Sub-Saharan Africa, Nigeria being the largest.

In 1955, the first commercial oil discovery was made in Angola. Since the first discovery, its oil industry has grown significantly. Angola experienced a 15 percent increase in oil production between 2002 and 2008. As of 2014, the majority of oil production comes from offshore fields off the coast of Cabinda and deepwater fields in the Lower Congo basin.[33] In 2014, oil was discovered in deepwater pre-salt fields in the Kwanza Basin. The Kwanza Basin has the potential to be one of the largest oil fields in Angola.[34] Chevron, under the subsidiary Cabinda Gulf Oil Company Limited, ranks among the country's top petroleum producers. Since 1989, Chevron with its partners has invested more than $210 million in programs that supports and promotes health, education, economic, environmental and social needs.[35] No information pertaining to tribal issues in the Southeast Atlantic region was found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Ministry of Environmental Affairs (MINAMB) in Angola is the mandated body responsible for coordination, development, implementation and enforcement of environmental policies regarding biodiversity, environmental impact assessments (EIAs), and environmental technologies and education[36]. The Department of Environmental Affairs (DEA) in South Africa is the national entity delegated to ensure protection of the environment and natural resources, aligned with sustainable development and the rational utilization of natural resources. The DEA achieves these tasks through formulating, coordinating, and monitoring the implementation of environmental policies, programs and legislation[37]. The DRC's Ministry of Environment, Nature Conservation and Tourism (MINENV) is the mandated body for environmental impact assessments (EIAs). Within MINENV there are about 20 directorates that are responsible for various aspects of environmental management.[38]. The Ministry of Sustainable Development, Forest Economy and Environment (MDDEFE) is mandated to implement, monitor, and control applicable policies, regulations, and strategies regarding the use of the Republic of Congo's natural resources[39]. The Ministry of Environment and Tourism is responsible for protecting Namibia's environmental resources through the implementation of legislation and policy reforms[40]. The Ministry of Environment, Nature Conservation and Town is the mandated body for environmental affairs in Gabon[41]. The Ministry does not have a webpage, and limited information was available regarding their specific responsibilities.

Offshore and Others

The goals and objectives of the Southeast Atlantic region's offshore licensing bodies and environmental protection agencies vary, however, no instances of cooperation or conflict were identified. No environmental agencies for Angola, Gabon, and the Republic of Congo were identified in the available sources, while no offshore licensing bodies were found for Gabon and the Democratic Republic of Congo using the available resources. Descriptions of several of the main regulatory bodies are found below:

South Africa – Department of Environmental Affairs

The responsibility of this department is to "ensure the protection of the environment and conservation of natural resources, balanced with sustainable development and the equitable distribution of the benefits derived from natural resources[42]." Some of its functions include "protecting and improving the quality and safety of the environment, facilitating an effective national mitigation and adaptation response to climate change, and creating conditions for effective corporate and cooperative governance, international cooperation and implementation of expanded public works projects in the environment sectors[43]."

South Africa – Petroleum Agency

South Africa's Petroleum Agency "promotes exploration for onshore and offshore oil and gas resources and their optimal development on behalf of government. The Agency regulates exploration and production activities, and acts as the custodian of the national petroleum exploration and production database[44]."

Namibia – Ministry of Environment and Tourism

The objective of the Ministry of Environment and Tourism is to "maintain and rehabilitate essential ecological processes, conserve biological diversity, and ensure that the utilization of natural resources is sustainable for the benefit of all Namibians[45]."

Namibia – Ministry of Environment and Mines

The goal of this industry "is to ensure the adequate and affordable energy supply in a sustainable manner taking advantage of our natural resources in support of the nation's socio-economic development[46]." This includes regulating the petroleum exploration and production industry and issuing petroleum licenses.

Democratic Republic of Congo – Ministry of Environment, Nature Conservation and Tourism

This ministry's mission is to develop and implement government policy in areas related to environmental protection.

Angola – Ministry of Petroleum

The Ministry of Petroleum is "responsible for the implementation of national policy and the coordination, supervision and control of the entire oil industry. The duties of the Ministry of Petroleum include:

- Formulating the general basis of the national oil policy,
- Conducting inventory studies of the oil potential of the country,
- Proposing legislation regulating the oil sector's activities,
- Proposing and ensuring the implementation of actions that fall under the Government's policy in relation to their industries, guiding the strategy and the activity of the sector and encouraging entrepreneurship[47]."

Republic of Congo – The Ministry of Hydrocarbons

The Ministry of Hydrocarbons has the following responsibilities:

- “Promote and develop the hydrocarbon sector,
- Follow and implement cooperation agreements with others in the field of hydrocarbons,
- Define and develop the national policy for the efficient management of oil resources,
- Monitor and analyze the oil market for better exploitation of hydrocarbon resources,
- Increase the capacity of state control on petroleum products,
- Direct and control the state enterprises under guardianship[48].”

Regulatory Contact Information

Some of the contact information for regulatory bodies could not be identified for a few of the countries in this regional grouping. For these specific instances, a website link was provided to direct the user to relevant information for the agency.

South Africa Department of Environmental Affairs

Address:
Environment House,
473 Steve Biko
Arcadia
Pretoria, 0083
South Africa
Telephone: + 27 86 111 2468
Email: callcentre@environment.gov.za
Website: https://www.environment.gov.za/content/home

South Africa Petroleum Agency

Visiting Address:
Tygerpoort Building
7 Mispel Street
Bellville 7530,
Cape Town
South Africa
Postal Address:
P.O Box 5111
Tygervalley 7536,
South Africa
Telephone: + 27 21 938 3500
Email: plu@petroleumagencysa.com
Website: http://www.petroleumagencysa.com/

Namibia Ministry of Environment and Tourism

Address:
1st Floor, Troskie Building,
Uhland Street,
Namibia
Telephone: +264-61-284 2111
Email: snegumbo@met.na
Website: http://www.met.gov.na/Pages/DefaultNew.aspx
(Webpage link is broken)

Namibia Ministry of Environment and Tourism

Address:
1st Floor, Troskie Building,
Uhland Street,
Namibia
Telephone: +264-61-284 2111
Email: snegumbo@met.na
Website: http://www.met.gov.na/Pages/DefaultNew.aspx
(Webpage link is broken)

Namibia Ministry of Energy and Mines

Address:
1 Aviation Road
Private Bag 13297
Windhoek
Namibia
Telephone: +264-61- 284 8111
Email: info@mme.gov.na
Website: http://www.mme.gov.na/default.htm

Democratic Republic of Congo Ministry of Environment, Nature Conservation and Tourism

Telephone: +241 73 29 28
Email: oab-gabon@internetgabon.com
Website: http://www.minenv.itgo.com/organisteurs/organisateurs.htm

Angola Ministry of Petroleum

Website: http://www.minpet.gov.ao/Institucionais/Missao.aspx

Republic of Congo Ministry of Hydrocarbons

Website: http://mhc.cg/le_ministere_des_hydrocarbures.html

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Southeast Pacific: Regional Offshore Exploration and Production Profile

Total (offshore and onshore) Oil Production (2013): 1.6 million barrels/day

Total (offshore and onshore) Gas Production (2013): 440 billion cubic ft./year

The Southeast Pacific regional grouping includes seven countries: Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Nicaragua, and Panama. Mexico is a priority country located within the Southeast Pacific region but is not covered in this regional grouping document. There are two large offshore natural gas producing areas in the Southeast Pacific – at the Guajira basin in Colombia and the Guayaquil basin in Ecuador. There is no significant offshore oil production in the Southeast Pacific region; notwithstanding, Colombia and Ecuador account for 99% of all oil produced in the region (excluding Mexico). El Salvador, Nicaragua, and Panama do not have any domestic oil/gas production, and Guatemala has limited onshore production (14,000 barrels/day)[1]. There are active exploration activities in the region, with Colombia's first open bidding round taking place in 2012, with 13 offshore blocks being offered, including deep and ultra-deep water prospects[2] Operating companies in the region include Ecopetrol and Chevron (Colombia) and Petroamazonas (Ecuador).

Geology and Geophysics

Currently, Colombia and Ecuador are the only two Southeast Pacific region countries with offshore hydrocarbon production. The majority of offshore blocks for exploration in Colombia are located off the northern coast and are classified by the National Hydrocarbon Agency as located in areas with little or no geological characterization[3]. Colombia's hydrocarbon basins include Guajira, Sinú, and Tumaco. The most important offshore natural gas field is the Chuchupa located in the Guajira basin, producing from a water depth of approximately 100 feet[4]. These fields were discovered in 1970 with an estimate reserves of 7 trillion cubic feet. In 2006, these two fields accounted for 72% of Colombia's natural gas production[5]. The most important natural gas field in Ecuador is the Amistad field (average daily production approximately 40 million cubic feet per day), located in the Guayaquil basin, off the southern coast of the country[6]. The United States Geological Survey (USGS) completed an assessment of petroleum geology in the vicinity of the Amistad field, in the Gulf of Guayaquil. The study detailed the geology and hydrocarbon potential of the areas, noting that the area exhibited great potential for gas hydrates, ice-like structures containing methane[7]. Overall, in the remaining non-priority Southeast Pacific countries, there is less information identified for upstream offshore hydrocarbon activity.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Special operating conditions in the Southeast Pacific include potential for deep (greater than 1,000 feet water depth) and ultra-deep water (greater than 5,000 feet water depth) exploration/production operations[8]. New technologies used in upstream offshore operations in the region include horizontal drilling and artificial lift enhanced recovery to increase reservoir production (e.g. at Colombia's Guajira natural gas basin)[9,10] and subsea tiebacks to transport produced fluids (e.g. Amistad field in Ecuador)[11].

Methods of Offshore Tender

Offshore licensing/concessions agreements with associated income tax/royalty payments (with country-specific conditions/stipulations), production sharing agreements, and technical service agreements are used to finance upstream operations in Southeast Pacific region countries. For example, in Colombia, the largest oil/gas producer in the Southeast Pacific, exploration and production licensing contracts are used and royalty charges are assessed based on monthly production rates for crude oil; and production location for natural gas. The royalty charges on produced crude oil range from 8% (for up to 5,000 barrel (bbl)/day monthly production) to 25% for more than 600,000 bbl/d monthly production).[12] Gas royalty charges in Colombia range from 60% (for natural gas produced offshore at a depth greater than 1,000 feet) to 80% (for natural gas produced onshore/offshore at a depth less than 1,000 feet)[13]. As of 2003, Colombia banned production sharing contracts, replacing them with exploration and production contracts which include production licenses up to 24 years with 10 year extensions available. In Ecuador, technical service agreements are exclusively used between foreign operators and the government and production sharing agreements are also applicable[14,15]. License/concessions agreements between oil operators and the Guatemalan Ministry of Energy and Mines are also used in Guatemala, and a 20% royalty charge is paid on produced oil[16,17]. License/concessions agreements are also used in Costa Rica[18] and Nicaragua (which also has used technical service agreements to finance offshore operations)[19,20]. El Salvador is not a hydrocarbon producing country and offshore oil/gas contracting is not relevant to its energy sector operations[21].

Environmental Overview and Development

The EIA process in Guatemala is used as an instrument to systematically identify and evaluate the environmental impacts of projects, works, activities, and industries in the planning, implementation, operation, and completion stages. The General Office of Environmental and Natural Resources Management (DGGARN), under the Ministry of Environment, administers and approves the EIA. It is required that information is gathered to determine compliance and identify the amounts of pollution. It is unclear who is responsible for gathering the information and determining compliance. In Nicaragua an EIA is required for activities, works, and projects with a potential negative effect on the environment. The Ministry of Environment and Natural Resources (MARENA) is responsible for the final decision of approval, and an environmental license issued by them sets monitoring requirements and specifies how monitoring and compliance are to be carried out. In Costa Rica, an EIA is required prior to beginning specific works, activities, and projects. Regulatory plans are also required to be evaluated. The National Environmental Technical Secretariat (SETENA) prepares guidelines for all activities, works, projects, and plans and is responsible for monitoring and enforcing compliance with EIA standards.

The EIA process in Panama acts as an early warning system based on continuous evaluation that enables preventative decision making to preserve the environment. Activities, works, and projects are subject to an EIA, as well as some national development plans. The National Environmental Authority (ANAM) is responsible for the final decision of approval. The developer is responsible for conducting monitoring and submitting reports to ANAM. ANAM certifies environmental auditors to evaluate and ensure monitoring and oversight programs. In El Salvador, a strategic environmental assessment (SEA) is required for environmental impacts of policies, plans, and programs; and an EIA is utilized to ensure that projects, works, and activities follow procedures to identify and quantify impacts and mitigation techniques. The Ministry of Environment and Natural Resources (MARN) is responsible for the decision of approval, and the

Environmental Management Program guidelines require monitoring at all stages, though it is unclear who is responsible for the monitoring. In Columbia, the EIA process acts as an authorization to carry out projects subject to meeting conditions for prevention, mitigation, and compensation to support the management of environmental impacts. The Ministry of the Environment, Housing, and Territorial Development (MAVDT) is responsible for the decision of approval for the relevant projects, and regional authorities are responsible for supervision and monitoring at all stages. The EIA process in Ecuador is meant to be a tool for applying environmental regulations and shaping sustainable development. Monitoring is done by the proponent with community supervision and auditing, and the Environmental Enforcement Agency (AAA) heads environmental control[22].

Natural Resources

The Southeastern Pacific is bordered by Guatemala, Nicaragua, Costa Rica, Panama, El Salvador, Colombia, and Ecuador. A total of 83 marine protected areas (MPAs) protect the region's coast, including 9 in Guatemala, about 8 on Nicaragua's Pacific coast, about 26 on Costa Rica's Pacific coast, about 15 on Panama's Pacific coast, 5 in El Salvador, about 6 on Colombia's Pacific coast, and 14 in Ecuador. This makes up over 30,000 square miles of protected ocean[23].

According to the high resource value analysis, much of the southeastern Pacific coastal zone is covered under existing MPAs. The existing MPAs are visually less evident along the Guatemalan, Honduran, and Nicaraguan coasts. However, still visible along the coastlines of all bordering countries of this marine region is evidence of wide endangered and threatened species' ranges, seagrass habitat, and marine bird areas. Concentrated around the Galapagos Islands is mangrove habitat, and a bit of marine turtle habitat and coral habitat, along with seagrass habitat. All of the Galapagos Islands are encompassed by a MPA (See Figure 1 below).

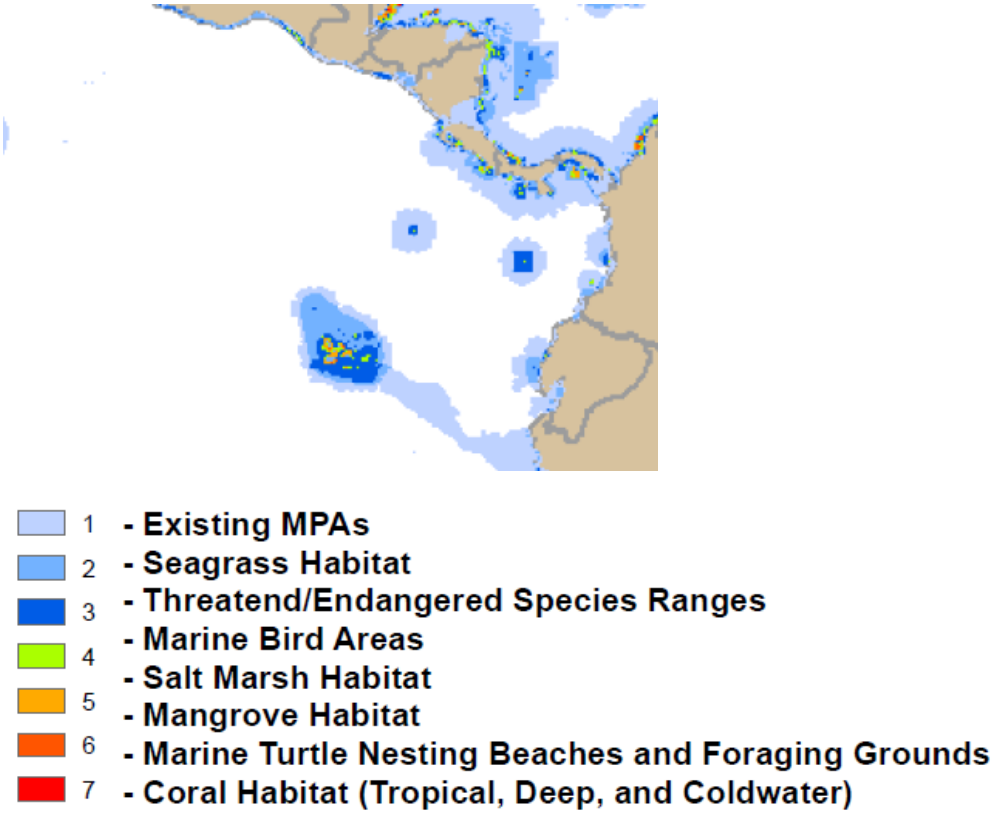

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

There are several shipwrecks off the coast of the Southeastern Pacific. One notable shipwreck is the Capitana, a Spanish galleon, discovered of the coast of Ecuador. The Capitana was built in Guayaquil in 1644, and was the biggest Spanish galleon built at that time.[24] Artifacts discovered included: 6300 silver coins, one gold coin, three silver bars, 54 bronze cannon balls, a small gold cross, some broken jewelry, and hundreds of musket balls.[25] The Qhapaq Ñan, Andean Road System in Ecuador, covers 18,641 miles and represents an extensive Inca communication, trade and defense network of roads constructed by the Incas over several centuries. The Qhapaq Ñan, Andean Road System network linked the snow-capped peaks of the Andes, to the Southeastern Pacific coast, hot rainforests, fertile valleys, and absolute deserts.[26] There are several archaeological sites as well as historic properties and towns along the Southeastern Pacific coastline[27]

Socio-economic and Tribal

Ecuador was chosen as the focus country to offer a unique perspective on the Southeastern Pacific region. Ecuador is the fifth-largest oil producer in South America and the smallest producer in the Organization of the Petroleum Exporting Countries (OPEC). Ecuador exports roughly 70 percent of its crude oil. In 2012, Ecuador produced 505,000 barrels per day (bbl/d) of crude oil of which more than one-third was exported to the United States; however, Ecuador plans to diversify its exports to Asian markets, particularly China.[28] In 2014, Eni, an Italian energy firm, made an oil

discovery in Ecuador that could potentially hold around 300 million barrels.[29] The oil sector is a vital factor for Ecuador's economy, accounting for a sizeable amount of all export earnings and representing one-third of all tax revenues. The economic, strategic, and environmental implications of the oil sector development are prominent political issues and continue to influence government policies.[30] No information pertaining to tribal issues regarding offshore drilling on the Southeastern Pacific coast was found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

Guatemala's MARN is the government's public entity specializing in protecting, preserving and the rational utilization of natural resources[31]. The central regulatory body MARENA. MARENA is the authority responsible for environmental issues, specifically regarding environmental impact assessments (EIAs)[32]. The governmental body for the environment in Costa Rica is SETENA, a division of the Ministry of Environment and Energy (MINAE)[33]. SETENA is the main authority responsible for environmental issues, particularly regarding EIAs[34]. The overarching regulatory body in Panama is ANAM. They are the mandated entity for the state on matters of natural resources and the environment to ensure the compliance and application of laws, regulations, and national environmental policies[35]. The central regulatory body in El Salvador is the Ministry of Environment and Natural Resources (MARN). MARN works to protect, conserve, improve, restore, and sustainably use El Salvador's natural resources and environment[36]. In Colombia, MAVDT is the central authority regarding environmental issues, including the EIA process[37]. The Ministry of Environment is Ecuador's governmental body responsible for designing environmental policies and developing strategies, projects, and programs for the preservation of ecosystems and the sustainable use of natural resources[38].

Offshore and Others

The extent and types of responsibilities of offshore upstream regulatory bodies within the Southeast Pacific regional grouping vary by country. Once source of cooperation is between the El Salvador National Energy Commission and the Ministry of Environment and Natural Resources who jointly published a report on the evaluation of the environmental strategy in the energy policy sector[39]. Sources of conflict include a border disagreement between Costa Rica and Nicaragua over maritime boundaries and the potential use of trans boundary horizontal drilling as well as historical tensions between Costa Rican environmental regulators and drilling operators. In 2002, the Costa Rican Environmental Secretariat denied a drilling permit application on the grounds of protection Costa Rica's sea turtle population.

Federal regulatory authorities in the realms of oil/gas financing, environment, and industrial safety and health were identified for Southeast Pacific region countries. Descriptions/background and contact information for environmental and oil/gas authorities are provided below.

Colombia

Ministry of Mining and Energy

Colombia's Ministry of Mines and Energy is a federal body responsible for regulating upstream hydrocarbon activities in the country[40].

Ministry of Environment and Sustainable Development

The Colombian Ministry of Environment and Sustainable Development is a federal agency responsible for national environment policy, protection, planning, management, and use and exploitation of natural resources[41].

Costa Rica

Ministry of Environment and Energy

Costa Rica's Ministry of Environment and Energy is a federal regulatory body in Costa Rica whose responsibilities include hydrocarbon environmental and energy policy[42].

Ecuador

Ministry of Environment

Ecuador's Ministry of Environment is responsible for forming environmental policy and coordinating strategies and projects for protection of ecosystems and sustainable use of natural resources[43].

Hydrocarbon Regulation and Control Agency

The Hydrocarbon Control and Regulation Agency was created in 2010 as the technical and administrative hydrocarbon regulatory body in the country, with responsibilities of control and monitoring of foreign and national hydrocarbon operations in the country[44].

El Salvador

Ministry of Environment and Natural Resources

The Ministry of Environment and Natural Resources of El Salvador is the primary federal environmental regulatory body in the country, with responsibility in environmental impact assessments[45].

National Energy Commission

El Salvador's National Energy Commission is the federal energy regulatory body whose responsibilities include formation of national energy policy and sustainable use of natural resources[46].

Guatemala

Ministry of Environment and Natural Resources

The Guatemalan Ministry of Environment and Natural Resources is the primary federal environmental regulatory body in the country, whose responsibilities include natural resources protection and sustainable use of natural resources[47].

Ministry of Energy and Mines – Vice ministry of Mining and Hydrocarbons

The Vice ministry of Mining and Hydrocarbons within the Ministry of Energy and Mines is Guatemala's federal regulatory body in the oil/gas sectors whose responsibilities include directing

the country's natural resources development in compliance with national regulations and based on international standards for the protection of the environment[48].

Nicaragua

Ministry of Energy and Mining

Nicaragua's Ministry of Energy and Mining is the national regulatory body with responsibilities in the upstream hydrocarbon sectors, including operations permitting/licensing and strategic planning and policy formation[49].

Ministry of Environment and Natural Resources

The Ministry of Environment and Natural Resources of Nicaragua is the environmental regulatory body in the country responsible for environmental impact assessment administration as well as regulation of environmental protection and sustainable use of natural resources[50].

Panama

National Hydrocarbons and Alternative Energies Department

Panama's National Hydrocarbons and Alternative Energies Department is a federal regulatory body responsible for hydrocarbon resources planning and policy[51].

National Environmental Authority

The National Environmental Authority of Panama is a main federal body whose responsibilities include national environment/natural resource policy/legislation development, evaluation of environmental impact studies, and assessment of sanctions and fines for environmental violations[52].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Colombia

National Hydrocarbons Agency (Agencia Nacional de Hidrocarburos)
Address: Av. Calle No. 59-65 Piso 2 – Edif. Cámara Colombiana de Infraestructura, Bogotá, Colombia, 111321
Telephone: (57+1) 593 17 17
Email: info@anh.gov.co
Website: http://www.anh.gov.co/Paginas/inicio/default.aspx (Spanish)

Ministry of Environment and Sustainable Development
Address: Calle 37, No. 8-40, Bogota, Colombia
Telephone: (57-1) 332-3400
Email: servicioalciudadano@minambiente.gov.co
Website: https://www.minambiente.gov.co/index.php (Spanish)

Costa Rica

Ministry of Environment and Energy
Address: Edificio Vista Palace, Calle 25, Avenida 8 y 10 San José, Costa Rica
Telephone: (593-2) 3996 500
Email: prensa@minae.go.cr
Website: http://www.minae.go.cr/ (Spanish)

Ecuador

Hydrocarbon Regulation and Control Agency
Address: Calle Estadio s/n entre Manuela Cañizares y Lola Quintana, Sector La Armenia – Conocoto – Pinchicha, Ecuador
Telephone: 91 349 4640/902 44 60 06
Email: http://www.arch.gob.ec/index.php/contactenos.html (website e-mail contact page – in Spanish)
Website: http://www.arch.gob.ec/index.php/nuestra-institucion/quienes-somos.html (in Spanish)

Ministry of Environment
Address: Calle Madrid 1159 y Analucía, Código Postal: 170517, Quito, Ecuador
Telephone: 593-2-398-7600
Email: https://www.ambiente.gob.ec/contacto/ (e-mail contact page)
Website: https://www.ambiente.gob.ec/el-ministerio/ (in Spanish)

El Salvador

National Energy Comission
Address: Calle el Mirador and 9a Calle Poniente ,#249, Col Escalon, San Salvador, El Salvador
Telephone: (503) 2233-7900
Email: Info@cne.gob.sv
Website:http://translate.google.com/translate?client=tmpg&hl=en&langpair=es|en&u=http%3A//www.cne.gob.sv/

Ministry of Environment and Natural Resources
Address: Edificio MARN (Instalaciones ISTA) 2 Calle y Colonia Las Mercedes, San Salvador, El Salvador
Telephone: (503) – 2132-6276
Email: medioambiente@marn.gob.sv
Website: www.marn.gob.sv

Guatemala

Ministry of Energy and Mines
Address: Diagonal 17, 29-78 zona 11 Las Charcas. Guatemala, Centroamérica.
Telephone: (502) 2419-6464
Email: http://www.mem.gob.gt/contactenos/ (e-mail contact page – in Spanish)
Website: http://www.mem.gob.gt/viceministerio-de-mineria-e-hidrocarburos-2/direccion-general-de-mineria/vision-y-mision/

Ministry of Environment and Natural Resources
Address: 20 calle 28-58, zona 10, Edificio MARN, Guatemala City, Guatemala
Telephone: (502) 2423-0500 (ext. 1100)
Email: sip@marn.gob.gt
Website: http://www.marn.gob.gt/

Nicaragua

Ministry of Energy and Mining
Address: Hospital Bautista 1c: al Oeste 1c: al Norte
Telephone: 2280-9500
Email: cap@marena.gob.ni
Website: http://www.mem.gob.ni/index.php?s=1 (Spanish)

Ministry of Environment and Natural Resources
Address: Carretera Norte Km 12 ½, frente a la Zona Franca Managua Nicaragua
Telephone: 2233-1232
Email: http://www.mem.gob.ni/index.php?s=1&idp=118&idt=1# (list of email contacts)
Website: http://www.marena.gob.ni/

Panama

National Hydrocarbons and Alternative Energies Department –
Contact information not identified in public sources

National Environment Authority
Address: http://www.anam.gob.pa/index.php/2012-12-06-22-51-52/localizacion (Link to office locations)
Telephone: http://www.anam.gob.pa/index.php/2012-12-06-22-51-52/directorio-telefonico (Link to telephone directory – Spanish)
Email: Not identified in public sources
Website: http://www.anam.gob.pa/

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Southwest Atlantic: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 178 billion bbl / year
Total Gas Production (onshore/offshore): 1.29 trillion cubic feet/year

The Southwest Atlantic regional grouping includes Argentina, Chile, and Uruguay. Argentina is the "largest natural gas producer and the fourth largest petroleum producer in South America[1]." Argentina's largest offshore projects are in the Carina and Aries reservoirs discovered in 1982 and 1981, respectively, off the coast of Tierra del Fuego (an archipelago in the Argentine province). Carina is 50 miles off the coast, while Aries is only 17 miles off the coast. Both reservoirs are mostly rich in gas, which can be found at depths between 0.6 and 0.9 miles below the seabed. The daily natural gas production from these two fields is approximately 12 million cubic meters[2]. The main oil and gas company in Argentina is Yacimientos Petrolíferos Fiscales (YPF). Other major oil and gas companies include Petrobras, Panamerican Energy, and Total[3].

Chile is the only South American country that is a member of the Organization of Economic Cooperation and Development (OECD), but it is only a small producer of oil and gas. As a result, it heavily relies on energy imports to meet its needs[4]. The small volumes of oil and gas it does produce come mainly from the "Austral basins in the south of the country[5]." The largest Chilean oil and gas company is ENAP, followed by Codelco. Other oil and gas distributors include Copec, Shell, and Petrobas[5].

Although Uruguay has no offshore hydrocarbon production, the "signature of eight offshore hydrocarbon exploration and exploitation contracts between state-owned company Administración Nacional de Combustibles, Alcoholes y Portland (ANCAP) and four international oil companies, namely BPa(reas 6, 11 and 12), BG(areas 8, 9 and 13),Total (area 14), and Tullow Oil (area 15)[6]," took place during Uruguay's Round 2 bidding process in 2012. In order to continue increasing Uruguay's understanding of its offshore resources, ANCAP and the Ministry of Industry, Energy and Mining of Uruguay, are currently planning a Round 3 bidding procedure,[4] which will allow the country to further increase its understanding of its offshore basins

Geology and Geophysics

Studies of Argentina's continental margin first started in 1957. There are four main basins in Argentina: Salado, Colorado, San Jorge, and Magallanes. The Salado and Colorado basins are made up of Precambrian and Paleozoic rocks. The San Jorge and Magallanes have younger rocks from the Late Jurassic and post-Jurassic[7]. In Chile, the oldest sediment offshore basins "range from Late Cretaceous to Miocene[8]."

There are three main basins in offshore parts of Uruguay: Punta del Este, Pelotas (southern portion) and Oriental del Plata. The stratigraphy of these offshore basins "is represented by large depositional sequences, consisting of Paleozoic sedimentary rocks and Precambrian crystalline basement rocks[9]." As for geological data specific to Chile, there were no unique aspects identified in available sources.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Oil and gas prospects may exist in deepwater parts of the Southwest Atlantic region. YPF in Argentina is currently looking for partners for deepwater exploration offshore Argentina, and Total stated in 2013 that "it will invest in an offshore deepwater Vega Pleyade natural gas field off the southern coast of Argentina." Total invested $850 million in this project, and is partnering with both Wintershall and Pan America Energy, a German and Argentine company, respectively. Three wells will be drilled during the first phase, and the field is expected to start production (approximately 6 million cubic meters of gas per day) by the end of 2015[10]. In addition, Spectrum (a seismic service provider) started a 2240 mile "seismic survey offshore Uruguay, and will cover open, ultra deep water acreage in the Oriental del Plata and Pelotas basins[11]." This data is being collected by vessel BGP Challenger and will be accessible in 2015[11].

Total Austral (a subsidiary of Total located in Argentina) has also developed extended reach wells in Tierra del Fuego.The drilling started from an onshore rig and then "deviated the well to reach the Ara and Kaus offshore reservoirs, increasing the measurement depth and the horizontal displacement of its wells to a total length of 40 feet[12]." In addition, the horizontal wells on the production platform will be connected to a "multiphase subsea pipeline to carry the gas and condensate to the existing onshore Río Cullen and Cañadon Alfa treatment plants."

Methods of Offshore Tender

In Argentina, the Hydrocarbons Law establishes the legal guidelines to be followed by the provinces for the exploration and production (E&P) of hydrocarbons. However, since 2007, each province has been given the power to "appoint the enforcement authority, grant exploration permits, exploitation concessions and agreements, collect royalties, control and supervise the permits, concessions and agreements, require the fulfillment of legal obligations in connection with investments, rational exploitation of resources, information and rentals and royalties' payments, and grant extensions to exploitation concessions or agreements, and to determine sanctions[13]."

The Argentine provinces and federal governments award exploration and production rights to the licensees that make the highest investment proposals through a bidding procedure. Exploration permits allow the permit holder to explore the area and give the licensee priority to exploit if there are commercial amounts of hydrocarbons. Under an exploitation concession, the permit holder is allowed to extract hydrocarbons from the area and is required to pay rental payments, royalties, and taxes. Exploitation concessions are usually 25 years and have a 10 year extension.

The other licensing system in place in Argentina consists of the provinces or federal government reserving offshore areas for state owned companies, so that those companies can obtain bids "for the granting of E&P contractual rights[13]." The awarded licensee and the state owned company are thus in a joint operating agreement.

The main taxes levied on oil and gas operations by the Argentine national government include "income tax, value-added tax, minimum presumed income tax, personal assets tax, tab on debits and credits in checking accounts, custom duties, and social security taxes, while provincial taxes consist of turnover tax, stamp tax, and royalties[14]." Municipalities may also issue additional taxes.

In Chile, exploration and exploitation of oil and gas takes place through "special exploration and exploitation operating contracts also known as Contrato Especial de Operación "CEOPs"[13], between the licensee and the Mining Ministry. CEOPs in Chile typically last up to 35 years and are subject to income, value-added, and withholding taxes[13].

In Uruguay, "the awarded companies of each block assume all risks and costs from operations through all exploration and production stages by entering into production sharing agreements." These agreements typically last for 30 years, but can be extended by an additional 10 years. The exploration period lasts for 3 years, during which "the committed exploratory program must be performed[15]." Following this initial 3 year period is a voluntary additional 3-year period in which the contactor is required to drill "at least one exploratory well, and a 2-year extension period, where the contractor must drill another exploration well, and return 30% of the block area to the Uruguayan state[15]."

Environmental Overview and Development

All three countries that border the Southwest Atlantic have environmental impact assessment (EIA) requirements. In Argentina, the General Law on the Environment (LGA) established the EIA as an instrument of environmental policy and management, but does not establish specific EIA instruments. The law establishes sectoral and provincial EIA regulations, but no general regulation at the federal level. In Uruguay, there is either a partial environmental impact study (EsIA-p) or a full environmental impact study (EsIA-c) which act as instruments for environmental management. In Chile, they require an environmental impact statement (DIA) and have an environmental impact assessment system (SEIA) in place. These instruments are used as procedures to determine if the environmental impact of an activity or project complies with prevailing regulations.[16]

Natural Resources

The Southwest Atlantic Ocean includes Argentina, Uruguay, and the Strait of Magellan, owned by Chile. The coast of the Southwest Atlantic is heavily protected by various forms of marine protected areas (MPAs). Argentina has established 43 MPAs, Uruguay has 8, and the Strait of Magellan has 8 as well. Almost 800 square miles are protected through these MPAs.[17]

As shown in the high resource value analysis, most of the coast is included in an existing MPA. There is extensive seagrass habitat which is home to a wealth of organisms, as well as threatened and endangered species. (See Figure 1 below)

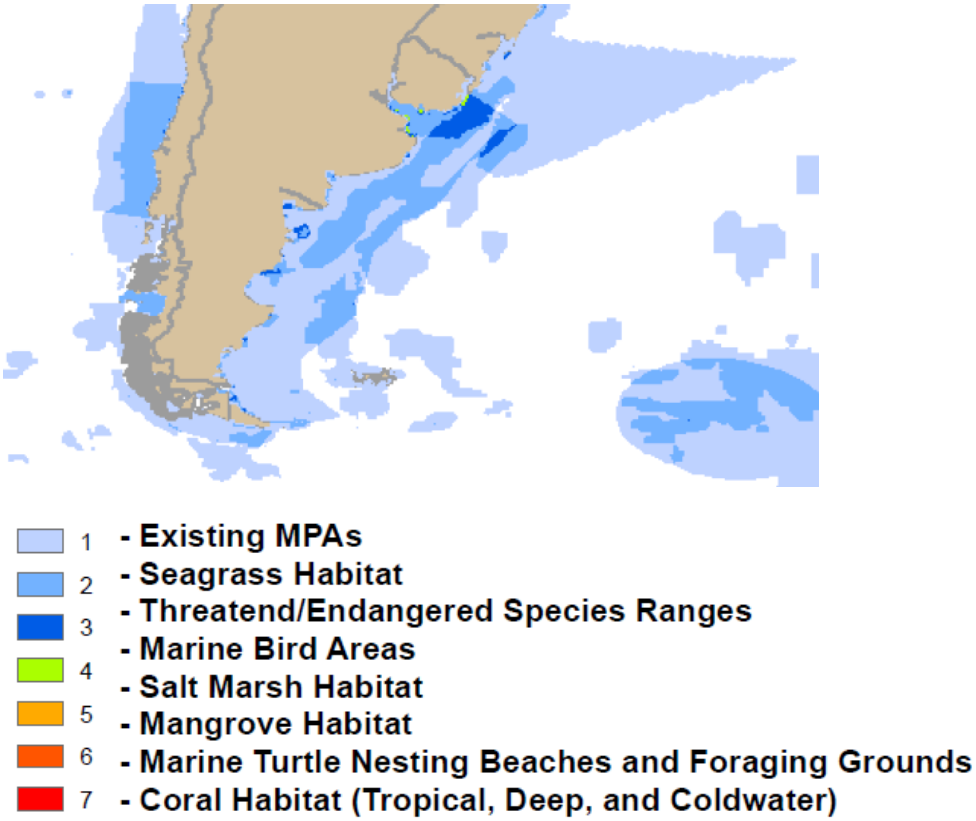

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues / Resources

Archaeological and Historical:

At least 30 shipwrecks dating back to the late 1800s have been discovered around Isla de los Estados, an Argentine island in the South Atlantic.[18] Numerous shipwrecks have also been discovered in Tierra del Fuego, the southernmost point of the continent spanning Argentina and Chile. Tierra del Fuego is notorious for some of world's most tumultuous weather, which has resulted in numerous shipwrecks.[19] In 2014, "La Purisima Concepcion," a 1765 shipwreck of a Spanish merchant ship was discovered in addition to 11 other ships along the 124 miles of the Tierra del Fuego coast.[20] There is evidence of coastal habitations (shellmounds) in Southern Patagonia, the Beagle Channel, and the Magallanian Strait.[21] There are several archaeological sites as well as historic properties and towns along the Southwest Atlantic coastline.[22]

Socio-economic and Tribal

Argentina was chosen as the focus country to offer a unique perspective on the Southwest Atlantic region. Argentina is estimated to hold the world's second-largest reserves of shale gas, and fourth-largest reserves of shale oil. The development of the country's shale oil and gas reserves has potential to propel economic growth. Argentina hopes by exploiting these resources with the help of private investments, they can reduce their energy trade deficit estimated at US$6.1bn in 2013.[23] Total, a Paris based oil and gas company, operates the Vega Pleyade gas and condensate development offshore Tierra del Fuego. Vega Pleyade has the potential to produce 70,000 barrels of oil per day.[24] Total marks the largest natural gas offshore investment to date

for Argentina and will save Argentina approximately $1.6 billion a year in fuel imports.[25] In 2014, several small UK firms, without the support of Argentina, are exploring the waters around the Falklands. The Falklands are projected to contain billions of dollars worth of oil and gas revenues. Argentina believes that without "continental support" these technically difficult projects pursued by the small firms could risk a major oil spillage across the South Atlantic. Argentina regards these activities as illegal oil exploration around the islands, and in 2013 the Argentine "parliament voted to impose jail sentences of up to 15 years on executives whose companies drill for oil, as well as punitive fines of up to $1.5bn." In addition, the firms in question will be banned from work in Vaca Muerta, a giant lucrative shale oil deposit in Argentina's Patagonia region.[26] No tribal issues pertaining to the Southwest Atlantic were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The overarching regulatory body for Argentina is the Secretary of Environment and Sustainable Development. This body evaluates environmental impact assessments (EIAs) for works and activities in Argentina. The regulatory bodies for Uruguay are the Ministry of Housing, Regional planning, and Environment (MVOTMA) and the National Environmental Office (DINAMA). They evaluate EIAs for activities, construction projects, and works in Uruguay. The regulatory bodies in Chile are the National Environmental Commission (CONAMA) and the Regional Environmental Commission (COREMA), as well as all agencies with environmental and sectoral responsibilities. They evaluate works and activities in Chile.[27]

Offshore and Others

The federal regulatory bodies within the Southwest Atlantic region are diverse, with roles in offshore hydrocarbon activities, as well as areas of environmental, licensing, health, and safety. Even with the diverse nature of the region, there were no specific instances of regulatory cooperation or conflict between the various agencies in the region with respect to offshore drilling. Overviews and descriptions of some key regulatory bodies are found below, however the offshore environmental regulatory bodies for both Argentina was readily identified in available sources.

Argentina – Energía Argentina Sociedad Anónima (ENARSA):

ENARSA has been Argentina's state company since 2004, and is in charge of any concessions related to offshore reserves. Specifically, Law 25, 943 states that ENARSA will have "ownership of exploration permits and concessions on all national maritime areas that are not subject to such permits or concessions to the date of enactment of this Act[28]." The Argentine state owns 53% of ENARSA, while the provincial governments own 12%. The remaining 35% is traded in the stock market[29].

Argentina – Secretaria de Ambiente y Desarrollo Sustentable (Secretary of Environment and Sustainable Development)

This agency is made up of multiple groups: the Unit Secretary, Environmental Policy Coordination, Planning and Environmental Policy, Promoting Sustainable Development, Control and Environmental Control and MERCOSUR (a group established in 1995, comprising of Argentina, Brazil, Paraguay, Uruguay, and Venezuela, whose main objective is to protect the environments of the countries). In general, the Secretary of Environment and Sustainable Development is Argentina's national authority responsible for environmental policy, including policy related to the "rational use of natural resources, biodiversity conservation, and sustainable development and environmental preservation[30]."

Uruguay Administración Nacional de Combustibles, Alcoholes y Portland (ANCAP)

ANCAP, state-owned petroleum company in Uruguay, along with the Ministry of Industry, Energy and Mining of Uruguay, is responsible for carrying out the Uruguay Round 3 licensing round for hydrocarbons. In 2009, ANCAP led Uruguay's first offshore licensing round in 2009, in which 11 oil and gas blocks were offered for exploration. In addition, ANCAP was in charge of designing the offshore geophysical acquisition program and in 2011, gained "exclusive rights to 3900 miles of 2D seismic data acquisition, gravimetry, and marine magnetometry of offshore basins collected by Reflect Geophysical[31]."

Uruguay Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente (The Ministry of Housing, Territorial Planning and Environment)

The National Directorate of Environment is part of the Ministry of Housing, Territorial Planning and Environment, and is responsible for both implementing and evaluating national environmental policies in Uruguay. In addition, they are also in charge of developing plans for assessing the quality of the water, air, and coastal areas. In addition, they promote awareness of and monitor the effects of human activities on the environment and sustainable development. Other functions of this Ministry include conducting Environmental Impact Assessments to mitigate the negative environmental effects of potential projects[32].

Chile Ministry of Environment

The Chilean Ministry of Environment is country's primary environmental regulatory body. Its responsibilities include design and implementation of Chile's environmental policy, plans, and programs, and well as protection and conservation of biological diversity and natural resources[33].

Chile Ministry of Energy

Chile's Ministry of Energy is the primary federal regulatory body responsible for energy planning, development and policy in the country[34].

Chile Ministry of Mining

In Chile, CEOPs are contracts that "entered into by and between the state (represented by the Mining Ministry) and a contractor for the exploration, exploitation, or other beneficial use of hydrocarbon deposits, the requirements and conditions of which are determined by a Supreme Decree of the President of Chile[13]." In order to get exploration and exploitation rights, the contractor has to prepare a proposal outlining the contract area of interest, "investment commitments, periods of exploration and retribution/compensation term[13]." The Mining Ministry is

then responsible for discussing the proposal with other groups such as the National Boundaries and Limits Authority and the Ministry of Defense to ensure that the potential area is suitable for exploration and production. Before the CEOP is issues, Chile's internal tax authority, Servicio de Impuestos Internos, provides its recommendation on how the tax regime should be executed.

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Argentina Energía Argentina Sociedad Anónima (ENARSA)

Address:
Av. Del Libertador 1068
Floor 2 (C1112ABN) Buenos Aires
Argentina
Telephone: (54) (11) 4348 8200
Website: http://www.enarsa.com.ar/index.php/en/

Argentina Secretaria de Ambiente y Desarrollo Sustentable (Secretary of Environment and Sustainable Development)

Address:
San Martin 451
C1004AAI C. de Buenos Aires
Argentina
Telephone: (54) (11) 4348 8200
Website: http://www.ambiente.gov.ar/

Uruguay Administración Nacional de Combustibles, Alcoholes y Portland (ANCAP)

Address:
Paysandu y Avda, del Libertador
Brig. Gral. Lavalleja
Telephone: +598 (2) 1931/ 2902 0608 / 2902 3892
Website: http://www.ancap.com.uy/

Uruguay Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente (The Ministry of Housing, Territorial Planning and Environment)

Address:
Zabala 1432 Esq. 25 de Mayo
Mesa Central 2917-0710
Montevideo Uruguay
Website: http://www.mvotma.gub.uy/

Chile Ministry of Environment

Address: San Martin 73, Santiago, Chile
Telephone: (56-2) 25735600
Email: http://portal.mma.gob.cl/contacto/
Website: http://portal.mma.gob.cl/vision-y-mision/ (Spanish)

Chile Ministry of Energy

Address: Alameda 1449, Pisos 13 y 14, Edificio Santiago Downtown II, Santiago de Chile
Telephone: (+56-2) 2 -365-6800
Email: http://www.gob.cl/escribenos/
Website: http://www.minenergia.cl/

Chile Ministry of Mining

Address:
Teatinos No. 120, 9th Floor
Santiago de Chile
Telephone: (56-2) 2473 3000
Website: http://www.minmineria.gob.cl/

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Western Atlantic: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 12,000 barrels/day

Total Gas Production (onshore/offshore): 3 billion cubic feet/year

The Western Atlantic regional grouping includes ten countries: Cape Verde, Gambia, Guinea, Guinea Bissau, Liberia, Mauritania, Morocco, Senegal, Sierra Leone, and Western Sahara. Overall, the region is an area of very small total (onshore and offshore) hydrocarbon production (12,000 barrels oil/day and approximately 3.0 billion cubic feet/year)[1]. Breaking down these amounts, the countries of Cape Verde, Gambia, Guinea, Liberia, Senegal, Sierra Leone, and Western Sahara have no appreciable oil or gas production[2]. In Mauritania, deep-water offshore hydrocarbon resources were discovered in 2002 at the Chinguetti oil field and production operations at the field began in 2006[3]. In Morocco and Senegal, there are offshore exploration operations, although the countries have no offshore hydrocarbon production; offshore production in Senegal is not anticipated before 2020[4,5]. Spurred by offshore discoveries in the Gulf of Guinea, there are additional exploration activities in several other Western Atlantic region countries, including Liberia, Guinea Bissau, and Gambia, and in 2010, Cape Verde signed an agreement for offshore exploration with the Brazilian oil company Petroleo Brasileiro S.A. (Petrobrás)[6,7]. Operating oil companies in the region include Tullow Oil, Total, and Petronas and national oil companies: PetroGuin (Guinea Bissau), NOCAL (National Oil Company of Liberia), National Mauritian Hydrocarbons Company (Mauritius), Petrosen (Senegal).

Geology and Geophysics

There is past and continued geological/geophysical exploration in the Western Atlantic region, in hopes to replicate the offshore production successes of neighboring countries located nearby within the Gulf of Guinea basin, such as Nigeria. In Mauritania, hydrocarbon reservoirs are located at sub-sea depths ranging between 4,270 and 6,200 feet, and discovered fields include the Chinguetti, Tiof, and Banda[8]. Due to complex the geology, offshore oil production potential at the Chinguetti field in Mauritania was over-estimated, and probable reserves were adjusted to 53 million barrels after an initial estimate of 120 million barrels[9,10]. More offshore discoveries have been made in the country and these are anticipated to be future sources of hydrocarbon production. There is prospective offshore production in Morocco, where hydrocarbon potential is estimated from geology which is similar to eastern Canada's producing reservoir, Cohasset-Panuke (and deep Panuke gas field)[11]. In Guinea Bissau, offshore exploration activities include three dimensional seismic data acquisition in the shallow waters of the Casamance-Bissau basin as well as in deep-waters (up to approximately 6,500 feet) in the MSGBC basin, which stretches from Guinea Bissau to Mauritania on Africa's west coast[12,13]. In Liberia, there have also been offshore exploration activities including collection of two dimensional (2-D) and three dimensional (3-D) seismic data; five exploratory wells were drilled between 2010 and 2012.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

The main special operating condition in the Western Atlantic region is deep-water (greater than 1,000 foot water depth) operations. Other operating conditions of note were not identified in available sources. In Mauritania, new production technology being utilized includes subsea production systems and subsea pipelines (Banda gas field), with planned use for offshore produced natural gas to generate electricity at a newly-constructed onshore power plant[14]. At the Chinguetti oil field in Mauritania, flexible flow lines and risers are connected to a floating production, storage, and an offloading vessel, which has an oil storage capacity of 1.6 million barrels and is designed to withstand 100-year storms with approximately 20 foot waves[15]. For the remaining countries hydrocarbon production is minimal, and special operating conditions and technologies were not identified in available sources.

Methods of Offshore Tender

Various types of upstream hydrocarbon agreements are used in the Western Atlantic region, including production sharing, license/concessions, and technical service agreements. In Mauritania, the offshore hydrocarbon fiscal regime consists of production sharing agreements (PSAs) and associated corporate income tax and royalty payments (at least 10% of hydrocarbon production value); exploration phases cannot exceed 10 years and development periods are 25 year (oil) and 30 years (gas)[16]. In Morocco, license/concessions contracts, associated taxes, and royalty payments are applicable to hydrocarbon financing, though corporate income tax for oil companies is exempted for up to 10 consecutive years after initial production[17]. In Senegal, hydrocarbon contracts may entail production sharing, license/concessions, and technical service agreements, as well as associated tax/payments including royalties (2-10% value of produced hydrocarbons for offshore oil, 2-6% for offshore gas)[18]. In Guinea, licensing agreements are used, and associated taxes (e.g. on profits and property) and royalty payments are applicable[19]. In Guinea Bissau license/concessions agreements as well as production sharing agreements are used[20]. Production sharing contracts are used in Liberia, made between the Liberian national oil company (NOCAL) and interested oil companies[21]. Sierra Leone also uses production sharing agreements in offshore exploration/development contracts, while Gambia issues licenses for hydrocarbon exploration activities. For the remaining countries, offshore tendering methods were not identified in publicly available sources.

Environmental Overview and Development

The environmental impact assessment (EIA) process in Cape Verde was established through the Basic Law of Environmental Policy. The EIA must include an analysis of the local environment, a study of the impacts resulting from the project, and a full evaluation of foreseeable impacts and mitigation measures[22]. The EIA process in Liberia was established through the World Bank Safeguard Policies. The process includes screening, scoping, implementation of environmental work, review and approval, public consultation and disclosure, surveillance and monitoring (executed by consultant), and development of monitoring indicators (executed by consultant)[23]. The EIA process in Gambia is headed by the National Environment Agency (NEA) and comprises of initial screening, preliminary assessment, scoping, environmental impact study, review, approval, and auditing (executed by the developer, the government, and the public)[24]. In Sierra Leone, environmental and social impact assessment reports are required, but are not made public due to the lack of a law on freedom of information[25]. The EIA process in Guinea is used mainly for mining licenses. Social and environmental impact assessments are required, but public consultation is not mandatory[26]. Guinea-Bissau established their Environmental Impact

Assessment Law in 2010 as a tool to support biodiversity implementation[27]. Senegal's EIA process requires an assessment, approval and mitigation[28]. A source providing a detailed description of the process was not found. Mauritania requires oil and gas developments to execute an EIA and to report the results to the Directorate of Environmental Control under the Ministry of Rural Development and Environment[29]. It is unclear if Western Sahara has an EIA requirement. One source mentioned an energy company carrying out an EIA in Western Sahara[30]. Morocco has legislation for an EIA process, but more emphasis needs to be put on it. Currently, it is inconsistent and lacks requirements for specific projects and installations[31].

Natural Resources

The Western Atlantic is located just above the Equatorial Atlantic on the northwestern edge of Africa. It touches 10 African coastal countries that together have set aside about 100 marine protected areas (MPAs). This includes 3 in Cape Verde, 7 in Liberia, 1 in Gambia, 9 in Sierra Leone, 7 in Guinea, 9 in Guinea Bissau, 14 in Senegal, 7 in Mauritania, 1 in Western Sahara, and 43 in Morocco; making up a total of over 8,000 square mile of protected ocean[32].

According to the high resource value analysis, there is a concentrated amount of biodiverse habitats off the coasts of northern Guinea, Guinea Bissau, Gambia, and southern Senegal. In this hotspot there is mangrove habitat, salt marsh habitat, seagrass habitat, marine bird areas, and endangered and threatened species habitats. Northern Mauritania and the south and north coast of Western Sahara show a concentration of salt marsh habitat, seagrass habitat, marine bird areas, and endangered and threatened species ranges. Cape Verde and the Western Atlantic coast are fringed with seagrass habitat and endangered and threatened species habitat (See Figure 1 below).

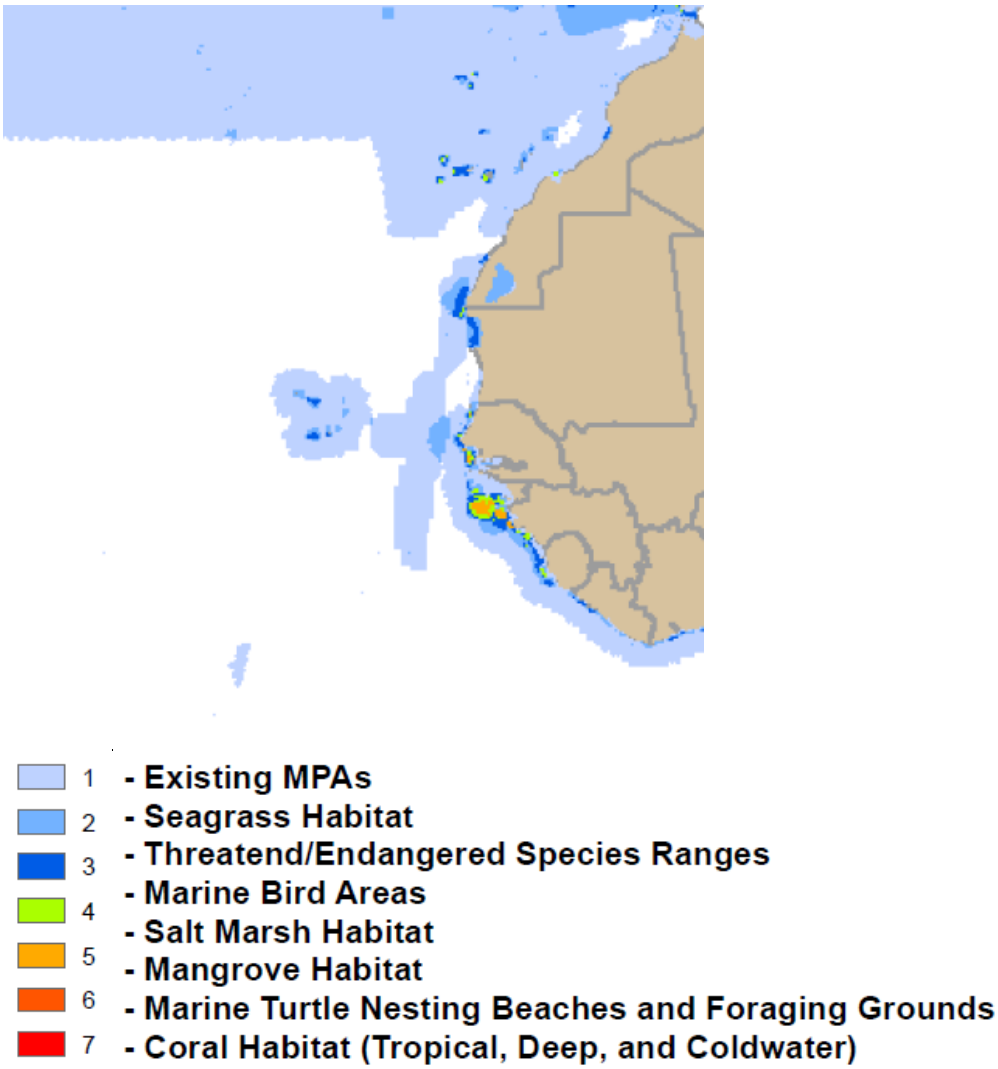

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

Several historical shipwrecks have been discovered in the Western Atlantic waters, including at least 80 off the coast of Cape Verde. [33] Saloum Delta off the coast of Senegal is marked by 218 shellfish mounds, burial sites, and artifacts that testify to human settlement along the coast of West Africa over the ages.[34] There are several archaeological sites as well as historic properties, towns, and slave trading centers along the Western Atlantic coastline.[35]

Socio-economic and Tribal

Equatorial Guinea was chosen as the focus country to offer a unique perspective on the Western Atlantic Region. In the 1990s, the discovery and development of large offshore drilling reserves propelled Equatorial Guinea into a significant oil and natural gas exporter. According to the World Bank, "the country grew by an average real annual growth rate of 26.2 percent from 2001 to 2005" as a result of the increase in oil production. [36] As of 2014, hydrocarbon production accounts for

nearly 90 percent of the gross domestic product (GDP) and provides almost all of the country's exports, while agriculture, the nation's main source of income, only supplies 30 percent of the country's needs.[37] Although Equatorial Guinea is one of the world's fastest-growing economies, the majority of the population have not benefited from the oil industry. In 2013, Equatorial Guinea's economy went into a recession contributed to the fall in oil revenue and lower gas and oil output. The recession is expected to continue through 2015.[38] No tribal issues pertaining to the Western Atlantic region were found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental Only

The Regulatory body for Cape Verde is the Ministry of Environment, Agriculture, and Fisheries, and is responsible for creating the legal framework for advancements in the environmental sector[39]. The Ministry of Lands, Mines and Energy is Liberia's mandated entity for formulating policies regarding environmental affairs[40]. Their website is currently under maintenance. The Department of State for Forestry and the Environment in Gambia is responsible for the Departments of Forestry and Wildlife Management, and the National Environment Agency in charge of providing professional, managerial, and administrative leadership in the implementation of environmental and forestry policy[41]. The Ministry of Lands, Country Planning and Environment in Sierra Leone is responsible for managing state lands in an environmentally sustainable manner[42]. The Ministry of Environment, Water, and Forests in Guinea is the overarching regulatory body for environmental affairs. They are collaborating with the International Union for Conservation of Nature (IUCN) to strengthen and formalize the management of natural resources in the region[43]. The Ministry of Natural Resources and Environment in Guinea-Bissau is the regulatory body responsible for monitoring, control and enforcement of the implementation of legislation regarding environmental affairs[44]. The Ministry of Environment and Conservation is the central regulatory body for environmental affairs in Senegal[45]. The webpage for the Ministry is down. The Ministry of Rural Development and Environment is the central regulatory body for environmental affairs in Mauritania[46]. The webpage for the Ministry is down. No sources were found siting a regulatory body for environmental affairs in Western Sahara. The regulatory body for environmental affairs in Morocco is the Ministry of Energy, Mining, Water and the Environment[47]. The Department of the Environment is the division of the Ministry that develops and implements national environmental and sustainable development policy[48].

Offshore and Others

The extent and types of responsibilities of national regulatory authorities in upstream hydrocarbon operations vary in Western Atlantic region countries. Sources of cooperation in the region include collaboration of country environmental regulatory agencies with environmental non-governmental organizations towards the goals of developing environmental policy, laws, and best practices[49]. Another source of cooperation is joint development of hydrocarbon resources in the region, for example between Guinea Bissau and Senegal. The two countries both own the AGC offshore

block, which under the terms of an agreement are 85% owned by Senegal and 15% by Guinea Bissau[50]. The Management and Cooperation agency between Guinea Bissau and Senegal is a governmental body established to manage the joint maritime area of the two countries. Even with the cooperation, one source of conflict between Guinea Bissau and Senegal occurred due to a dispute, which slowed offshore exploration. Eventually, the dispute was settled in in 1993. There are an estimated 400 million barrels of oil the joint maritime zone between the two countries[51].

Federal regulatory authorities in the realms of oil/gas financing, environment, and industrial safety and health were identified for Western Atlantic region countries and information on environmental and oil/gas authorities in the region area provided below.

Cape Verde

Ministry of Agriculture, Environment, and Fishery

The Ministry of Environment, Agriculture and Fishery is a primary environmental regulatory body in the country, charged with responsibilities including natural resources conservation and protection[52].

General Energy Directorate

Cape Verde's General Energy Directorate is the primary hydrocarbon regulatory authority in the country[53].

Gambia

Minister of Forestry and Environment

The Gambian Ministry of Forestry and the Environment is charged with activities regarding national sustainable resource use, environmental protection, and international environmental cooperation[54].

Ministry of Petroleum

The Ministry of Petroleum of Gambia is responsible for hydrocarbon exploration and production operations in the country, including promotion of production activities by providing incentives for foreign investors[55].

Guinea

Ministry of Environment, Water, and Forestry

Guinea's Ministry of Environment, Water, and Forestry is the national environmental regulatory body in the country, with responsibilities including formation of the legal framework for environmental regulation and sustainable resources use management[56].

Ministry of Mines and Geology

Guinea's Ministry of Mines and Geology is the federal upstream oil/gas regulatory body in the country, consisting of two entities: The Department of Research and Promotion of Petroleum and the National Society of Petrol Exploitation of Guinea[57].

Guinea Bissau

Ministry of Natural Resources and Environment

The Ministry of Natural Resources and Environment of Guinea Bissau is a primary national agency with authority in issuance of mineral extraction licenses[58].

Ministry of Natural Resources and Industry

The Ministry of Natural Resources and Industry of Guinea Bissau is the regulator of the hydrocarbon sector activities in the country, with responsibility in approving exploration/development plans and supervising activities of the national oil company, Petroguin[59].

Liberia

Ministry of Land, Mines, and Energy

Liberia's Ministry of Land, Mines, and Energy is the national environmental regulatory authority in the country, with responsibilities in climate change policy/initiatives, water resources management, natural resources law and development[60].

Bureau of Hydrocarbons

Liberia's Bureau of Hydrocarbons, a subordinate agency within the national Ministry of Land, Mines, and Energy, is the federal hydrocarbon regulatory agency in the country, responsible for developing laws and regulations and providing guidance/oversight to the industry. The Liberian government cites the future need for establishing a health and safety regulator in the petroleum industry prior to commercial petroleum production[61].

Mauritania

Ministry of Environment and Sustainable Development

The Ministry of Environment and Sustainable Development of Mauritania's responsibilities include sustainable use of national natural resources[62].

Ministry of Petroleum, Energy, and Mines

The Mauritian Ministry of Petroleum, Energy, and Mines is responsible for technical and administrative supervision of hydrocarbon activities in the country[63].

Morocco (and Western Sahara)

Ministry of Energy, Mining, Water, and Environment

The Ministry of Energy, Mining, Water, and Environment of Morocco is the national regulatory body with authority in national environmental policy[64].

National Office of Hydrocarbons and Mining

The Moroccan National Bureau of Petroleum and Mines is responsible for regulatory affairs in the country's petroleum industry, with responsibilities including: encouraging development of national hydrocarbon resources and building expertise in the petroleum sector[65].

Senegal

Department of Environment and Classified Enterprises

Senegal's Department of Environment and Classified Enterprises is the national environmental authority in the country, responsible for environmental policy and protection[66].

Ministry of Mines, Energy, and Industry and National Oil Company, Petrosen

Senegal's Ministry of Mines, Energy, and Industry is the primary regulatory body for national oil/gas operations, in coordination with the national oil company, Petrosen, which is responsible for technical management of the country's hydrocarbon operations[67,68].

Sierra Leone

Ministry of Lands, Country Planning, and Environment

The Ministry of Lands, Country Planning, and Environment has authority in national environmental resources management and pollution prevention. The Sierra Leone Environmental Protection Agency was established in 2008 to systematize legislative framework for natural resources management[69].

Petroleum Directorate

Sierra Leone's Petroleum Directorate was established in 2011 as the country's hydrocarbon regulatory body, with responsibilities including: management of national petroleum resources, administration of hydrocarbon tender procedures, and health/safety/operational compliance monitoring of petroleum facilities[70].

Regulatory Contact Information

In instances where all detailed relevant regulatory contact information was unable to be obtained from available sources, website links were provided.

Cape Verde

General Energy Directorate
Regulatory contact information not identified in publicly available sources

Ministry of Environment, Agriculture, and Fishery
Regulatory contact information not identified in publicly available sources

Gambia

Ministry of Petroleum
Address: Banjul area office, Bertil Harding High Way, Kotu, Gambia, West Africa
Telephone: +220-880-6317
Email: www.mop.gov.gm
Website: info@mop.gov.gm

Ministry of Forestry & the Environment
Address: 5C Marina Parade, Gambia, West Africa
Telephone: +220-422-7307
Email: info@mofen.gov.gm
Website: http://www.accessgambia.com/information/forestry-department.html

Guinea

Ministry of Petroleum
Regulatory contact information not identified in publicly available sources

Ministry of Natural Resources and Environment
Regulatory contact information not identified in publicly available sources

Guinea Bissau

Ministry of Natural Resources and Industry
Regulatory contact information not identified in publicly available sources

Liberia

Bureau of Hydrocarbons
Contact information not identified in publicly available sources

Ministry of Lands, Mines, and Energy
Address: not identified in publicly available information
Telephone: not identified in publicly available information
Email: http://www.molme.gov.lr/content.php?sub=35&related=14 (link to email contact form)

Website: http://www.molme.gov.lr/content.php?sub=71&related=1&res=71&third=71

Mauritania

Ministry of Petroleum, Energy, and Mines
Address: Route de la plage rond-point Sabah, Nouakchott, Mauritaine, Africa
Telephone: 00 (222) 4525-9515
Email: not identified in publicly available information
Website: http://www.mauripem.com/english/contact.html

Ministry of Environment and Sustainable Development
Address: B.P. 170 Nouakchott, Mauritania, Africa
Telephone: +222 4529-0115 (M.Molay Abdelmoumen – Director of Pollution Control)
Email: molayelmomen@yahoo.fr (M.Molay Abdelmoumen – Director of Pollution Control)
Website: Not identified in publicly available information

Morocco

National Office of Hydrocarbons and Mining
Address: 5, Avenue Moulay Hassan Rabat, Morocco, Africa
Telephone: (212)-05-3770-9411
Email: http://www.onhym.com/contact.html (email contact page - in French)
Website: http://www.onhym.com/ (French)

Ministry of Energy, Mining, Water and Environment
Address: N° 9, Avenue Al Araar, 420/1 Secteur 16, Hay Riad, Rabat
Telephone: 0537-576-647/0537-576-661
Email: sg@environnement.gov.ma (Secretary General of Department of Environment)
Website: http://www.environnement.gov.ma/index.php/fr/ministere/le-ministre (French)

Senegal

Ministry of Energy, Mines and Industry
Address: 104 Rue Carnot, Dakar (B.P. 4021), Senegal
Telephone: (221-8) 229-626
Email: not identified in publicly available sources
Website: not identified in publicly available sources

Ministry of Environment and Classified Enterprises
Contact information not identified in publicly available sources

Sierra Leone

Petroleum Directorate
Contact information not identified in publicly available sources

Ministry of Lands, Country Planning, and Environment
Contact information not identified in publicly available sources

Western Sahara (territory of Morocco – same applicable Ministries as in Morocco, see contact information on previous page of this report)

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Western Pacific: Regional Offshore Exploration and Production Profile

Total Oil Production (onshore/offshore): 128 million bbl / year
Total Gas Production (onshore/offshore): 4.3 trillion cubic feet/year

The countries in the Western Pacific region include China, South Korea, Taiwan, and Japan. China is one of the world's largest consumers and importers of oil. Due to the fact that China's largest onshore oil fields are now mature, the country has been increasingly focused "on developing largely untapped reserves in the western interior provinces and offshore fields[1]." Most of these offshore fields are located in the "Bohai Bay region in the Yellow Sea and the South China Sea (particularly the Peal River Mouth Basin and the East China Sea[2]). The Bohai Bay oil field project was started in 1999, and involved the construction of six offshore platforms. However, that is not the only example of offshore production in the Bohai Bay region. China's state company, the China National Offshore Oil Corporation (CNOOC), has entered into many production sharing agreements with companies for the exploitation of other Bohai Bay oil fields. "Several appraisal well drilling programs have been carried out by its partners, which include Kerr-McGee, Sino-American Energy Corp, ChevronTexaco, Shell Exploration China Limited (Shell), Newfield Exploration, Petronas Carigali and Anadarko[3]."

Like China, South Korea relies heavily on energy imports to meets its country's needs. Korea is bounded by the Yellow Sea, the East Sea, and the South Sea, all which may contain hydrocarbon potential. The Korea National Oil Corporation (the country's state company, abbreviated as KNOC) has acquired 2D and 3D seismic data for the continental shelves listed above, and has drilled 45 wells since 1972. In 1998, the KNOC discovered Block 6-1, also known as Donghae-1 in the East Sea, and the "recoverable reserves are estimated to be about 186 billion cubic feet of natural gas[4]." This is the first commercial hydrocarbon offshore discovery in Korea. Other offshore basins that are still underexplored include the Ulleung, Yellow, and Jeju basins.

Taiwan also has to rely on oil and coal imports for its energy needs. As a result, Taiwan's state company, CPC, Taiwan (Chinese Petroleum Corporation), and the CNOOC, have paired up to explore for oil and gas reserves in the deepwater parts of the Strait of Taiwan, after shallow water exploration did not result in any commercial amounts of hydrocarbons[5]. Similarly, Japan has limited domestic energy resources. Even though offshore areas around Japan, like the East China Sea, have oil and gas reserves, the development of these areas has been hindered by the territorial issues with China. In 2008, China and Japan agreed to "jointly explore natural gas fields and equally invest in the development of two fields - Chunxiao/Shirakaba and Longjing/Asunaro[6]." In March 2013, Japan's state-run Japan Oil, Gas and Metals National Corporation (JOGMEC) "confirmed Japan's estimates of 40 trillion cubic feet (Tcf) of methane hydrates in the Nankai Trough on the southeast coast of the country[7]." Exploratory oil and gas wells have also been drilled in Japan. An oil and natural gas field "off the island of Sado in Niigate Prefecture[8]," might be one of the largest fields in Japan.

Geology and Geophysics

The Bohai Bay Basin contains several of China's oil and gas fields. It can be characterized as a Meso-Cenozoic continental basin with source rocks consisting mostly of source rocks of "lower tertiary sediments characterized by multi-cyclic sedimentation[9]." In addition, it is believed that "the abrupt changes of sedimentary formations and the development of numerous faults caused the formation of various types of oil and gas reservoirs[10]."

Sedimentary basins in the Yellow sea can be separated tectonically into the North Yellow Sea Basin (NYSB), the northern basin of the South Yellow Sea (SYSNB), and the southern basin of the South Yellow Sea (SYSSB). The North Yellow Sea and the South Yellow Sea have different "stratigraphic evolution and oil accumulation features[11]." The acoustic basement (defined as "the surface below which little if any seismic energy can penetrate[12]") of the NYSB consists of crystalline rocks, while the basements in the SYSNB and SYSSB are Paleozoic "sedimentary layers of metamorphic rocks[13]." Drilling wells have shown that the Mesozoic source rocks of the South Yellow Sea basins and the Paleozoic formations in the SYSSB have hydrocarbon potential.

Special Operating Conditions and New Cutting-Edge Technologies Utilized

Deepwater drilling is prevalent in the Western Pacific region. For instance, the CNOOC's last licensing round in 2013 with foreign companies "included 25 blocks, 15 of which reside in deep water areas[14]." China's national oil company also develops its fields using enhanced oil discovery (EOR) techniques, which is "the process of obtaining stranded oil not recovered from an oil reservoir through certain extraction processes. EOR uses methods including thermal recovery, gas injection, chemical injection, and low-salinity water flooding[15]."

In addition, with Japanese companies discovering the presence of methane hydrates (ice-like substances formed from methane gas) offshore the country's east coast (such as the Nankai Trough area), depressurization technologies are used to produce methane from methane hydrates[16]. This consists of "dissociating methane hydrate in the layers and collecting the resultant methane gas through wells and production systems[17]." In February 2012, Japan Petroleum Exploration (JAPEX) and Japan's National Oil Corporation (JNOC), "engaged in operator work in fields tests of methane hydrate production and advanced drilling on production wells that were completed in February through March 2012. The world's first offshore production test of methane hydrate using the depressurization method was conducted by Japan in 2013[18].

Methods of Offshore Tender

The offshore tendering method used by China includes production sharing contracts and royalties. The offshore tendering and petroleum tax regimes could not be identified for South Korea, Taiwan, and Japan using the available sources.

In China, production sharing contracts are part of the petroleum policy, and an income tax of 25%is applied[19]. Other taxes that are applied in China include special oil gain levies, value added taxes, and resource taxes. In addition, sometimes signature bonuses are defined in the production sharing contract and "take into account the volume of petroleum resources and the economic value of the field[20]." The value added tax rate is generally 17%.

Environmental Overview and Development

The environmental impact assessment (EIA) process in China became state regulated in 2003 through the Law of People's Republic of China on Environmental Impact Assessment. It is implemented by several authorities of environmental protection, the main one being the Department of Environmental Impact Assessment under the Ministry of Environmental Protection (MEP). For plans, policies and programs, a strategic environmental assessment (SEA) is required.[21] South Korea has a systematic EIA process in place headed by the Ministry of Environment (MOE). The project developer prepares the draft environmental impact statement (EIS) and the final EIS with intermittent opportunities for public participation. The EIS is submitted to the approval agency of South Korea for the final decision of approval after consulting with the MOE. The approval agency and the MOE then manage all monitoring and mitigation[22]. Taiwan's EIA process is required for government and private projects and is prepared by the project proponent. The proponent must go through the standardized steps, and once the project is approved by the competent authority, project monitoring and permit enforcement is required[23]. Japan's EIA process is required for governmental and private projects and is prepared by the project proponent. The proponent must go through screening and scoping by the competent authority. The EIA must include a range of alternatives before it is submitted for review by the public and the relevant authority. Judicial review, monitoring, and permit enforcement are not required[24]. Under Federal Laws No. 7-FZ on "Environmental Protection" and No. 174-FZ on "Ecological Expertise", state environmental assessments (EAs) must be performed for all offshore E&P activities on the Russian continental shelf[25]. Environmental assessments are reviewed by the Ministry of Natural Resources and the Federal Environmental, Industrial, and Nuclear Supervision Service (Rostekhnadzor). The EIA Directive requires that the document "identify, describe, and assess in an appropriate manner… the direct and indirect effects of a project." Factors to be taken into account include humans, fauna and flora, soil, water, air, climate and landscape, material assets and cultural heritage[26].

Natural Resources

The Western Pacific touches China, South Korea, Taiwan, Japan, and Russia. There are over 400 marine protected areas (MPAs) in the Western Pacific including 57 in China, 90 in South Korea, 28 in Taiwan, 156 in Japan, and 77 in Russia making up over 65,000 miles of protected ocean[27].

According to the high resource value analysis, Japan, Taiwan and the majority of China have continuous MPAs extending off their coasts. The series of islands between Taiwan and Japan are rich in biodiversity with seagrass habitat, salt marsh habitat, mangrove habitat, coral habitat, threatened and endangered species, marine bird areas, and marine turtle nesting beaches and foraging grounds. Both Taiwan and Japan have concentrations of salt marsh habitat and marine bird areas, and these two country's coasts along with South Korea's and China's coasts are lined with seagrass habitat and ranges of threatened and endangered species. The southeastern region of Russia that borders the Western Pacific is fringed with seagrass habitat and concentrations of threatened and endangered species. Several expansive MPAs can be found off Russia's southeastern Pacific coast as well (See Figure 1 below).

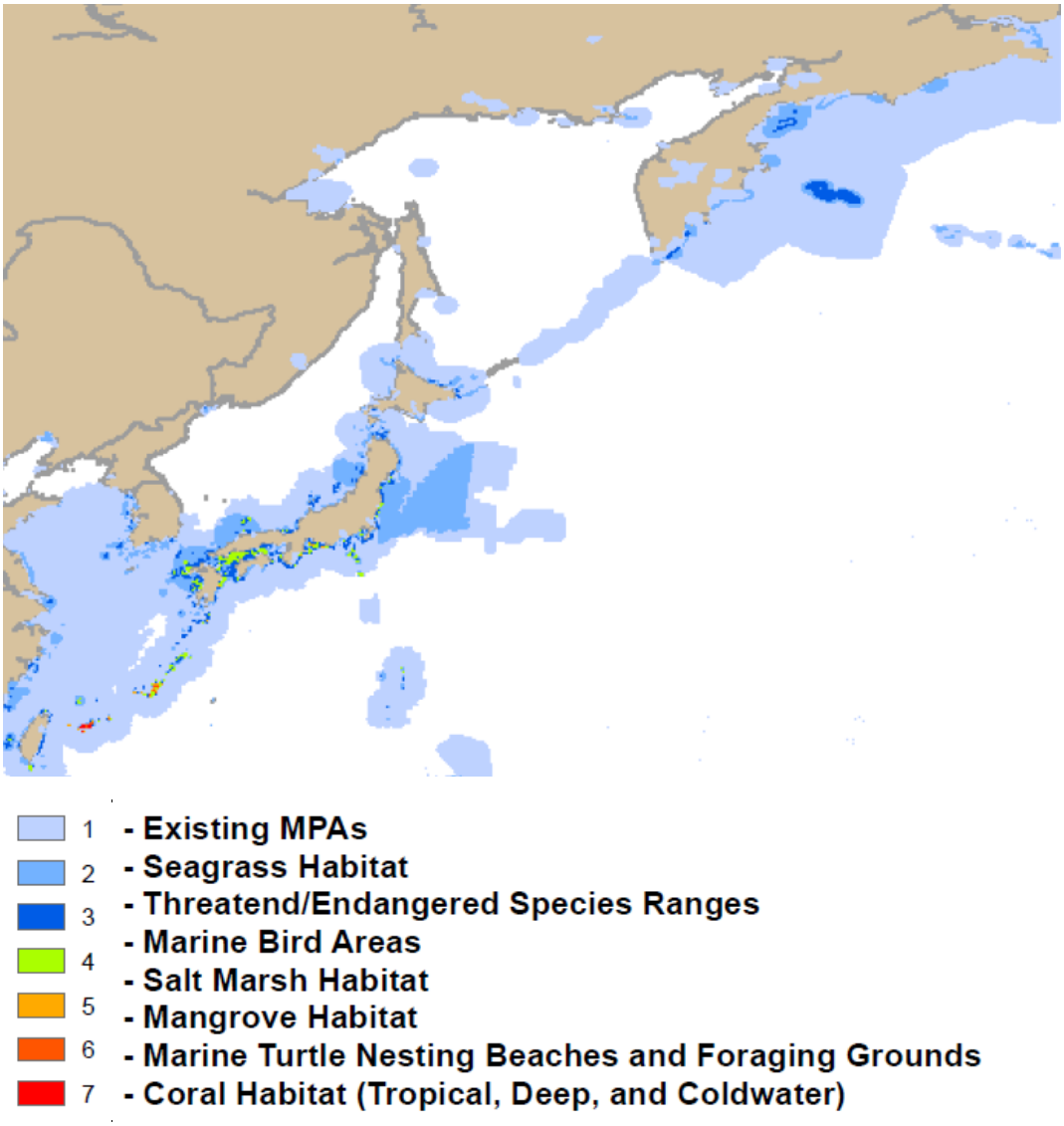

Figure 1: High Resource Value Analysis Overview

Archaeological, Historical, Socioeconomic and Tribal Issues/Resources

Archaeological and Historical:

Marine archaeological sites in the Western Pacific include remnants of a Yuan Dynasty vessel off the coast of Nagasaki, Japan. The vessel, dating back to 1281, is believed to be a part of the Kublai Khan's lost fleet. The vessel yielded over 4,000 artifacts, including: ceramic shards, cannonballs and stone anchors.[28] Submerged stone structures off the Yonaguni Jima Island (near the southern tip of Japan's Ryukyu archipelago) dating back to at least 5,000 years, include the ruins of a castle, a triumphal arch, five temples, and at least one large stadium.[29] There are several archaeological sites as well as historic properties and towns along the Western Pacific coastline.[30]

Socio-economic and Tribal

Japan was chosen as the focus country to offer a unique perspective on the Western Pacific region. In April, 2013, compelled by the government decision to back off on nuclear power, the Japanese government engaged in exploratory drilling for oil and gas for the first time in 10 years. Japan began offshore testing just off the island of Sado in Niigata Prefecture. Authorities believed that the field could potentially be the largest in Japan, big enough to rival a midsized oil field in the Middle East.[31] In July, 2013, no non-commercial hydrocarbons were found southwest of Sado Island.[32] Japan is the third largest oil consumer and importer in the world and meets less than 10 percent of its own total primary energy use from domestic sources. In light of Japan's lack of sufficient domestic oil resources, amounting to only 44 million barrels as of January 2013, Japanese energy companies continue to participate in global oil and natural gas projects by providing technical, financial, and project management services.[33] No information pertaining to tribal issues in the Western Pacific region was found.

Regulatory Bodies

Some regulatory bodies described in the environmental only section below overlap with regulatory bodies described in the Offshore and Others section. In many instances country regulatory bodies have multiple functions that cross over from environmental into energy, mining, etc. These instances should be not be viewed as redundant, but as a highlight of the multiple connections between regulatory bodies and their functions.

Environmental only

In China, the Ministry of Environmental Protection of the People's Republic of China (MEP) is the overarching body that develops, organizes, and implements national environmental plans and policies, laws and regulations, and administrative rules and regulations, among many more important tasks.[34] The Ministry of Environment (MOE) in South Korea is the mandated body responsible for protecting the national territory from threats to the environment[35]. Taiwan's Environment Protection Administration (EPA) acts as the nation's cabinet-level authority overseeing environment related policies[36]. The government reorganized the Administration into the Ministry of Environment and Natural Resources (MENR), but it has yet to be enacted by national legislature[37]. The Ministry of the Environment (MOE) in Japan is the mandated body responsible for formulating environmental policy, participating in international negotiations, environmental and waste management, the health of the environment, and nature conservation. Bureaus are in place to manage each responsibility[38].

Offshore and Others

There has been territorial conflict between China and Japan over oil and gas fields in the east China fields. Even though agreement was reached in 2008 to jointly develop some fields, tensions flared again in 2009 when China "asserted sovereignty over the fields[39]," and again in 2012 when China installed a production platform in a disputed area. However, there have also been instances of cooperation between countries in this region. For instance, Taiwan's CPC Corporation and the CNOOC are working together to explore deepwater areas in the Strait of Taiwan. Descriptions of several of the main regulatory bodies are found below:

China – Ministry of Environmental Protection

The objective of this ministry is to “develop and organize the implementation of national policies and plans for environmental protection, draft laws and regulations, and formulate administrative rules and regulations for environmental protection, environmental protection standards, and pollution prevention[40].”

China – China National Offshore Oil Corporation / Ministry of Land and Resources

“The China National Offshore Oil Corporation is the largest offshore oil and gas producer in China, is a state-owned company operating directly under the State-owned Assets Supervision and Administration Commission of the State Council of the People's Republic of China[41].” It is mainly responsible for offshore oil and gas exploration and development.

In addition, the Ministry of Land and Resources is responsible for “enacting laws and regulations that govern the management of land, mineral, and marine resources[42].” It is also in charge of “supervising the examination, approval, registration, and licensing of the rights to explore and to mine the mineral resources, as well as the transfer of rights to examine and approve blocks open to foreign investment[43].” This ministry also collects and compiles geological data.

South Korea – Ministry of Environment

The objective of the Ministry of Environment “to protect the national territory from threats of environmental pollution and improve the quality of life for the public. The tasks of the Ministry of Environment include enactment and amendment of environmental laws and regulations, introduction of environmental institutions, building up framework structure for environmental administration, drafting and implementation of comprehensive measures for environmental conservation, setting up standards for regulations, and providing administrative and financial support for environmental management to local governments, inter-Korean environmental cooperation, and environmental cooperation with other countries[44].”

South Korea – Korea National Oil Corporation / Ministry of Trade, Industry and Energy

“The Korea National Oil Corporation (KNOC) is a state-owned oil company and the largest entity in South Korea's upstream sector, with 3.2 million barrels of ultra-light crude (condensates) domestic reserves. In addition, KNOC, is responsible for acquisitions of overseas companies and investments with major international and national oil companies for exploration and development in Korea[45].”

The Ministry of Trade, Industry, and Energy’s responsibilities related to energy include “working to ensure a stable and steady energy supply to meet the nation’s growing demands, pursuing a long-term strategy of overseas energy development projects to ensure supply stability, promoting responsible energy use and conservation, and combating climate change by increasing energy efficiency and promoting conservation[46].”

Taiwan – Environmental Protection Agency

Taiwan’s Environmental Protection Agency is made up of seven departments: “comprehensive planning, air quality protection and noise control, water quality protection, waste management, environmental sanitation and toxic substance management, and environmental monitoring[47].” The goal of this agency is promote and enhance environmental protection work and function.

Taiwan – Bureau of Energy

The Bureau of Energy is responsible for:

"-Formulating energy policies and energy related regulations,

-Evaluating and planning of energy supply and demand,

-Granting permission on the exploration, production, transport, storage, transformation, distribution, marketing, and utilization of energy,

-Reviewing natural gas and electricity prices,

-Granting establishment permit, and undertaking matters concerning the registration, administration, counseling, and oversight of energy enterprises,

-Undertaking matters concerning the registration and oversight of energy technical personnel,

-Establishing an energy database system,

-Promoting energy conservation programs and education, and providing technical assistance,

-Promoting research and development of new and renewable energy technology and energy conservation technology,

-Promoting international energy cooperation[48]."

Japan – Ministry of the Environment

The Ministry of the Environment is in charge of global environmental conservation, pollution control, and nature conservation.

Japan – Japan Oil, Gas and Metals National Corporation

Until 2004, the Japan National Oil Corporation (JNOC) was responsible for Japan's oil exploration and production In 2004, most of JNOC's activities were taken over by the Japan Oil, Gas and Metals National Corporation (JOGMEC), which is "a state-run enterprise charged with aiding Japanese companies involved in exploration and production overseas and promotion of commodity stockpiling domestically[49]."

Regulatory Contact Information

For agencies with incomplete regulatory contact information, website links were provided to connect the user to any pertinent information regarding the agency in question.

China Ministry of Environmental Protection

Address: No.115 Xizhimennei Nanxiaojie, Xicheng District, Beijing, P.R.China
Catalogue of Telephone Numbers:
http://english.mep.gov.cn/contact/200712/t20071206_113935.htm
Email: advice@mep.gov.cn.
Website: http://english.mep.gov.cn/About_SEPA/Mission/200707/t20070704_106099.htm

China National Offshore Oil Corporation

Address: No.25,Chaoyangmenbei Dajie, Dongcheng District, Beijing 100010, P. R. China
Telephone: 86 10 8452 1010
Email: cnooc@cnooc.com.cn
Website: http://www.cnooc.com.cn/col/col6301/index.html

China Ministry of Land and Resources

Address: No. 64 Funei Street 100812 Beijng, China
Telephone: 86-10-66558407/08/20
Website: http://www.mlr.gov.cn/mlrenglish/

South Korea Ministry of Environment

Address: Government Complex-Sejong, 11, Doum 6-Ro, Sejong-si, 339-012 Rep. of Korea
Telephone: 82-44-201-6568
Website: http://eng.me.go.kr/eng/web/main.do

Korea National Oil Corporation

List of Contact Information for Various Offices:
http://www.knoc.co.kr/ENG/sub05/sub05_4.jsp
Website: http://www.knoc.co.kr/ENG/sub03/sub03_1_1_4.jsp

Korea Ministry of Trade, Industry and Energy

Address: 02 Hannuri-daero, Sejong-si, 339-012, Republic of Korea
Website: http://www.motie.go.kr/language/eng/index.jsp

Taiwan Environmental Protection Agency

Website: http://web.epa.gov.tw/en/epashow.aspx?list=9044&path=9055&guid=da6d766e-4053-4dc9-896d-c85421f2b5b6&lang=en-us

Taiwan Bureau of Energy

Address: (10492) 13F, No.2, Fusing N. Rd., Jhongshan District, Taipei City 104, Taiwan
Telephone: 886-2-2772-1370
Website: http://web3.moeaboe.gov.tw/ECW/english/news/News.aspx?kind=6&menu_id=958

Japan Ministry of Environment

Address: Godochosha No. 5, Kasumigaseki 1-2-2, Chiyoda-ku, Tokyo 100-8975, Japan
Telephone: +81-(0)3-3581-335
Website: http://www.env.go.jp/en/

Japan Oil, Gas and Metals National Corporation

Address: Toranomon Twin Building 2-10-1 Toranomon, Minato-ku, Tokyo 105-0001, Japan
Telephone: +81-3-6758-8000
Website: http://www.jogmec.go.jp/english/about/index.html

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