



AMERICAN UNIVERSITY OF BEIRUT

OIL AND GAS REVENUE MANAGEMENT  
– CASE OF LEBANON

by  
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A thesis  
submitted in partial fulfillment of the requirements  
for the degree of Master of Science  
to the Department of Mechanical Engineering  
of the Maroun Semaan Faculty of Engineering and Architecture  
at the American University of Beirut

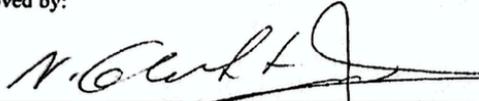
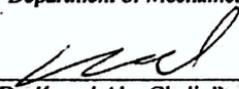
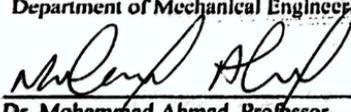
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# ABSTRACT OF THE THESIS OF

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Title: Oil and Gas Revenue Management – Case of Lebanon

In this study, we will discuss in detail the prospective oil and gas resources present in the Lebanese offshore from a technical, contractual, financial, and managerial perspective. The discussion will commence with a technical exploratory assessment of the oil and gas resources to determine the potential size of this sector based on available data. Then, we will shift our discussion to the various contractual frameworks that could be signed between the Lebanese government and international oil companies, such as concessions, production sharing agreements, and service contracts. We will also discuss the Lebanese Offshore Petroleum Resources Law and the terms of the production sharing agreement that the LPA, MOEW and the consortium signed for the awarded blocks in the Lebanese offshore. Based on the parameters mentioned in the contract, we will estimate Lebanon's total share of oil and gas and determine Lebanon's estimated total revenues from this sector. Finally, we will discuss an optimal revenue distribution for three managerial alternatives – sovereign wealth funds, infrastructure investments, and debt servicing – in ways that would boost economic growth, enhance the livelihoods of citizens, and benefit future generations.

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## ABBREVIATIONS

- AW: ANNUAL WORTH
- BCF: BILLION CUBIC FEET
- FW: FUTURE WORTH
- LPA: LEBANESE PETROLEUM ADMINISTRATION
- MMBO: MILLION BARRLES OF OIL
- MOEW: MINISTRY OF ELECTRICITY AND WATER
- PW: PRESENT WORTH
- TCF: TRILLION CUBIC FEET

# CHAPTER I

## INTRODUCTION

Lebanon has been facing an excruciating economic crisis that led to the exponential rise in both the exchange and inflation rates. Living conditions are rapidly deteriorating as businesses are being forced to shut down and entire sectors are collapsing. The Lebanese government must place serious efforts to restart the economy through short term and long term planning. For the short term, the Lebanese government is aiming to secure direct funds from the International Monetary Fund. As for the long term, viable solutions include tackling corruption, restructuring the debt, fairly distributing the financial losses, and working towards a productive and sustainable economy. In addition to that, Lebanon potentially possesses in its offshore a large quantity of undiscovered hydrocarbon resources. It is well known that oil and gas resources have always been viewed as a game changer when it comes to a country's economy, if handled correctly. Therefore, transparent and professional exploration, production, and revenue management in this sector can act as a boost for the Lebanese economy in the future. In this study, we aim to assess the oil and gas quantities in the Lebanese offshore based on the available data. Then, we will discuss the several types of contractual frameworks that are being signed between international oil companies and governments, such as concessions, production sharing agreements, and service contracts. We will also assess the Lebanese Offshore Petroleum Resources Law, extracting relevant articles that discuss revenue sharing from the oil and gas production phase such as royalties, taxes, and petroleum share. Based on the parameters mentioned

in the Exploration and Production Agreement signed between the MOEW, the LPA and the consortium for the awarded blocks, we will estimate Lebanon's potential share from the hydrocarbons present in its offshore. Afterwards, we will estimate Lebanon's potential revenue share from this sector. For this value, we will discuss an optimal revenue distribution scenario between three different managerial alternatives: sovereign wealth funds, infrastructure investments, and debt servicing. Our aim is to ensure that the methods in which these revenues are used aid in boosting economic growth, enhancing the living conditions of citizens, reducing budget losses, and benefiting future generations.

#### **A. Issue and Proposal**

Lebanon is expected to start generating revenues in 2027 from oil and gas resources present in its offshore. In order to properly manage these revenues and to avoid improper allocations, one must find an optimal management scenario for this sector. Based on the Lebanese Offshore Petroleum Resources Law, a sovereign wealth fund is already proposed as a revenue management option. Since Lebanon is heavily indebted and is known to have improper infrastructure when it comes to electricity, water, transport, etc., we propose three distinct management scenarios for revenues generated from the oil and gas sector: investing in a sovereign wealth fund, debt servicing, and investing in sustainable infrastructure. Our study aims to derive an optimal revenue distribution between the cases aforementioned in order to boost economic growth, enhance the livelihoods of citizens, and benefit future generations.

## **B. Objectives**

This study aims to fulfill several objectives related to the oil and gas sector in Lebanon. The data in this study are derived from several sources and research articles dealing with hydrocarbon resources in the Levant Basin and in the Lebanese offshore.

The main objectives of the study are:

- To discuss the estimates of the oil and gas quantities present in the Lebanese offshore based on available data.
- To discuss the contractual frameworks in the oil and gas sector that govern relations between states and IOCs.
- To assess the Lebanese Offshore Petroleum Resources Law.
- To assess the production sharing agreement signed between the LPA, MOEW, and the consortium for the awarded blocks in the Lebanese offshore.
- To determine Lebanon's share from the extractable oil and gas resources.
- To determine Lebanon's total revenue from these resources.
- To present several revenue management options such as sovereign wealth funds, infrastructure investment, and debt servicing.
- To optimally distribute these revenues on the managerial alternatives in ways that would benefit current citizens and future generations, and boost economic growth.

## CHAPTER II

### LITERATURE REVIEW

In this section, we will present information based upon research on the Lebanese economy, debt, and infrastructure. We will briefly discuss the oil and gas sector before delving into its details. Moreover, we will examine sovereign wealth funds. Finally, we will talk about contractual frameworks that govern the relation between states and oil companies.

#### **A. Lebanese Economy**

In this section, we will discuss the Lebanese Economy. Lebanon is currently witnessing an economic crisis, with the Lebanese Lira having lost 80% of its value in the span of 10 months (2019-2020). Additionally, BDL has accumulated losses worth \$49 billion – in other words, 91% of the country’s economic output in 2019 (Consultancy-me.com, 2020). The GDP and GDP per capita in current US Dollars were estimated to be \$53.367 billion and \$15,327.309 in 2019 respectively. The GDP recorded double digits decline in 2020, after recording high rates of 10% by the end of 2010 (World Bank, n.d.).

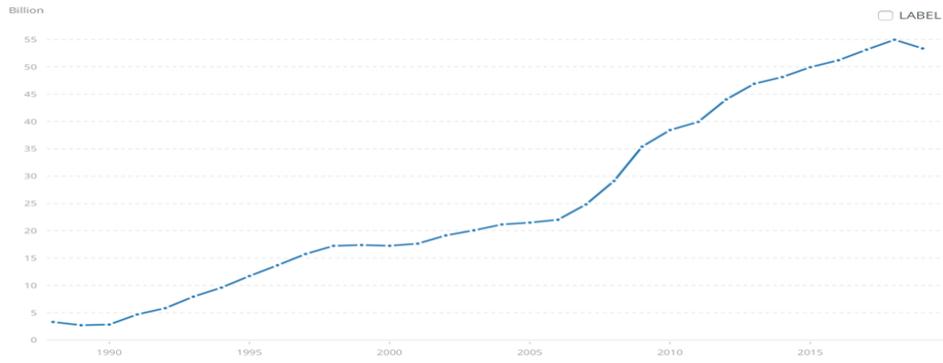


Figure 1 - Lebanon's GDP

(Source: World Bank)

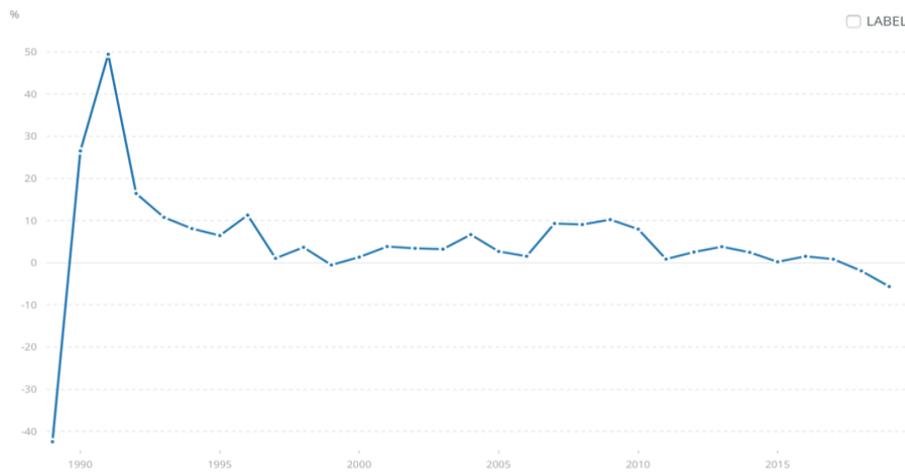


Figure 2 - Lebanon's GDP Growth

(Source: World Bank)

The unemployment rate was 11.35% in 2018 and has significantly risen since then to surge past the 30% mark in 2020. This equates to around 550,000 unemployed out of the 1.8 million workforce (Consultancy-me.com, 2020). The World Bank has estimated in 2018 that around one third of the Lebanese population lives in poverty, with that figure possibly rising up to 50% in 2020 (as seen in the figure below) as the economic situation worsens (World Bank, n.d.).

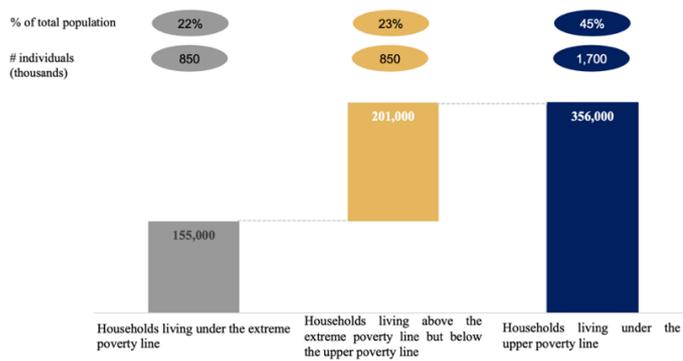


Figure 3 - Poverty line in 2020

(Source: World Bank)

Lebanon's economy is service oriented, with the banking and tourism sectors being the main growth sectors. From the figure below, one can realize the large size of the services sector, which amounts to 75% of GDP.

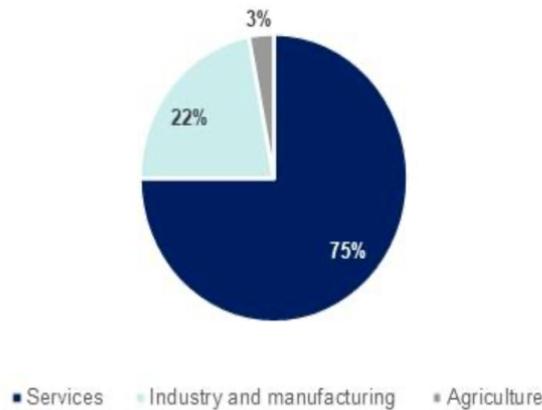


Figure 4 - Output composition by sector as a share of GDP

(Source: World Bank)

The touristic sector, which Lebanon is famous for, is collapsing rapidly. As such, numerous touristic locations are being forced to close due to the excruciating economic challenges, namely insufficient solvency in the market needed for imports and the rising exchange rate. In fact, a study by InfoPro Research found out that one fifth of the companies in the country have either ceased or suspended operations since

the beginning of 2019. Moreover, 50% of the aforementioned companies have shut down in the first five months of 2020 (Consultancy-me.com, 2020).

As for the banking sector, there was no previous restriction on foreign exchange and capital movement. However, this has changed recently with people being denied access to their deposited USD money by the banks. Lebanese people are currently witnessing an effective unofficial 50% haircut on their dollar deposits; as the withdrawal rate from USD bank accounts is at 3950 LL/\$ while the current market rate is roaming in the vicinity of 7500 – 8500 LL/\$. Moreover, the \$49 billion in BDL's accumulated losses is equal to the total value of the deposits held by commercial banks at BDL (Consultancy-me.com, 2020).

The Lebanese economy is heavily burdened by the soaring debts. Two main causes of the yearly increase in national debt are the rising fiscal imbalance and the electricity sector, with the latter draining \$2 billion yearly in subsidies from the budget. Moreover, the large discrepancy between exports and imports has led to a large trade deficit, which subsequently depleted foreign exchange reserves. Another main cause of the fragile economy is corruption. In fact, Lebanon ranks 138th out of 180 countries on the corruption perception index ("Economy of Lebanon", 2019). The lack of transparency and the absence of profound accountability led to mistrust between the general public and the government, which in turn led to the decrease of investments and inflow of money from the Lebanese diaspora.

As for inequality, it is worth mentioning that the 1% elite rich in Lebanon receive approximately a quarter of the total national income, whereas the bottom 50% of the population is left with 10%. This makes Lebanon one of the most unequal countries in the world ("Economy of Lebanon", 2019).

Nevertheless, Lebanon has a bright future in case the government adopts a clear economic vision, works transparently, and battles corruption. The Lebanese government should focus on ensuring macroeconomic stability, spending efforts and resources on priority areas that would yield economic growth, improving its business environment, and finally developing high value-added and future-proofed productive sectors. If performed properly, this will result in economic diversification, a sustainable balance of payments surplus in the medium-term, an increase in available jobs, and a potential real growth increase in GDP (Association of Banks in Lebanon, 2020).

## **B. Lebanese Debt**

A major cause of the Lebanon economic crisis is the ever increasing debt. In fact, according to the data released by the Ministry of Finance, Lebanon's gross public debt reached \$92.42 billion in March 2020. The local currency debt reached \$58.3 billion in the first quarter of 2020 (63.12% of the total public debt), whereas the total debt in foreign currency totaled \$34.09 billion (Chbeir, 2020). The government debt is at 154.9% of GDP, which makes Lebanon the third most indebted country in the world.

Moving on, we will analyze notable sources of foreign debt, primarily The Paris I, II, III Conferences. The Paris I conference occurred on February 27, 2001 and resulted in raising €500 million for development projects in Lebanon. As for the Paris II Conference, it occurred a year later, on November 23. This conference resulted in raising \$4.4 billion, out of which \$3.1 billion were directed towards reducing public debt and \$1.3 billion were directed towards financing socio-economic projects. Finally, the last conference, Paris III, occurred on January 25, 2007. This conference resulted in a pledged amount of \$7.53 billion to be granted for Lebanon (Credit Libanais S.A.L.,

2016). Another source of the external debt is coined to the pegging of the Lira against USD throughout the years – BDL borrowed USD money from commercial banks for high interest rates in order to subsidize commodities (such as electricity and wheat) and import supplies (trade balance is highly deficit). With time, this led to the depletion of dollar reserves in the country and the accumulation of debt in USD.

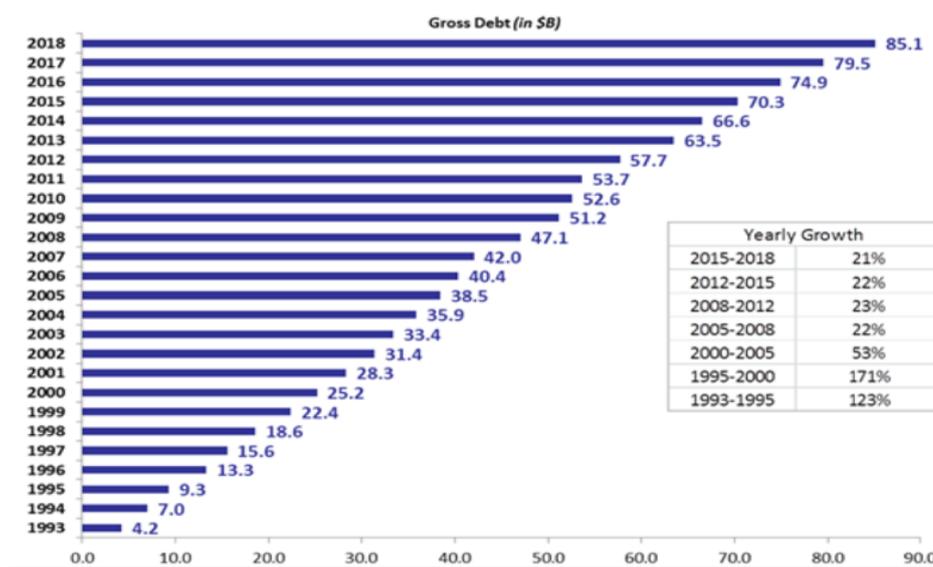


Figure 5 - Evolution of Gross Debt

(Source: Ministry of Finance; BLOMInvest Bank)

The banking sector in Lebanon currently holds 53% of Lebanon’s gross public debt. As depicted in the graph below, the central bank holds 39.7% of the local currency debt as of March 2016. The general trend of public debt was evenly divided between local and foreign currencies up until 2008. Then, a local currency borrowing trend emerged which led to an increase in debt from \$20.81 billion in 2007 to \$43.25 billion in 2015. As of 2016, the general public debt was split at 61.43% for local currency versus 38.57% for foreign currency. This is largely due to the fact that the issuance of Eurobonds, which requires ratification by the parliament, was halted due to the high

political instability and the discontinuous parliamentary sessions. It is also worth mentioning that 92.35% of the foreign currency debt is in US dollars, with 4.44% attributed to Euro currency and the remaining 3.21% attributed to other currencies (CREDIT LIBANAIS S.A.L., 2016).

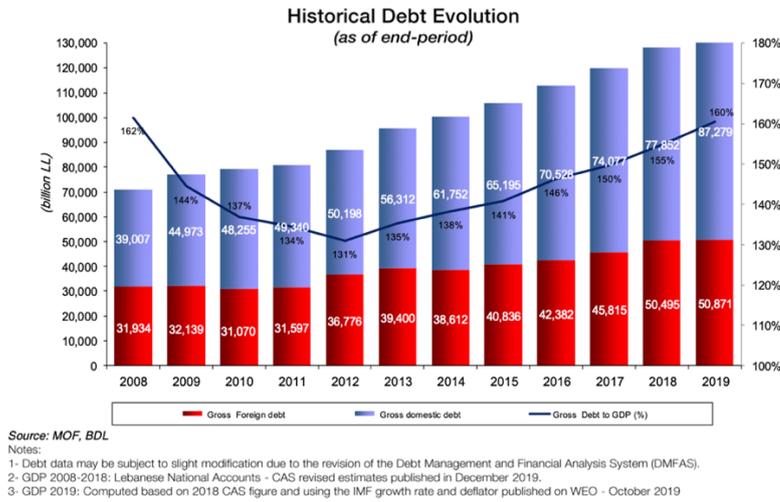


Figure 6 - Historical Debt Evolution  
(Source: Ministry of Finance)

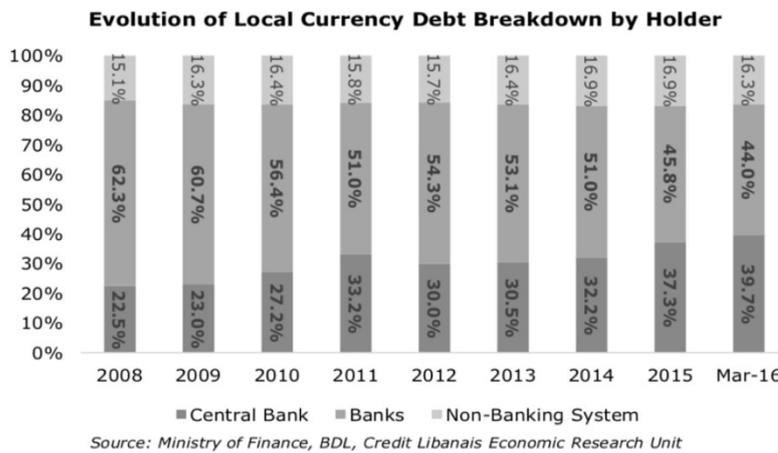


Figure 7 - Evolution of Local Currency Debt Breakdown by Holder  
(CREDIT LIBANAIS S.A.L., 2016)

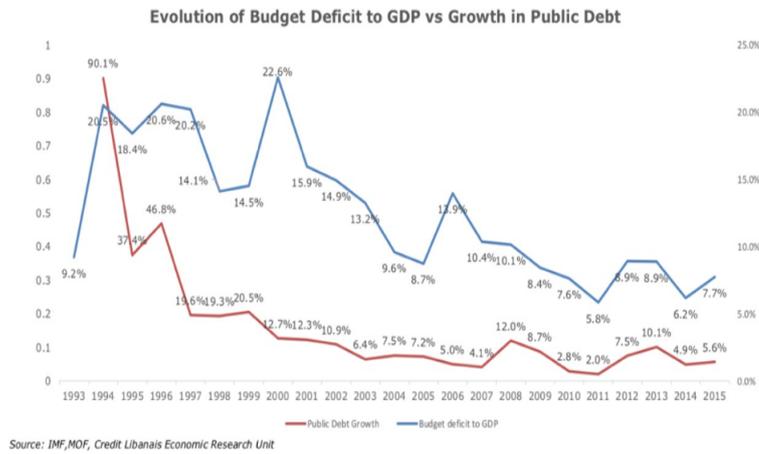


Figure 8 - Evolution of Budget Deficit to GDP vs Growth in Public Debt (CREDIT LIBANAIS S.A.L., 2016)

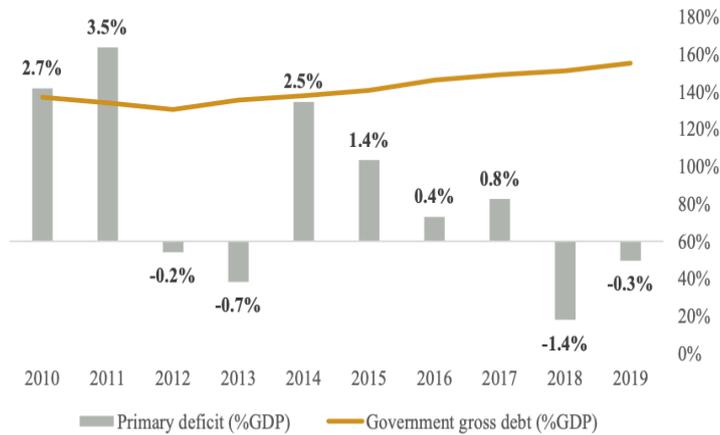


Figure 9 - Evolution of primary deficit and public debt (Source: IMF WEO)

As for debt servicing, interest payments amounted to around 9% of GDP and 39.35% of total revenues. This totaled around \$5.5 billion in 2018 as seen below. The interest rate on Eurobonds in 2018 was 8.9%.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
%GDP growth (IMF)	1.1%	3.9%	3.4%	1.7%	7.5%	2.7%	1.7%	9.3%	9.2%	10.1%	8.0%	0.9%	2.8%	2.7%	2.0%	0.2%	1.7%	1.5%	1.0%
Interest Payments (in %GDP)	NA	NA	16.6%	16.8%	12.3%	10.5%	13.2%	12.6%	11.3%	10.8%	10.2%	9.4%	8.2%	8.2%	8.6%	8.9%	9.3%	9.2%	9.0%
Interest Payments (in % total revenues)	NA	NA	80.60%	74.91%	52.38%	46.05%	58.49%	54.42%	46.98%	45.52%	46.46%	40.19%	38.53%	40.23%	38.50%	46.57%	48.03%	42.92%	39.35%

Table 1 - Cost of Debt

(Source: Ministry of Finance; BLOMInvest Bank)

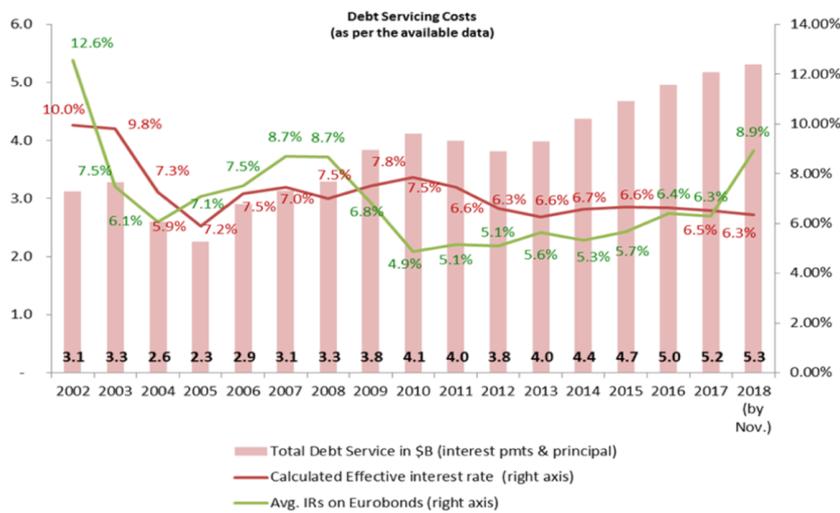


Figure 10 - Cost of debt per type

(Source: Ministry of Finance; BLOMInvest Bank)

It is evident from the data mentioned beforehand that the Lebanese debt is causing huge economic pressure on the government. Many proposed that revenue generated from the oil and gas resources should be directed towards fulfilling the existing debt. If this option is to be followed, it will lead to:

- Decreasing the debt ratio.
- Decreasing the debt service.
- Increasing the credit rating.

- Providing a better fiscal situation.

Our focus in this study will be servicing Eurobonds, whereby part of the revenues achieved from the oil and gas sector will be used to pay principle debt and interest. According to the table below, Eurobonds amount to the equivalent total of 47,776 (in billion LBP) in foreign currencies. Hence, this equates to \$31.53 billion (using 1507 LL/\$). We will not consider the remaining foreign currency loans and other debts, as such debts are of bilateral and multilateral nature usually characterized by low interest rates, and cannot be defaulted as in the case of private debt. Certain assumptions such as a decreased interest rate, defaulting on debt payments till 2027, and haircuts on external debt are taken in later sections of this study. It is worth noting that future foreign debts such as funds from IMF and World Bank (if acquired) will not be considered in our scenario, as these funds are characterized by low interest rates and payments cannot be defaulted.

Public Debt Table <sup>(1)</sup> (as of end-period)										
Public Debt (in LL billion)	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Change Dec 19 - Dec 18	% Change Dec 19 - Dec 18
Gross Public Debt (A + B) <sup>(1)</sup>	86,974	95,712	100,364	106,031	112,910	119,892	128,347	136,150	9,803	8%
A. Local currency debt	50,198	56,312	61,752	65,195	70,528	74,077	77,852	87,279	9,427	12%
1. Central Bank	14,849	16,761	19,454	23,907	30,150	35,580	39,006	50,717	11,711	30%
2. Commercial Banks (including REPOs)	27,667	30,315	31,869	30,279	29,581	27,756	27,402	25,316	(2,086)	-8%
3. Other local debt (T-bills)	7,882	9,236	10,429	11,009	10,797	10,741	11,444	11,248	(198)	-2%
o/w Public entities	6,479	7,117	7,701	8,461	8,718	8,941	9,956	9,968	12	0%
o/w Contractor bonds	134	134	180	180	139	166	166	120	(46)	-28%
*Accrued interest included in debt	789	877	1,029	997	1,098	1,159	1,123	1,294	171	15%
B. Foreign currency debt <sup>(2)</sup>	36,776	39,400	38,612	40,836	42,382	45,815	50,495	50,871	376	1%
4. Eurobonds	32,789	35,533	34,850	37,561	39,240	42,339	47,225	47,776	551	1%
Of which, Paris II at preferential rates	2,646	2,130	1,615	1,099	583	68	-	-	-	-
Of which, Paris III at preferential rates	317	271	226	181	136	-	-	-	-	-
Of which, market-issued Eurobonds	29,427	32,688	32,584	35,846	38,063	41,791	46,678	47,206	528	1%
* Accrued Interest on Eurobonds	400	444	425	435	458	480	547	570	23	4%
5. Loans	3,884	3,738	3,648	3,207	3,079	3,443	3,264	3,092	(172)	-5%
5.1 Paris II loans	279	208	128	83	48	18	-	-	-	-
5.2 Paris III loans <sup>(2)</sup>	997	915	760	629	525	452	344	261	(83)	-24%
5.3 Bilateral loans (non-Paris II and III)	841	827	1,200	1,054	953	935	822	727	(95)	-12%
5.4 Multilateral loans (non-Paris II and III)	1,753	1,694	1,506	1,417	1,494	1,954	2,015	2,036	21	1%
5.5 Foreign Private Sector Loans	14	94	54	24	59	84	83	68	(15)	-18%
6. Other debt	103	129	114	68	63	33	6	3	(3)	-50%
6.1 Special Tbls in Foreign currency <sup>(3)</sup>	103	129	114	68	63	33	6	3	(3)	-50%
Public sector deposits	12,916	15,495	14,246	13,555	14,586	15,659	14,186	15,677	1,491	11%
Net debt	74,058	80,217	86,118	92,476	98,324	104,233	114,161	122,473	8,312	7%
Gross Market debt <sup>(4)</sup>	59,014	65,789	67,774	69,200	70,303	71,944	76,204	74,441	(1,763)	-2%
% of total debt	67.9%	68.7%	67.5%	65.3%	62.3%	60.0%	59.4%	53.9%	-5.5%	-9%

Source: MOF, BDL

Notes:

<sup>(1)</sup> Due to revisions in the Debt Management and Financial Analysis System (DMFAS):

<sup>(1)</sup> Debt data for December 2012 to December 2018 may be subject to slight modification.

<sup>(2)</sup> IBRD loan, UAE loan and French loan of which the first tranche was received in February 2008 and the second tranche in September 2012

<sup>(3)</sup> Special Tbls in Foreign currency (expropriation and contractor bonds).

<sup>(4)</sup> Gross market debt equals gross debt less the portfolios of the BDL, Public Entities, bilateral and multilateral loans, Paris II and Paris III related debt.

Table 2 - Public Debt Table

(Source: Ministry of Finance)

### **C. Lebanese Infrastructure**

This section deals with infrastructure in Lebanon. We will start our discussion with the power and electricity sector, which drains around \$2 billion in losses yearly from the government's budget. In fact, Lebanon has ranked in the top 4 world worst nations when it comes to the quality of electricity supply. Electricity in Lebanon is monopolized by EDL, which controls around 90% of the sector. Due to the inconsistency of EDL, citizens end up purchasing power from private generators and end up paying double electrical bills (the highest in the region). Moreover, electricity losses on the grid amount to 40%, with 15% representing technical losses and 25% representing nontechnical losses. In 2016, the electricity shortage totaled 1909 MW. As for the distribution of electricity, it goes as follows: 45% for residential and business sectors, 23% for industry, 12% for administrative buildings, 5% for concessions, and 15% for technical losses (Fardoun, Ibrahim, Younes, & Louahlia-Gualous, 2010). From the data above, one can realize the immediate need for reforms and investment in this sector, as proper governance of this sector will save the government billions of dollars, enhance living conditions, and boost industrial sectors.

Moving on, Lebanon lacks a proper, sustainable, and efficient transport system. Thus, people rely on private vehicles in order to undergo daily activities. This causes high congestions especially in densely populated areas such as Beirut, causing economic and time losses (Saadeh & Mikhael, 2015). Investing in proper public transport systems, as well as proper transport infrastructure, will definitely boost the economy on the long run and would provide better living conditions for people.

Finally, for the water issue, surface water in Lebanon is currently stored in two main concentrated reservoir dams, the Qaraoun reservoir and the Chabrouh dam. Other examples of surface water storage are smaller dams in different areas, along with artificial ponds and hill lakes. As for water supply networks, most pipelines are old and badly maintained, which results in up to 50% water loss due to leakage. Hence, similar to electricity, citizens rely on private water suppliers to sustain their demand (Fanack, 2015).

From the information presented above, it is evident that the three sectors require investments and proper maintenance in order to supply the demand of the population. Investing in infrastructure might be redeemed as an inferred cost, but its benefits far outweighs the costs. Investing in infrastructure will not only enhance the livelihoods of citizens but would also promote economic growth in other sectors such as manufacturing and tourism and create jobs. Moreover, a proper infrastructure will attract foreign investors to invest in Lebanon especially with its strategic position in the MENA region.

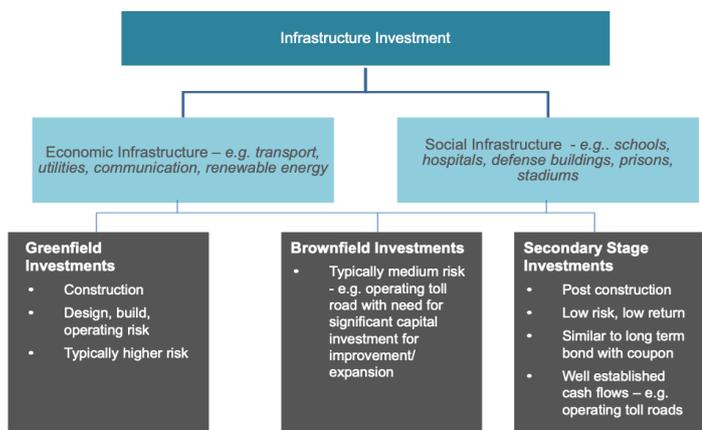


Figure 11 - Infrastructure Investment

(Source: World Bank)

The Lebanese government aimed in 2018 to secure funds from CEDRE conference in order to finance projects related to the infrastructure. The government developed a Capital Investment Plan detailing 269 infrastructure projects in 8 sectors, worth around \$23 billion – this amounts to around 40% of the GDP. The projects distribution is as follows: water (124); wastewater (24); electricity (17); infrastructure for tourism and cultural heritage (11); telecommunication (8); infrastructure for industry (2); and solid waste (1). After presenting the plan at CEDRE conference, the government received funding pledges totaling \$11.6 billion. The aim of the government in the CIP was to reduce inequality ensuring balanced development across the regions. As seen below, the largest share of funds was allocated for the transport sector (32.2%), followed by electricity (24.4%), and water (21.1%) (Atallah, Dagher, & Mahmalat, 2019).

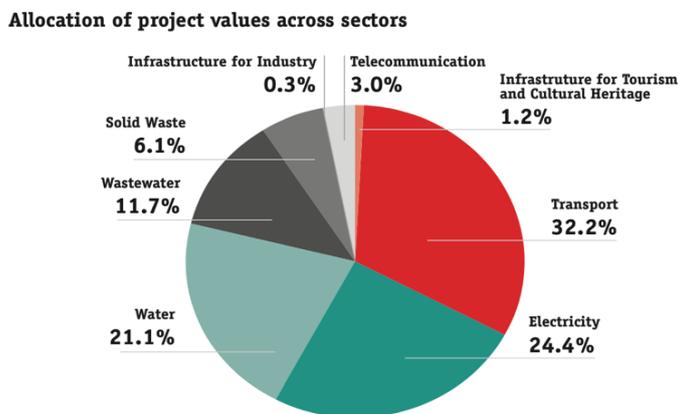


Figure 12 - Allocation of project values across sectors  
(Source: The Lebanese Center for Policy Studies)

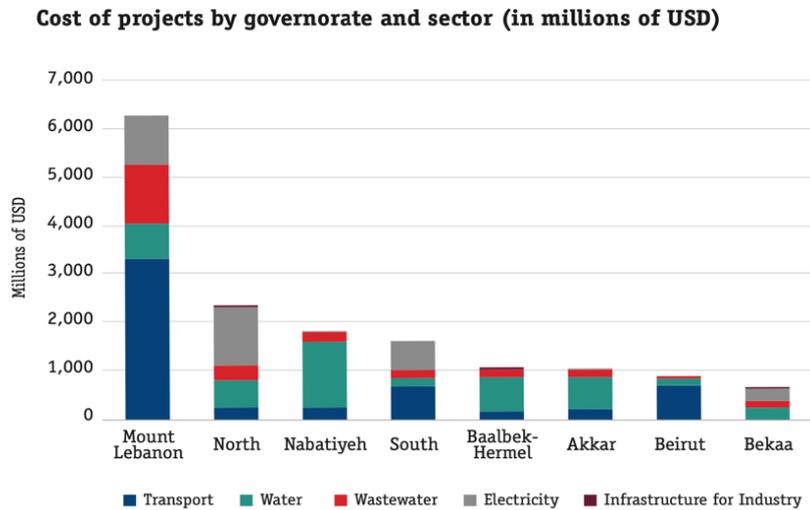


Figure 13 - Cost of projects by governorate and sector

(Source: The Lebanese Center for Policy Studies)

**CAPITAL INVESTMENT PROGRAM (USD Million | 2017)**

	Cycle 1	Cycle 2	Cycle 3
<b>Transportation</b>	2,863	2,820	1,698
<b>Water and Irrigation</b>	2,257	878	1,710
<b>Electricity</b>	2,251	1,441	2,000
<b>Solid Waste Management</b>	1,400	-	-
<b>Wastewater</b>	1,364	1,040	278
<b>Telecommunication</b>	700	-	-
<b>Cultural Heritage</b>	84	180	-
<b>Support to Industry</b>	-	75	-

Table 3 - Capital Investment Program

(Source: The Presidency of the Council of Ministers of Lebanon)

We propose benefitting from oil and gas revenues in order to finance these projects instead of increasing foreign debt. Thus, we will consider the possibility of financing these infrastructure projects from the revenues acquired from the sale of oil and gas products.

#### **D. Sovereign Wealth Funds**

Sovereign funds are state-owned funds that are invested in various financial assets. Basically, they are an alternative to channeling surplus in the budget to the economy or depositing it in the central bank. In the year 2012, experts estimated the total combined global sovereign wealth funds to be \$5 trillion in assets. The ultimate aim of a sovereign wealth fund is to stabilize a country's economy and to accumulate wealth for future generations. SWF are of a passive long-term nature and often invest in government bonds, equities, and foreign direct investments. There is a new trend of investing in hedge funds and private equity. The Abu Dhabi Investment Council is an example of a Sovereign wealth fund (SWF) in the Arab region (Twin, 2019). The Norwegian sovereign wealth fund is a notable example of successful investing, where investments of revenues generated from petroleum resources yielded an astonishing value of \$1.1 trillion, or \$200,000 per citizen (Reuters, 2019).

Lebanon is known to be a highly corrupted nation. Therefore, one must have many doubts regarding how well revenues will be handled. Therefore, a SWF investing in foreign assets and managed by international companies might be the solution for battling out this problem. Moreover, even if corruption wasn't taken into consideration, Lebanon lacks the sufficient skills for proper investments due to bad management. In addition, the Lebanese government is known to lack one devised investment plan, which is evident through the examination of budget distributions throughout the years: no cost/benefit analysis, lack of investment knowledge, etc. Finally, the general trend of focus in Lebanon is short termed, thus we lack medium and long-term visions. For all the aforementioned reasons, a SWF can be considered as an option for revenue saving.

## **E. Oil and Gas in Lebanon**

The oil and gas industry offers hope to nourish the Lebanese economy if operated and managed successfully. In this section, we will offer a quick overview about this sector before going into details in later sections.

Seismic studies performed by the British Spectrum Company and the Norwegian Petroleum Geo-Services Company in 2002 and 2006, along with studies conducted by the US Geological Survey in 2010, indicated the presence of oil and gas reservoirs in the Lebanese offshore. The studies estimated a reservoir of approximately 1.7 billion barrels and 122 trillion feet of oil and gas in the Levant Basin (Shehab, 2017). According to Beicip Franlab, the total Lebanese oil and gas reserves range from 440 to 675 million barrels of oil and 12 to 25 trillion cubic feet of gas respectively.

As for the contractual aspects, the Lebanese parliament ratified the Offshore Petroleum Resources Law in August 2010. A production sharing agreement will be agreed upon between the Ministry of Electricity and Water and the international oil companies. The companies are to recover investments made up to a certain ceiling in case oil and gas discovery is achieved, and royalty will be paid to the Lebanese government in terms of revenue sharing. Based on the Exploration Production Agreement, production will then be divided between the government and the companies. Several factors will play a huge role in how well Lebanon would benefit from these reserves. First of all, the real volume of extractable oil and gas will highly alter the expected revenue. Second, the planning and management of these resources by the Lebanese government is crucial in order to optimize the benefits. The third factor that will alter the expected revenue is the oil and gas global prices at the time of extraction (Shehab, 2017). In the upcoming sections, we will analyze and discuss in

details the Levant Basin, the Lebanese Exclusive Economic Zone, the Lebanese Law, and the revenues to be expected from this sector.

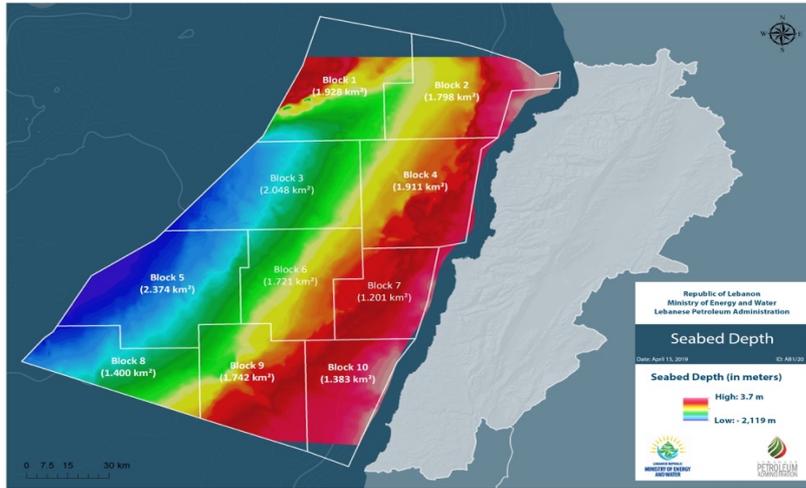


Figure 14 - Seabed depth  
(Source: Lebanese Petroleum Administration)

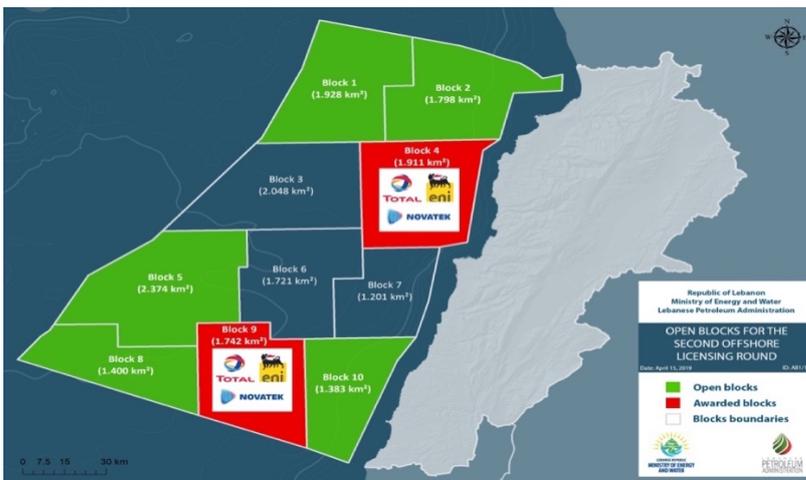


Figure 15 - Open and awarded blocks  
(Source: Lebanese Petroleum Administration)

## F. Types of Potential Oil and Gas Contracts

This section aims to shed light on the terms and dynamics of the contractual frameworks that govern the relation between states and IOCs in order to understand the choice of framework the Lebanese government chose. First of all, the main aim of each

government is to ensure its sovereignty over its national resources, maximize its profit share, and minimize the costs. Thus, the choice of the contractual framework depends on many factors, of which are the expertise of the government in the oil and gas sector, the potential geopolitical and technical risks, and the oil and gas history of the region. Our focus will be on the following types of contractual frameworks: concessions, production sharing agreements, service contracts, and joint ventures. As we will see in the next section, the Lebanese law indicates that oil and gas activities shall be performed under an exploration and production agreement.

### *1. Concessions*

A concession basically grants an international oil company full rights to explore and produce hydrocarbons in a designated area. Hence, ownership of the produced oil and gas is reserved for the IOC while the government benefits from royalty payments (in cash or kind), along with profit taxations. Thus, this type of contractual framework is a license and it gives the international oil company exclusive rights to explore and exploit petroleum, own and market the production, and own the relevant equipment and installations (Extractives Hub, n.d.). It is worth talking about early concessions, along with their huge disadvantages to the state and their evolution to modern concessions. Basically, early concessions had long period contracts ranging from 60 to 75 years, meaning that governments lost sovereignty over their national resources for an extended period of time. Moreover, early concessions isolated governments from the oil production process, as no state participation was present and IOCs were granted full control of the resources. This put governments at a great disadvantage as the primary beneficiary of the contract was the IOC. Basically, the state only benefited from a flat rate per ton as royalties instead of a percentage of value of sale price of production –

this had turned out to be minor in value compared to what the IOCs were making. As time passed, Middle Eastern and Gulf countries started pushing for negotiations, which lead to many transitions into modern concessions. The reasons behind the IOC's willingness to renegotiate contracts were: the fear of nations resorting to nationalizing their resources; the concessions in place were highly profitable and renegotiations would still imply large profits; the IOCs were vertically integrated which prompted them to prefer accessing reserves over fluctuations in profits (Bindemann, 1999).

Modern concessions are similar to early concessions when it comes to IOCs having full rights over exploration and production of hydrocarbons. Nevertheless, modern concessions have much shorter contract periods with specifically designated areas, work obligations, relinquishment clauses, higher royalties, and bonus payments. Moreover, state participation is witnessed in modern concessions as opposed to early concessions. It is also worth mentioning that in modern concessions, the IOC bears all costs and risks, which could prove crucial for governments in case no commercial resources were found. It is evident that modern concessions provide fairer terms for states. These contracts are quite simple especially for developing countries, since the process is straightforward and usually requires a simple level of support and expertise from the government's side.

## ***2. Production Sharing Agreements***

The next contractual framework in our discussion is production sharing agreements. These types of contracts are used in more than 40 countries as means of managing rights and duties between governments and IOCs. A production sharing agreement is a contract rather than a license. Hence, the state owns its hydrocarbon

resources and the IOC explores and produces these resources at its own risk and expense. If commercial quantities are produced, a share from the produced oil and gas is given to the IOC as a payment or compensation for the undertaken risk and performed service. Several factors play a role in shaping the PSA, such as the petroleum legislation of the state, the country's economic model, and the country's experience in the oil and gas sector. A PSA includes signing bonuses for the government that can be traded for larger shares of future profits, cost recovery entitlements for the IOC, and royalties and taxation clauses. The duration of the contract is usually 20 to 30 years. PSAs are popular throughout the world, and are undergone in several MENA countries (Bindemann, 1999).

From a financial point of view, the concession and the PSA are not that different, as both aim to distribute revenue between the IOC and the government. However, the power of a PSA lies in granting the state sovereignty over its resources. Hence, from a political perspective, a PSA is deemed to be better for the state.

### ***3. Service Contracts***

Now moving on to service contracts. These contractual frameworks are the least popular among the aforementioned framework. Basically, they are undergone in countries that adopt a nationalistic approach or countries that have long established petroleum production. In service contracts, the government requests the services of an IOC in certain areas due to their financial and technical expertise in that area, such as enhanced recovery. For its service, the IOC is paid in cash rather than in kind (Extractives Hub, n.d.). Due to the short-term nature of the contract and the lack of

access to data especially risk analysis, service contracts are not very popular and are not favored by IOCs.

The three frameworks mentioned above are petroleum agreements signed between governments and international oil companies (or consortiums). Now, we will move on to agreements between companies.

#### ***4. Other Agreements***

Joint operating agreements are agreements signed between multiple petroleum companies due to the high risk associated in the upstream sector. Governments (or national oil companies) also participate in such agreements. In a joint venture, multiple parties agree to use their expertise and resources in order to perform a certain project together, with a joint operator or committee managing the operations. A state participation agreement aims to allow the state, or a representative of the state, such as a national oil company, to commercially participate in the joint venture. Thus, in such an agreement, the government becomes an investor, and hence assumes risks and shares profits from production. Farm-out agreements are used when one party in a joint venture transfers its portion to a new partner or an existing partner. Finally, unitization agreements are used in case of a given field crossing the borders of two license or contract areas awarded by the host country (Extractives Hub, n.d.).

Found below is a table summarizing the mentioned frameworks (concessions, PSA, JV, and service agreements), along with a tree diagram showcasing an example of a PSA profit distribution.

<b>Contract</b>	<b>IOC</b>	<b>Government</b>
<b>Concession</b>	All risk / All reward	Reward is function of production and price
<b>Production Sharing Agreement</b>	Exploration risk / Share in reward	Share in reward
<b>Joint Venture</b>	Share in risk and reward	Share in risk and reward
<b>Pure Service Agreement</b>	No risk	All risk

Table 4- Summary table of the contractual frameworks

(Bindemann, 1999)

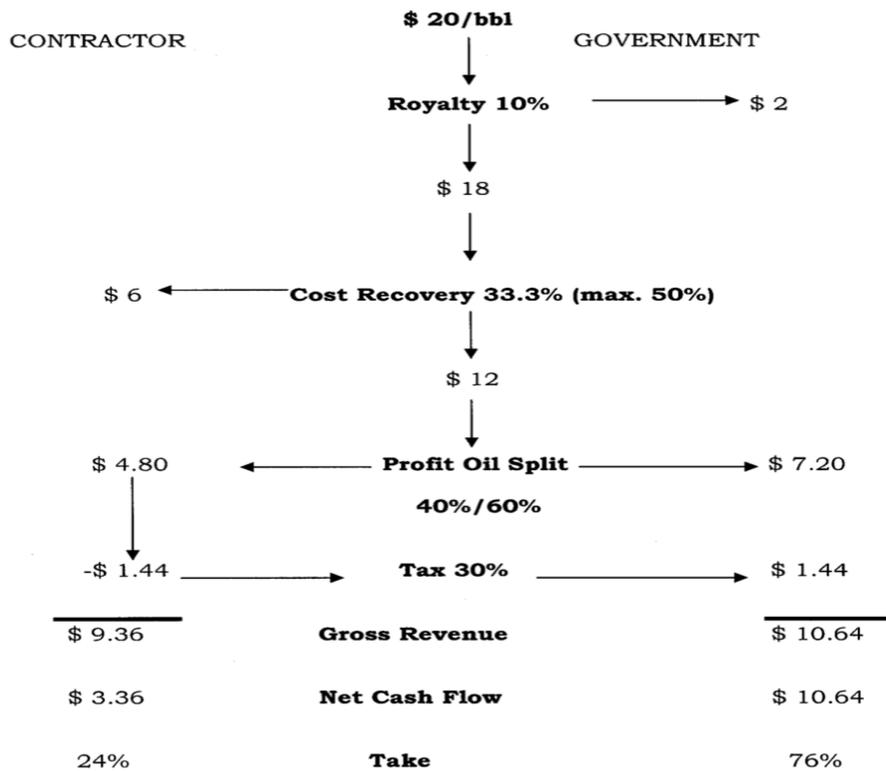


Figure 16 - Typical PSA Profit Flow Chart

(Bindemann, 1999)

## CHAPTER III

### METHODOLOGY

Our study aims to determine an estimate for the oil and gas resources in the Lebanese offshore in order to determine the estimated revenues for the Lebanese government and subsequently provide management alternatives for these revenues. Our main aim is to maximize benefits such as economic growth and enhanced living conditions for current and future generations. As such, our study will commence with a technical, contractual, and financial analysis, dealing with:

- Exploratory assessment and technical specifications.
- Assessment of the Lebanese Offshore Petroleum law.
- Assessment of the Exploration and Production Agreement.
- Determination of Lebanon's production share, royalties, and taxes.
- Determination of Lebanon's estimated revenue.

After the technical analysis, we will achieve a general idea about the estimate monetary value of the oil and gas resources in the Lebanese offshores. After revenue estimation, we will begin our revenue management discussion. For revenue estimation, we will be discussing two data sets:

- Ministry of Electricity and Water.
- Spectrum estimates.

As it will be shown in later sections, these data sets assume different sizes of surveyed areas. Since the oil and gas sector is characterized by high uncertainty, we chose these two estimates as a form of a low estimate and high estimate scenarios.

As for the debt servicing, we will consider servicing only Eurobonds. Due to the current plans of restructuring debt, we considered three scenarios for haircuts on Eurobonds:

- 25% haircut on Eurobonds.
- 50% haircut on Eurobonds.
- 75% haircut on Eurobonds.

As for the management of these revenues, the trend that would be followed is that the total expected revenue will be transformed into an annual worth representation, along with an annual worth representation of Eurobond debt servicing (servicing of both principle debt and interest) and infrastructure investments. After that, the net revenues left will be deposited in sovereign wealth funds. Hence, we will present the following management scenarios:

- Sovereign wealth funds.
- Infrastructure investments.
- Debt servicing.

#### **A. Assumptions**

Since 2027 is the expected year of revenue generation, certain assumptions provide the basis for the study. Due to the economic crisis currently happening in Lebanon, the uncertainties surrounding oil and gas, and the falling oil and gas prices worldwide, certain parameters must be assumed such as:

- Year of revenue generation is assumed to be in 2027.
- Debt restructuring is assumed to occur with haircuts on external debts.
- Government debt servicing is assumed to continue in 2027.

- Oil and gas prices are assumed as per EIA.
- Recovery factor, production rates, cost recovery, and cost of petroleum are assumed.
- Interest rate on foreign debt is assumed to become 3%.
- Estimates of MOEW and Spectrum are chosen.

## CHAPTER IV

### EXPLORATORY ASSESSMENT AND TECHNICAL SPECIFICATIONS

This section will tackle the potential size of the oil and gas resources present in the Lebanese offshore. Determining the potential quantity of these resources allows us to provide a projected estimate of the total expected revenues in later sections. Our estimates are based on the present seismic data of the Lebanese Offshore and information about the Levant Basin presented next.

#### **A. Levant Basin**

To begin with, the Lebanese offshore is part of what is called the Levant Basin. The Levant Basin Province is an area in the eastern Mediterranean that covers almost 83,000 square kilometers. The area is bounded by: the Levant Transform zone to the east; the Tartus Fault to the north; the Eratosthenes Seamount to the northwest; the Nile Delta Cone Province boundary to the west and southwest; the limit of compressional structures in Sinai to the south.

It is evident that this area covers the offshore of several countries. Subsequently, the hydrocarbon resources present in the Levant Basin are distributed over the territories of several nations. To assess the potential quantities of hydrocarbons resources in the Levant Basin, we will refer to the study titled “Assessment of Undiscovered Oil and Gas Resources of the Levant Basin Province, Eastern Mediterranean” by the U.S Geological Survey. The study considers three assessment units: the Plio-Pleistocene Reservoirs, the Levant Sub-Salt Reservoirs, and the Levant Margin Reservoirs.

Moreover, the study considers the Mesozoic-Cenozoic Composite as the petroleum system, which includes the possibility of viable petroleum source rocks of Triassic, Jurassic, Lower Cretaceous, Upper Cretaceous, Miocene, and Plio-Pleistocene ages. The Plio-Pleistocene reservoir assessment unit is mainly formed from incised channels and deep-water slope and fan sandstones as reservoirs. Meanwhile, the Levant Sub-Salt Reservoirs assessment unit contains Mesozoic and Paleogene sandstones, ranging from incised valley deposits to deep-water slope and fan sandstones. Finally, the Levant Margin Reservoir includes Jurassic and Cretaceous shelf-margin carbonates, nearshore marine sandstones, and deep-water slope and fan sandstones reservoirs.

The study estimates the volume of the undiscovered technically recoverable oil and gas resources in the Levant Basin Province to be 1,689 MMBO for oil as a mean volume (range is between 483 MMBO to 3,759 MMBO) and 122,378 BCFG for gas as a mean volume (range is between 50,087 BCFG to 227,430 BCFG). As for the distribution of these resources over the assessment units, it is as follows: 6,197 BCFG of gas is estimated to be in the Levant Margin Reservoirs; 81,437 BCFG of gas is estimated to be in the Levant Sub-Salt Reservoirs; 34,744 BCFG of gas estimated to be in the Plio-Pleistocene Reservoirs. Hence, it is evident that Levant Sub-Salt Reservoirs contain the largest quantity of vapor followed by the Plio-Pleistocene Reservoirs (Schenk et al, n.d.). Below we can find a visual representation for the Levant Basin area along with a table summarizing the results of the study.

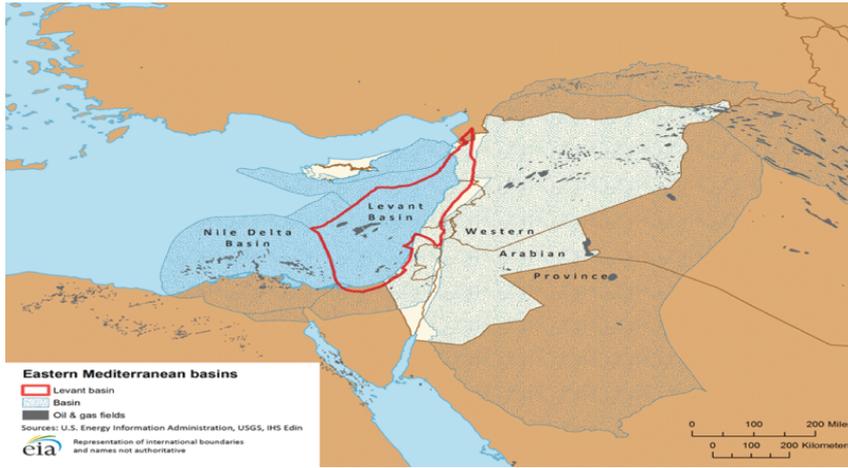


Figure 17 - The Geographic Representation of the Levant Basin  
 (Source: U.S. Energy Information Administration)

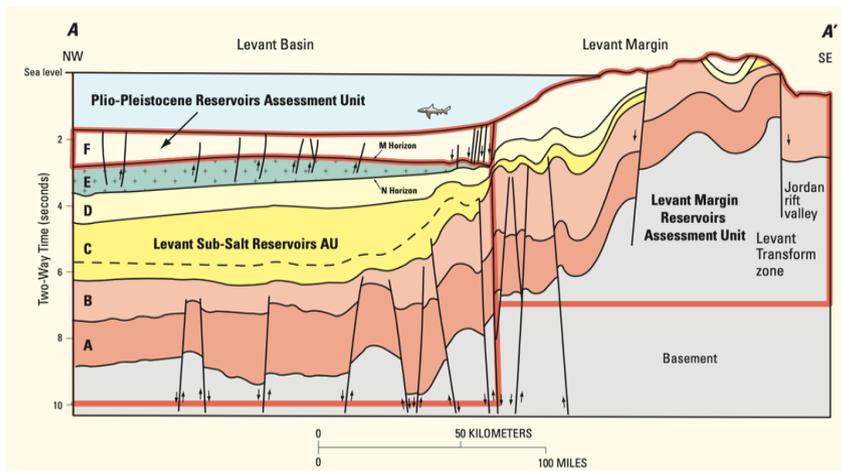


Figure 18 - Representation of the Assessment Units in the U.S Geological Survey Study  
 (Source: Schenk et al)

Total Petroleum Systems (TPS) and Assessment Units (AU)	Field type	Largest expected mean field size	Total undiscovered resources											
			Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Levant Basin Province, Mesozoic-Cenozoic Composite TPS														
Levant Margin Reservoirs AU	Oil	177	278	763	1,765	857	340	944	2,202	1,062	7	19	45	22
	Gas	1,074					1,678	4,559	10,594	5,135	51	142	333	160
Levant Sub-Salt Reservoirs AU	Oil	184	148	460	1,242	548	179	569	1,559	679	4	12	32	14
	Gas	12,238					32,462	74,210	150,573	80,758	1,006	2,309	4,721	2,519
Plio-Pleistocene Reservoirs AU	Oil	130	57	217	752	284	68	265	933	351	1	5	19	7
	Gas	4,756					15,360	32,066	61,569	34,393	157	328	633	353
Total Conventional Resources			483	1,440	3,759	1,689	50,087	112,613	227,430	122,378	1,226	2,815	5,783	3,075

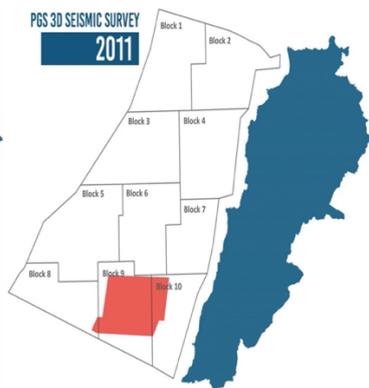
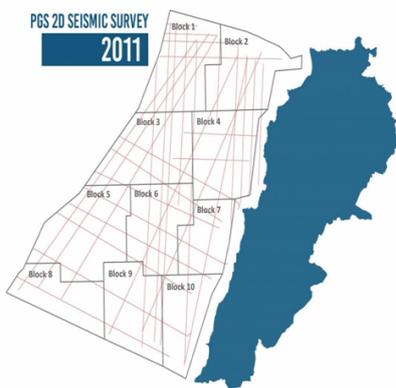
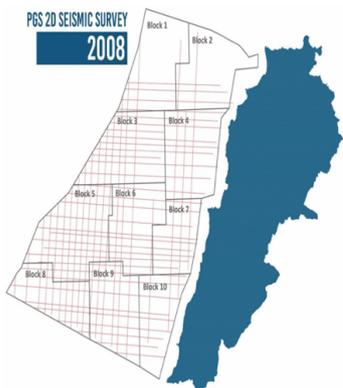
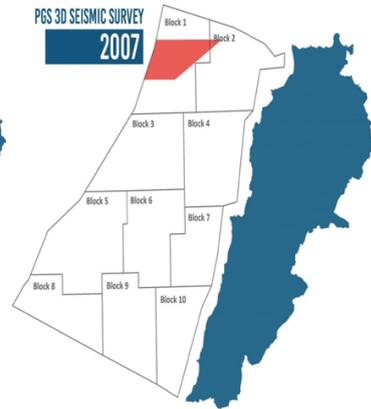
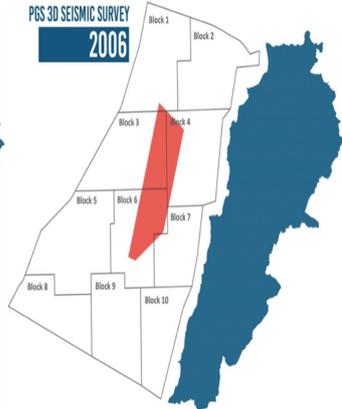
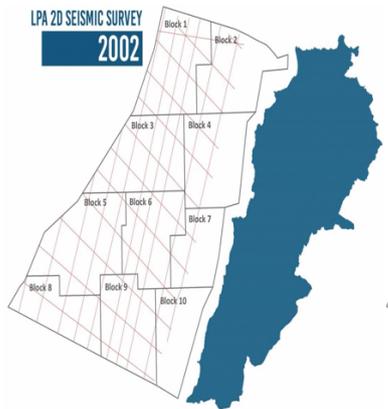
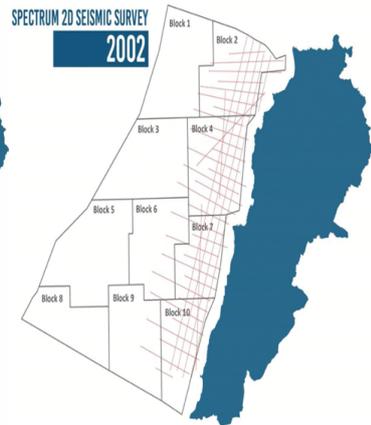
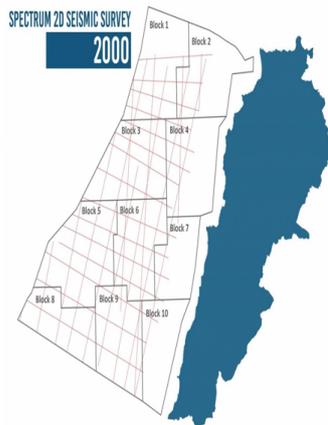
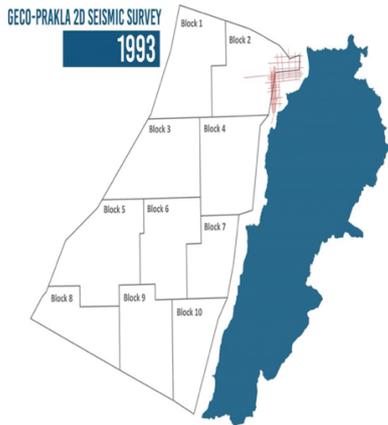
Table 5 - Data from the U.S Geological Survey Study

(Source: Schenk et al)

## B. Lebanese Offshore

After understanding the nature and potential of the Levant Basin, we can shift our focus now to the oil and gas resources present in the Lebanese offshore, which is a considerable part of the Levant Basin.

The Lebanese offshore exclusive economic zone, totaling an area of 22,730 square kilometers, is divided into 10 exploration and drilling blocks, varying in size from 1,259 square kilometers to 2,374 square kilometers. Since 1993, seismic surveys were performed in the Lebanese offshore to better understand the oil and gas potential of the country. These seismic surveys were performed by three companies, Geco-Prakla, Spectrum, and Geo-Services.



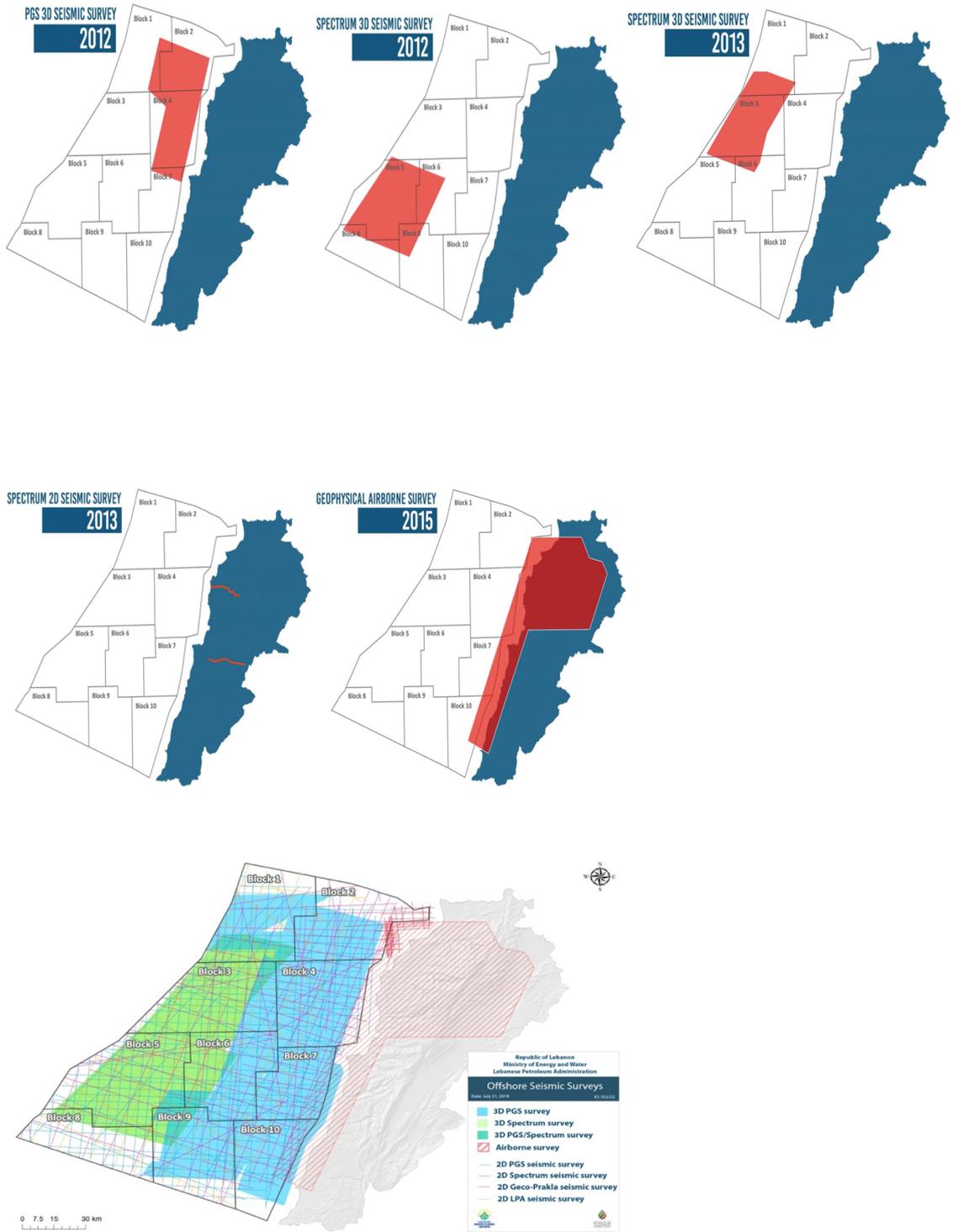


Figure 19 - Seismic Surveys

(Source: LPA)

As stated and seen above, offshore seismic surveys were performed by Petroleum GeoServices, Spectrum, and Geco Prakla. The Geco Prakla 2D seismic surveys, acquired in 1993, cover 508 linear kilometers off-Tripoli. The dataset provides a detailed grid over the Lebanese acreage and structural insight of the basin. As for the PGS seismic surveys, they include 9,700 linear kilometers of 2D seismic data along with 9,700 square kilometers of 3D seismic data. Moreover, the PGS 2D datasets include a GeoStreamer seismic program of 5,000 kilometers. Meanwhile, Spectrum dataset covers 5,172 linear kilometers of 2D seismic surveys and 5,360 square kilometers of 3D seismic surveys.

To assess the possibility of the presence of hydrocarbon onshore, an airborne geophysical acquisition survey was undertaken covering around 6000 square kilometers (2000 square kilometers covered the coast whereas 4000 square kilometers covered the onshore).

Four way dip closure structures, which are considered candidates for exploration, and Direct Hydrocarbon Indicators were revealed in the 2D and 3D seismic data interpretations. Moreover, due to reservoir characterization, stratigraphic traps towards the margin were identified. In addition, there was an improvement in the understanding of the hydrocarbon maturity, migration pathways, trapping mechanisms, and type of source rocks due to basin modeling. Finally, basin modeling coupled with seismic interpretation and reservoir characterization revealed the prospectivity of the Lebanese offshore – hence modeling the presence of gas, condensates and oil (Lebanese Petroleum Administration, n.d.).

Spectrum estimated the presence of around 25 TCF of natural gas based on 3D surveys in 2012 (in the southern coast of Lebanon as seen in the above attached diagrams). The survey covered parts of Block 5, 6, 8, and 9. On the other hand, Beicip Franlab estimated in 2013 the presence of 440 to 675 MMBO of oil in the northern maritime borders. Meanwhile, the Ministry of Electricity and Water stated in 2013 that the estimated quantities are 96 TCF of gas and 865 MMBO of oil based on a 50% probability (in the 45% surveyed area) (BankMED Market and Economic Research Division, 2014).

Definitely, these figures remain speculations as the oil and gas sector is filled with uncertainties and the only way a definitive answer is reached is upon commencement of drilling activities. It is evident that the MOEW estimates are much larger than that of Spectrum when it comes to gas. Therefore, we will discuss two scenarios throughout the study whereby the lower estimate is 25 TCF of gas and 675 MMBO of oil and the higher estimate is 96 TCF of gas and 865 MMBO of oil. Hence, we will term the two scenarios: Spectrum estimates and MOEW estimates.

## CHAPTER V

### ASSESSMENT OF THE CURRENT CONTRACTS

After presenting earlier the various types of contractual frameworks that governments can undertake with IOCs, we will now shift our focus to Lebanon. The Offshore Petroleum Resources Law (Law no. 132/2010) that was issued by the parliament on August 24, 2010 regulates petroleum activities in Lebanon. The law covers the production sharing regime along with the royalties, revenue management, competitive bidding, the grant of a petroleum license through exploration and production agreements, and the standards related to health, safety, and environment (Lebanese Petroleum Administration, n.d.). For the scope of this study, we will be discussing the articles that are directly related to the contractual framework and revenues.

#### **A. Law no. 132/2010: Offshore Petroleum Resources Law**

According to the Offshore Petroleum Resources Law, the Lebanese government will sign a production sharing contract with a consortium of at least three pre-qualified companies. The right holders have the exclusive right to explore, develop, and produce oil and gas in the awarded blocks. It is worth mentioning that the right holders incur all costs during the exploration and development phases, and in case of failure to determine commercial quantities, the right holders are not compensated for their expenses. In case of commercial production, the total government take will be composed of royalties, share of profit oil, and taxes (Lebanese Petroleum Administration, n.d.).

We will start our discussion with articles 3, 4, 5 and 6 from the Offshore Petroleum Resources Law. Article 3 mentions that revenues generated from the oil and gas sector shall be placed in a sovereign wealth fund, and whatever is left uninvested shall be spent in a transparent manner as to ensure the rights of the state and not inflict economic damage. Hence, it is inferred that the managerial plan is already set forth which are sovereign wealth funds (Law no. 132/2010: Offshore Petroleum Resources Law of 2010).

Articles 4, 5, and 6 deal with state sovereignty over the resources, as they ensure that the state has exclusive right to the petroleum resources and their management (article 4), and that any company willing to undergo exploration and production in the Lebanese offshore must be authorized and is subject to the Lebanese law (article 5). Furthermore, article 6 mentions that the state has the right for participation in the exploration and production of hydrocarbons. Article 6 also goes beyond that to announce the possibility of founding a national oil company in case commercial quantities were discovered (Law no. 132/2010: Offshore Petroleum Resources Law of 2010). According to the aforementioned data, it is evident that the government is aiming towards a production sharing agreement rather than a concession.

Article 10 deals with the creation of a petroleum administration and defines its duties and powers, which are, as the article mentions, conducting studies regarding petroleum potentials, dealing with licensing and contracting through aiding with bids, assisting the minister in petroleum related topics such as qualifications of bidding applicants and results of negotiations, playing a managerial role in all that is related to data and the exploration, production, transportation, and cessation phases (Law no. 132/2010: Offshore Petroleum Resources Law of 2010). In fact, the Lebanese

Petroleum Administration was created on December 4, 2012 by Decree number 7968, with the aim of planning, supervising, and managing the upstream sector.

The following articles (12,19,27,37,41,42,43,44,45) deal with the laws governing exploration and production agreements, and the byproducts of the agreement such as production split, royalties, taxes, etc.

Articles 12 and 19 deal with the exploration and production agreements. Precisely, article 12 states that the contractual framework to be awarded to companies is an exploration and production agreement. It also mentioned that the exploration phase should not exceed 10 years, whereas the production phase should not exceed 30 years. This guarantees that IOCs do not stall or slow down work if this option was more profitable for them at a given time. As for article 19, it thoroughly depicts the stages that the exploration and production agreement follows in order to become official. Moreover, point three of the article explicitly mentions that companies awarded the exploration and production agreement shall form an unincorporated joint venture. Furthermore, the article discusses the liabilities held by the right holders towards other parties, and announces that each right holder is liable for their own taxes. Finally, point seven explains in detail the content of the exploration and production agreement, such as the coordinates of the awarded area, the allocation of participation interest between the right holders, the duration of each phase of the agreement, the minimum work obligations and expenditure commitments for the exploration phase, potential state participation provisions, environmental matters provisions, accounting rules and methods for determining profits, dispute resolution and arbitration provisions, and standard minimum guarantees that cover the minimum work obligations for the various

steps in the lifecycle of the project (Law no. 132/2010: Offshore Petroleum Resources Law of 2010).

Article 27 ensures that the aim of the government is maximum profit from the oil and gas resources. This article states that the production phase shall take place in a way to maximize petroleum production from reservoirs using the most prudent technical and sound economic principles. Moreover, the production manner mentioned above should avoid any waste of petroleum or reservoir energy. Furthermore, the production manner shall occur in a pace that is suitable for the economy of the state. Finally, the last point of the article obliges the right holders to continuously evaluate their production strategies and to always take necessary measures to improve results. As for article 37, it states that right holders might be required to submit reports to the minister regarding production and facility related matters, as well as alternative scenarios for production and enhanced recovery techniques. This in a way allows the state to participate in the production process (Law no. 132/2010: Offshore Petroleum Resources Law of 2010).

Article 41 discusses the area fee, which is progressive and calculated per square kilometer and should be paid from the first year following the expiry of the exploration phase duration. As for Article 42, it discusses the entitlements from the petroleum extracted, and splits them into royalties, cost petroleum and profit petroleum. It also states that each right holder is obliged to contribute in the royalty petroleum and is entitled for cost and profit petroleum based on their interest share in the agreement. Meanwhile, Article 43 ensures that the state has right to royalty from all extracted petroleum, collected either in cash or in kind. Moreover, it states that a right holder

must pay or deliver this royalty to the state on all the extracted petroleum, unless those quantities are being reinjected in a reservoir within the same exploration area.

Furthermore, the royalty volumes, rate and payments for both liquid and gaseous petroleum shall be stipulated by a decree from the council of ministers, based on a proposal from both the minister of electricity and water and the minister of finance.

Article 44 states that the method of calculation and allocation of entitlement of the cost petroleum and profit petroleum should also be stipulated by a decree from the council of ministers based on a proposal by the minister of electricity and water along with the opinion of LPA. Finally, Article 45 states that petroleum activities and petroleum rights conducted in Lebanon and its offshore are subject the Lebanese tax law (Law no. 132/2010: Offshore Petroleum Resources Law of 2010).

It is worth mentioning that the taxation mentioned in Article 45 from Law no. 132/2010 is governed by the Law no. 57/2017 titled “Tax Provisions Related to Petroleum Activities in Accordance with Law 132/2010”. This law includes articles that determine income tax on petroleum activities and on the salaries and remunerations of personnel and workers in the petroleum sector. Moreover, the law includes articles covering stamp duty fee on EPA, the value added tax, and the custom fees on equipment, machines, and tools used in petroleum activities, as well as exemptions from such fees (Lebanese Petroleum Administration, n.d.).

## **B. Determination of Lebanon’s Production Share, Royalties, and Taxes**

In this section we will refer to the model Exploration and Production Agreement that is already in place for the awarded blocks. These articles are derived from decree number 43 issued by the cabinet on January 4, 2017. Annex number 2 in the decree

deals with the EPA, and we will refer to articles 22, 23, 24 and 25 that deal with royalties, entitlements for royalties, disposable petroleum, cost recovery, and profit petroleum entitlements.

To start with the topic of royalties, article 22 mentions a variable rate for crude oil and a 4% fixed rate for natural gas. The variable rate depends on the daily production rate of crude oil and follows this pattern:

<b>Production Rate (Barrels/Day)</b>	<b>Royalty Rate</b>
<b>0 to 15000</b>	5%
<b>15001 to 25000</b>	6%
<b>25001 to 50000</b>	7%
<b>50001 to 75000</b>	8%
<b>75001 to 100000</b>	10%
<b>Above 100000</b>	12%

Table 6 - Production Rate vs Royalty Rate

(Source: Lebanese Model Exploration and Production Agreement)

Article 24 deals with profit petroleum entitlements, it defines profit petroleum as any volume of disposable petroleum in excess of the cost petroleum mentioned in article 23. The profit petroleum distribution is as follows:

<u>R-Factor</u>	<u>State's Portion</u>	<u>Right Holders' Aggregate Portion</u>
$R \leq 1$ Less than or equal to 1	A% ( $\geq 30\%$ )	100%-A%
$1 < R < R_B$ Greater than 1 and less than $R_B$	See formula below	100% less percentage determined in formula below
$R \geq R_B$ Greater than or equal to $R_B$	B%	100%-B%

(Source: Lebanese Model Exploration and Production Agreement)

Table 7 - Distribution of shares

The state portion (SP) is determined through the following equation for the case of  $1 <$

$$R < R_B: SP = A + \left[ \frac{(B-A) \times (R-1)}{(R_B-1)} \right]$$

SP	State's Portion of Profit Petroleum
A	State's Portion of Profit Petroleum for R-factor less than or equal to 1
B	State's Portion of Profit Petroleum for R-factor greater than or equal to $R_B$
$R_B$	Constant greater than 1 agreed upon through bidding

R	R-factor which is the cumulative cash inflow divided by the cumulative CAPEX
---	--

Table 8 - Legend

Where the R-factor is determined by dividing the cumulative cash inflow by the cumulative CAPEX, where the cumulative cash inflow is equal to profit petroleum for the right holders added to cost petroleum for the right holders minus operating expenses, whereas the CAPEX is equal to all capital expenditures. A, B and  $R_B$  are determined through bidding, such as A has a minimum of 30% , B is greater than A, and  $R_B$  is greater than 1 (Exploration and Production Agreement for Petroleum Activities, 2015).

To determine A,B and  $R_B$ , we will refer to the EPA signed for block 9 between the Lebanese government and the consortium formed of Total, Eni, and Novatec. In article 24, it is mentioned that A has a value of 30%, B has a value of 40% and  $R_B$  has a value of 3. This reduces the above equation to:  $SP = 30\% + \left(\frac{10\% \times (R-1)}{2}\right)$

Therefore, the state's portion relies only on the R-factor now, which reduces the profit share table to:

<b>R-Factor</b>	<b>State's Portion</b>	<b>Right Holder's Aggregate Portion</b>
<b>R less than or equal to 1</b>	30%	70%
<b>1 &lt; R &lt; <math>R_B</math></b>	$SP = 30\% + (10\% \times (R-1)/2)$	100% - SP

<b>R greater than or equal to</b>	40%	60%
<b>R<sub>B</sub></b>		

Table 9 - Shares as a function of R-factor

Iterating the R-Factor from 1 till R<sub>B</sub> (3) using 0.5 increments, and fixing the state's portion to 30% for R less than or equal to 1, and 40% for R greater than or equal to R<sub>B</sub>, we get the following distribution:

R	SP
0	30
0.5	30
1	30
1.5	32.5
2	35
2.5	37.5
3	40
3.5	40
4	40
4.5	40
5	40
5.5	40
6	40
6.5	40
7	40
7.5	40
8	40
8.5	40
9	40
9.5	40
10	40
10.5	40
11	40
11.5	40
12	40
12.5	40
13	40
13.5	40
14	40
14.5	40
15	40

Table 10 - R-factor vs SP

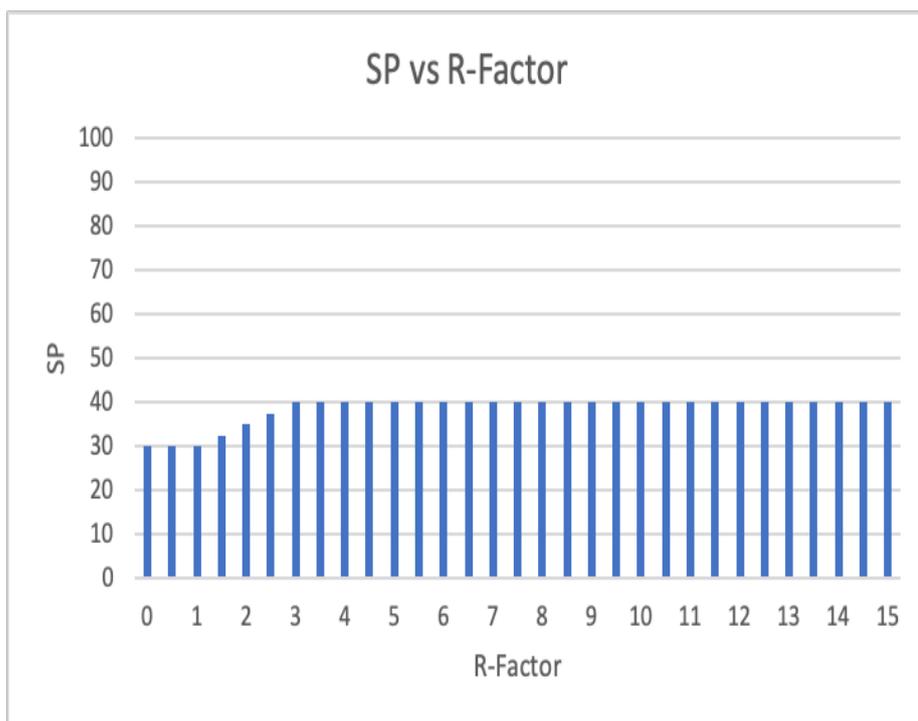


Figure 20 -SP vs R-Factor

Therefore, it is evident that the Lebanese government's share from block 9 production is a minimum of 30% and a maximum of 40% of the profit petroleum, depending on the R-Factor. To determine Lebanon's share of petroleum resources, we will assume the following parameters:

- Recovery factor of hydrocarbons equal to 80%.
- Income tax rate equal to 20%.
- Cost Petroleum equal to 35% (assumed to be identical for both commodities since same well is being drilled).
- Royalty on oil is 12%.
- R-factor of 2 (hence State's Portion is equal to 35% of profit petroleum).

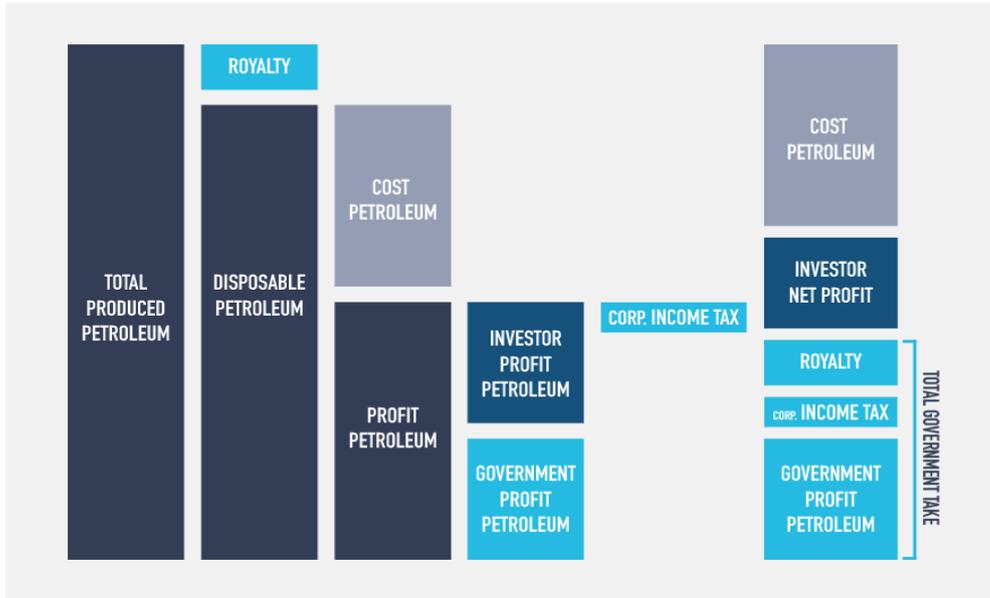


Figure 21 - Profit Distribution According to Lebanese PSA

(Source: Lebanese Petroleum Administration)

The above chart presents the flow of profit in the production sharing agreement chosen by Lebanon. As stated before in the articles, we can see that from the total produced petroleum, a percentage is taken as royalty for the Lebanese government. After that, we are left with disposable petroleum, which is divided into cost petroleum (for cost recovery) and profit petroleum. The profit petroleum is then divided between the consortium and the government, and the consortium's share is subjected to a corporate income tax. Therefore, the total governmental profit is the royalty, corporate income tax, and the governmental profit share of petroleum as stated earlier.

### C. Petroleum Share Based on Spectrum Estimates

As depicted in the chart above, we will determine in this section the government's total share of oil and gas resources based on the estimates provided by Spectrum (25 TCF of gas and 675 MMBO of oil). First, we will begin by multiplying

these values by the 80% recovery rate, yielding a total produced value of 20 TCF for gas and 540 MMBO of oil. From these values, we deduct 4% for gas and 12% for oil as royalty rates; hence, we get 0.8 TCF of gas and 64.8 MMBO of oil as royalties for the government. We are left now with disposable petroleum equal to 19.2 TCF of gas and 475.2 MMBO of oil. From these values, we deduct 35% as cost petroleum to result in a remaining profit petroleum of 12.48 TCF of gas and 308.88 MMBO of oil. For an R-factor of 2, the government's share is:

Profit \* Government Share + Profit \* IOC Share \* Tax + Royalty

- $12.48 * 0.35 + 12.48 * 0.65 * 0.2 + 0.8 = 6.7904$  TCF of gas
- $308.88 * 0.35 + 308.88 * 0.65 * 0.2 + 64.8 = 213.06$  MMBO of oil

<b>SPECTRUM</b>	<b>OIL (MMBO)</b>	<b>GAS (TCF)</b>
TOTAL	675	25
RECOVERABLE	540	20
ROYALTY	64.80	0.80
DISPOSABLE	475.20	19.20
COST	166.32	6.72
PROFIT	308.88	12.48
INVESTOR	200.772	8.112
TAX	40.1544	1.6224
STATE	108.108	4.368
TOTAL STATE	213.06	6.79

Table 11 - SP of oil and gas Spectrum

#### **D. Petroleum Share Based on MOEW Estimates**

Similarly, using the same assumptions, we determine Lebanon's petroleum share as follows. The 96 TCF of gas and 865 MMBO of oil are reduced to 76.8 TCF

and 692 MMBO after taking recovery rate (80%) into account. Furthermore, the royalties for the Lebanese government are 3.07 TCF of gas (4%) and 83.04 MMBO of oil (12%). The remaining disposable quantity, after deducting royalties, are 73.73 TCF and 608.96 MMBO. On these quantities, we apply a 35% cost petroleum, and we are left with 47.92 TCF and 395.82 MMBO as profit petroleum. For an R-factor of 2, the government's share is:

Profit \* Government Share + Profit \* IOC Share \* Tax + Royalty

- $47.92 * 0.35 + 47.92 * 0.65 * 0.2 + 3.07 = 26.08$  TCF of gas
- $395.82 * 0.35 + 395.82 * 0.65 * 0.2 + 83.04 = 273.04$  MMBO of oil

<b>MOEW</b>	<b>OIL (MMBO)</b>	<b>GAS (TCF)</b>
<b>TOTAL</b>	<b>865</b>	<b>96</b>
<b>RECOVERABLE</b>	<b>692</b>	<b>76.80</b>
<b>ROYALTY</b>	<b>83.04</b>	<b>3.07</b>
<b>DISPOSABLE</b>	<b>608.96</b>	<b>73.73</b>
<b>COST</b>	<b>213.136</b>	<b>25.8048</b>
<b>PROFIT</b>	<b>395.82</b>	<b>47.92</b>
<b>INVESTOR</b>	<b>257.2856</b>	<b>31.15008</b>
<b>TAX</b>	<b>51.45712</b>	<b>6.230016</b>
<b>STATE</b>	<b>138.5384</b>	<b>16.77312</b>
<b>TOTAL STATE</b>	<b>273.04</b>	<b>26.08</b>

Table 12 - SP of oil and gas MOEW

## CHAPTER VI

### LEBANON'S ESTIMATED REVENUES

To calculate Lebanon's estimated revenue, we must find a proper estimate for the price of crude oil and natural gas in the time frame 2027 – 2036. Therefore, we resorted to the U.S. Energy Information Administration for data regarding the expected price forecasts in this time frame.

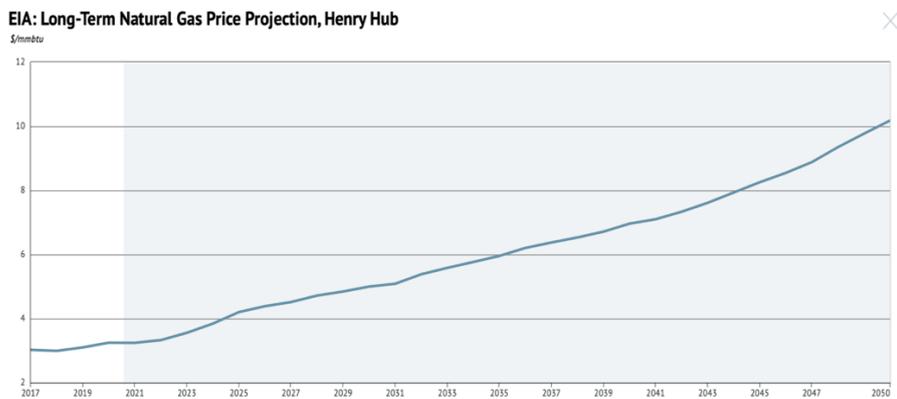


Figure 22 - Natural Gas Price Forecasts

(Source: EIA)

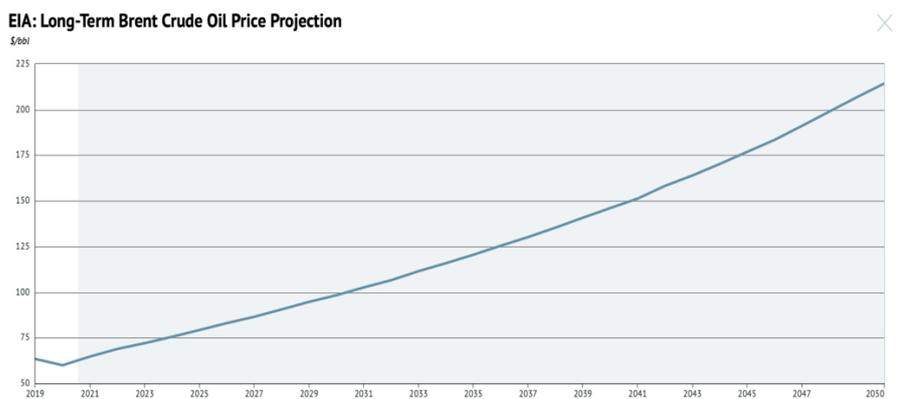


Figure 23 - Crude Oil Price Forecasts

(Source: EIA)

As seen below, the oil and gas prices for the time frame 2027 – 2036 (10 years) are as follows:

<b>YEAR</b>	<b>GAS PRICES (nom \$/ mmbtu)</b>	<b>OIL PRICES (nom \$/bbl)</b>
2027	4.52	86.48
2028	4.72	90.51
2029	4.84	94.65
2030	5.00	98.29
2031	5.09	102.56
2032	5.38	106.52
2033	5.58	111.48
2034	5.77	115.85
2035	5.95	120.47
2036	6.2	125.41

Table 13 - Oil and Gas Prices

**A. Profit Share Based On Spectrum Estimates**

According to Spectrum estimates, the government’s share of oil and gas are 213.06 MMBO and 6.79 TCF respectively. Assuming production occurs evenly over a 10 year time frame, this yields 21.306 MMBO and 0.679 TCF respectively of oil and gas per year. Thus, this results in a total profit as shown below:

YEAR	GAS PRICES	OIL PRICES	GAS QUANTITY	OIL QUANTITY	GAS PROFIT	OIL PROFIT	TOTAL (BILLION \$)
2027	4.52	86.48	0.679	21.306	3.07	1.84	4.91
2028	4.72	90.51	0.679	21.306	3.20	1.93	5.13
2029	4.84	94.65	0.679	21.306	3.29	2.02	5.30
2030	5.00	98.29	0.679	21.306	3.40	2.09	5.49
2031	5.09	102.56	0.679	21.306	3.46	2.19	5.64
2032	5.38	106.52	0.679	21.306	3.65	2.27	5.92
2033	5.58	111.48	0.679	21.306	3.79	2.38	6.16
2034	5.77	115.85	0.679	21.306	3.92	2.47	6.39
2035	5.95	120.47	0.679	21.306	4.04	2.57	6.61
2036	6.2	125.41	0.679	21.306	4.21	2.67	6.88
	(nom \$/ mmbtu)	(nom \$/bbl)	(TCF)	(MMBO)	(BILLION \$)	(BILLION \$)	SUM
							<b>58.44</b>

Table 14 - Revenue based on Spectrum estimates

Hence, as seen from the table, the total oil and gas profits equals \$58.44 billion in current dollars. In the next sections, we will transform this value into an annual worth representation over the time frame 2027 – 2036.

### **B. Profit Share Based On MOEW Estimates**

According to MOEW estimates, the government’s share of oil and gas are 273.04 MMBO and 26.08 TCF respectively. Assuming production occurs evenly over a 10 year time frame, this yields 27.304 MMBO and 2.608 TCF respectively of oil and gas per year. Thus, this results in a total profit as shown below:

YEAR	GAS PRICES	OIL PRICES	GAS QUANTITY	OIL QUANTITY	GAS PROFIT	OIL PROFIT	TOTAL (BILLION \$)
2027	4.52	86.48	2.608	27.304	11.79	2.36	14.15
2028	4.72	90.51	2.608	27.304	12.31	2.47	14.78
2029	4.84	94.65	2.608	27.304	12.62	2.58	15.21
2030	5.00	98.29	2.608	27.304	13.04	2.68	15.72
2031	5.09	102.56	2.608	27.304	13.27	2.80	16.08
2032	5.38	106.52	2.608	27.304	14.03	2.91	16.94
2033	5.58	111.48	2.608	27.304	14.55	3.04	17.60
2034	5.77	115.85	2.608	27.304	15.05	3.16	18.21
2035	5.95	120.47	2.608	27.304	15.52	3.29	18.81
2036	6.2	125.41	2.608	27.304	16.17	3.42	19.59
	(nom \$/ mmbtu)	(nom \$/bbl)	(TCF)	(MMBO)	(BILLION \$)	(BILLION \$)	SUM
							<b>167.08</b>

Table 15 - Revenue based on MOEW estimates

Hence, as seen from the table, the total oil and gas profits equals \$167.08 billion in current dollars. In the next sections, we will transform this value into an annual worth representation over the time frame 2027 – 2036.

### C. Results Discussion

It is evident that the profit estimation in the above two sections are highly different. The reason behind that is that Spectrum estimates consider seismic data from four blocks in the southern offshore of Lebanon (blocks 5,6,8, and 9), which as stated earlier predicts the presence of around 25 TCF of gas and 675 MMBO of oil in the offshore territory. Meanwhile, the Ministry of Electricity and Water provides estimates based on 45% surveyed area in Lebanon’s EEZ based on a 50% probability, which as aforementioned, amounts to 96 TCF of gas and 865 MMBO of oil.

We considered both estimates as a means of providing two distinct revenue estimates. Revenues might be higher or lower than calculated values as all depends on

the rate of exploration and production, in addition to the actual quantities discovered upon drilling.

In the following sections, we will transform these revenues into an annual worth representation, along with transforming the total Eurobonds and total funds needed for infrastructure into annual worth representation. Hence, upon deducting the cost from revenues, what is left can be deposited in a sovereign wealth fund.

## CHAPTER VII

### MANAGEMENT SCENARIOS

In the final section of our study, we will discuss the three management scenarios mentioned earlier. Thus, we will be covering sovereign wealth funds, infrastructure investments, and debt servicing. Following that, we will distribute revenues in such a manner that the annual funds needs of infrastructure investments and debt servicing are fulfilled, and the remaining revenues are deposited in sovereign wealth funds for future generations. Both scenarios mentioned earlier (Spectrum and MOEW estimates) will be discussed.

As mentioned in the literature review, the total debt held in foreign currency amounts to \$34.08 billion in the first quarter of 2020, whereas the debt in local currency amounts to \$58.33 billion. In our study, we will consider debt servicing to foreign debt holders only. Moreover, as per the financial recovery plans currently circulating, we will consider haircuts on this external debt with defaults on Eurobonds until the year 2027. Any additional foreign debt (such as CEDRE, IMF, World Bank) will not be added to this external market debt, as such debts are of bilateral and multilateral nature usually characterized by low interest rates, and cannot be defaulted as in the case of private debt. It is worth mentioning that we will assume that negotiations between the Lebanese government and Eurobonds holders will result in a decrease of interest rates to 3%.

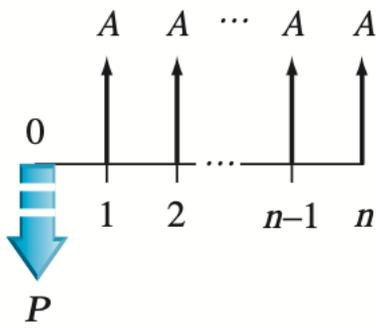


Figure 24 - Annual Worth

Annual worth (AW) representation is a uniform annual amount over a specific period of time that is equivalent to a total amount at a specific year. Hence, in our case, we need to transform the total external debt into equivalent yearly payments over a 10-year time frame.

Transforming the \$31.53 billion into annual worth representation:

$$AW = PW * \frac{i*(1+i)^n}{(1+i)^n - 1}$$

Where:

- $PW = 31.53 * 0.75 = \$23.65$  billion for the case of 25% haircut (PW is present worth amount i.e. debt amount in the year of 2026 since we assumed debt default till 2027).
- $PW = 31.53 * 50 = \$15.77$  billion for the case of 50% haircut.
- $PW = 31.53 * 0.25 = \$7.88$  billion for the case of the 75% haircut.
- $i = 3\%$ .
- $n = 10$  years.

Hence,

$$AW(25\% \text{ haircut}) = 23.65 * \frac{0.03*(1+0.03)^{10}}{(1+0.03)^{10} - 1} = 23.65 * 0.1172 = \$2.77 \text{ billion/}$$

*year* in average debt servicing over a 10 year time frame.

$$AW(50\% \text{ haircut}) = 15.77 * \frac{0.03*(1+0.03)^{10}}{(1+0.03)^{10}-1} = \$1.85 \text{ billion/year.}$$

$$AW(75\% \text{ haircut}) = 7.88 * \frac{0.03*(1+0.03)^{10}}{(1+0.03)^{10}-1} = \$0.92 \text{ billion/year.}$$

(BILLION \$)	AMOUNT	ANNUAL WORTH
TOTAL EURO BONDS	31.53	
25% HAIRCUT	23.65	2.77
50% HAIRCUT	15.77	1.85
75% HAIRCUT	7.88	0.92

Table 16 - Debt Servicing Annual Worth

As for infrastructure investments, we will consider the projects discussed in CEDRE plan. Hence, from previous sections, the total value of all projects was \$23 billion (in 2018).

Representing this value as a future worth for the year 2026 (interest rate assumed 3%):

$$FW = PW * (1 + i)^n = 23 * (1 + 0.03)^8 = \$29.14 \text{ billion}$$

Then transforming this value into an annual worth starting from 2027 and until 2036 results in:

$$AW = PW * \frac{i*(1+i)^n}{(1+i)^n-1} = 29.14 * \frac{0.03*(1+0.03)^{10}}{(1+0.03)^{10}-1} = \$3.42 \text{ billion/year}$$

### A. Management Scenario for Spectrum Estimates

The total revenues based on Spectrum estimates are \$58.44 billion (in current dollars).

Which translates into:

$$FW = PW * (1 + i)^n = 58.44 * (1 + 0.03)^6 = \$69.78 \text{ billion in 2026}$$

Hence this converts in the time frame 2027 – 2036 to an annual worth of:

$$AW = 69.78 * \frac{0.03*(1+0.03)^{10}}{(1+0.03)^{10}-1} = \$8.18 \text{ billion/year.}$$

Hence, the net profit (revenues – infrastructure costs – debt servicing) is:

- For 25% haircut:  $8.18 - 3.42 - 2.77 = \$1.99$  billion per year can be deposited in sovereign wealth funds.
- For 50% haircut:  $8.18 - 3.42 - 1.85 = \$2.91$  billion per year can be deposited in sovereign wealth funds.
- For 75% haircut:  $8.18 - 3.42 - 0.92 = \$3.84$  billion per year can be deposited in sovereign wealth funds.

(IN BILLION \$ PER YEAR)	DEBT	INFRASTRUCTURE	REVENUE	SWF
CASE 1 25% HAIRCUT	2.77	3.42	8.18	1.99
CASE 2 50% HAIRCUT	1.85	3.42	8.18	2.91
CASE 3 75% HAIRCUT	0.92	3.42	8.18	3.84

Table 17 - Revenue allocation based on Spectrum estimates

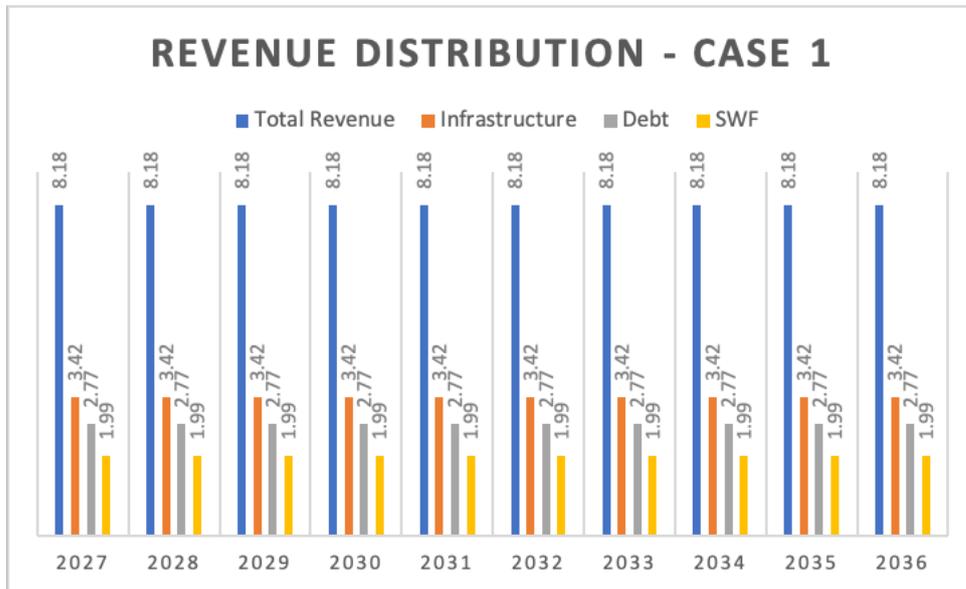


Figure 25 - Spectrum Revenue Distribution Case 1

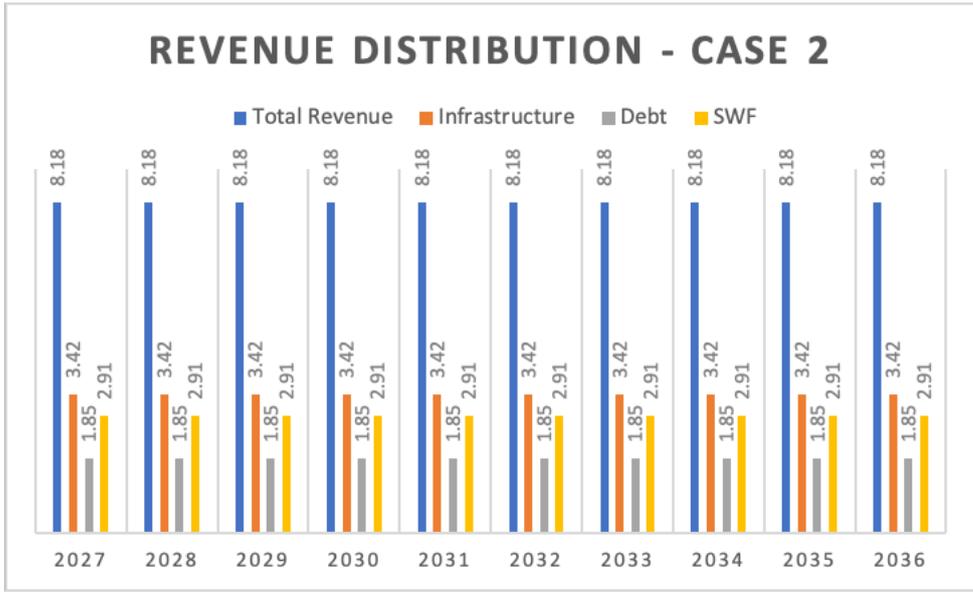


Figure 26 - Spectrum Revenue Distribution Case 2

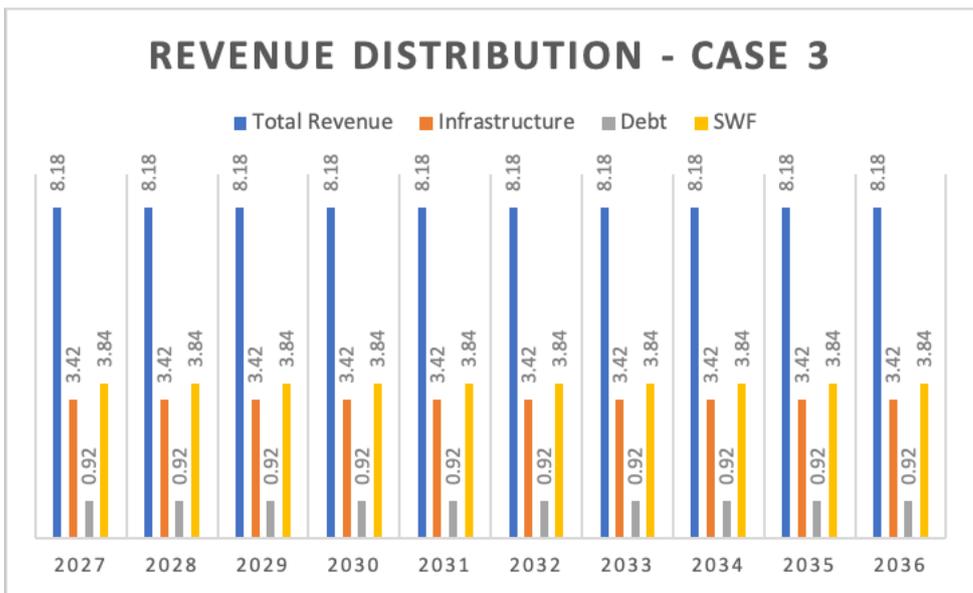


Figure 27 - Spectrum Revenue Distribution Case 3

**B. Management Scenario for MOEW Estimates**

The total revenues based on MOEW estimates are \$167.08 billion (in current dollars).

This translates into a future worth of:

$$FW = PW * (1 + i)^n = 167.08 * (1 + 0.03)^6 =$$

\$199.50 billion in 2026

Hence, this converts in the time frame 2027 – 2036 to an annual worth of:

$$AW = 199.50 * \frac{0.03*(1+0.03)^{10}}{(1+0.03)^{10}-1} = \$23.39 \text{ billion/year}$$

Hence, the net profit (revenues – infrastructure costs – debt servicing) is:

- For 25% haircut:  $23.39 - 3.42 - 2.77 = \$17.20$  billion per year can be deposited in sovereign wealth funds.
- For 50% haircut:  $23.39 - 3.42 - 1.85 = \$18.12$  billion per year can be deposited in sovereign wealth funds.
- For 75% haircut:  $23.39 - 3.42 - 0.92 = \$19.05$  billion per year can be deposited in sovereign wealth funds.

(IN BILLION \$ PER YEAR)	DEBT	INFRASTRUCTURE	REVENUE	SWF
CASE 1 25% HAIRCUT	2.77	3.42	23.39	17.20
CASE 2 50% HAIRCUT	1.85	3.42	23.39	18.12
CASE 3 75% HAIRCUT	0.92	3.42	23.39	19.05

Table 18 - Revenue allocation based on MOEW estimates

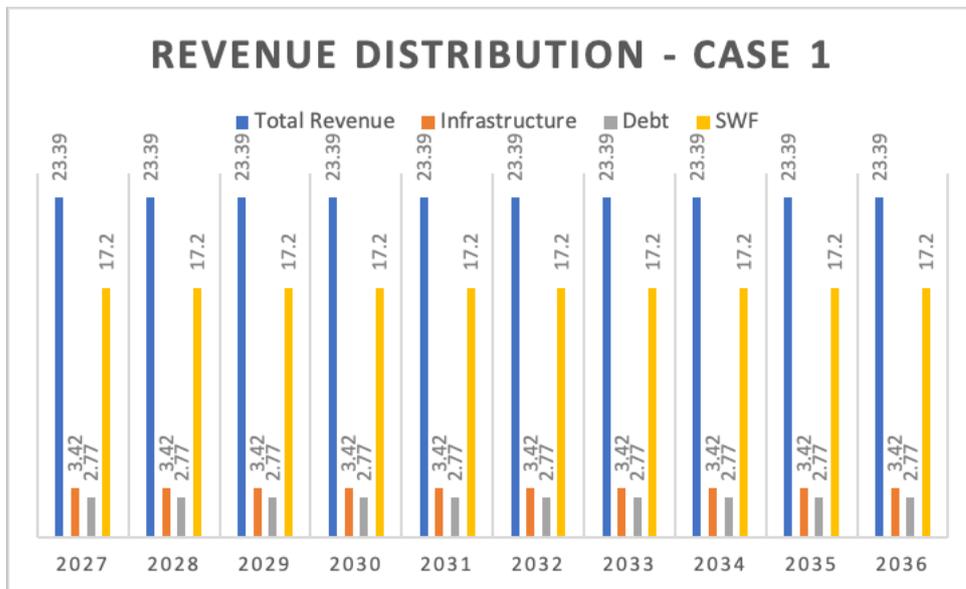


Figure 28 - MOEW Revenue Distribution Case 1

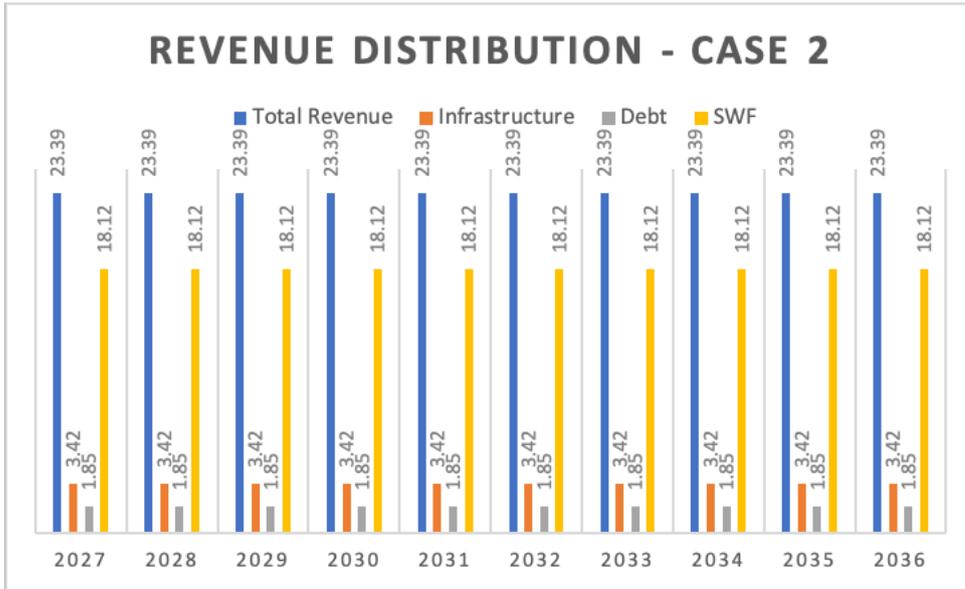


Figure 29 - MOEW Revenue Distribution Case 2

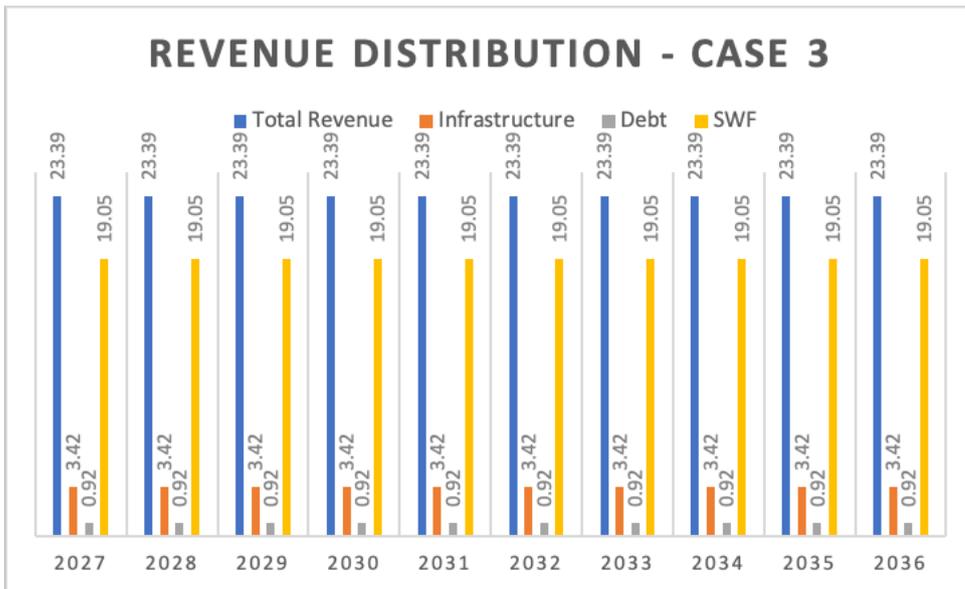


Figure 30 - MOEW Revenue Distribution Case 3

## CHAPTER VIII

### ANALYSIS

As seen above, in both scenarios, Lebanon can fulfill its debt and complete 269 infrastructure projects. As stated earlier, this translates to 124 water projects, 24 wastewater projects, 17 electricity projects, 11 infrastructure for tourism and cultural heritage projects, 8 telecommunication projects, 2 infrastructure for industry projects, and 1 solid waste project. If properly implemented, these projects will enhance living conditions, create jobs, and boost the economy. Moreover, the current existing foreign debt will be fulfilled in both scenarios, which will increase the credit rating of Lebanon, and in turn promote investments from abroad. Since the funds to be invested yearly in a SWF in the second scenario are quite large, the government can use part of them to provide incentives for local industries, invest in education, healthcare etc. A good option for the second scenario is to deposit 50% of the yearly remaining revenues in a SWF and the other 50% in a credit account. This credit account can be used to finance public and private sector projects etc.

#### **A. Limitations**

Due to the absence of accurate data in Lebanon, results are based on various estimates and assumptions, which might affect the accuracy of the findings of the present study. As such, revenues stated along with other parameters may vary according to better access of data in the future. Moreover, there is a scarcity in evidence regarding the future steps to be followed in Lebanon to face the current exacerbating economic

conditions. Hence, all parameters related to debt and infrastructure may change with time depending on policies followed by future governments. Finally, the commencement of drilling activities will provide accurate data regarding the size of the oil and gas quantities – the current data are still only speculations, and subsequently, estimates based on this data are also considered to be speculations.

## **B. Conclusion**

From this study, we conclude that the estimated revenues from the oil and gas sector are significant. If managed properly and transparently, this sector can push the Lebanese economy forward. Based on the Spectrum estimates, Lebanon's mean expected revenue is 66.88 billion dollars, whereas based on the data provided by the MOEW, Lebanon's mean expected revenue is 197.54 billion dollars. In both scenarios, we considered that the government will debt service its Eurobonds debt (both principle and interest payments), along with funding infrastructure projects. The expenditures will increase the credit rating of Lebanon (which will promote investments), decrease the budget losses on the government in terms of debt servicing and subsidies, provide better living conditions for citizens, and promote growth in industrial sectors and the economy. Subsequently, the initial costs incurred will have massive positive implications later on that will promote additional revenues. The remaining amounts from the revenues, after deducting infrastructure and debt servicing costs, will be deposited in sovereign wealth funds. The oil and gas sector proves to be lucrative given proper negotiations of contracts and management of production takes place.

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