J Environ Sci Public Health 2021;5 (3):379-396 *DOI: 10.26502/jesph.96120138*

Research Article

Evaluating the Integration of Health, Safety and Environmental Management Practices in the Oil and Gas Companies

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Received: 30 July 2021; **Accepted:** 09 August 2021; **Published:** 15 August 2021

Citation: Albert Abdel Nour, May A Massoud, Michel Mokbel, Ibrahim Alameddine. Evaluating the Integration of Health, Safety and Environmental Management Practices in the Oil and Gas Companies. Journal of Environmental Science and Public Health 5 (2021): 379-396.

Abstract

The need for Oil and Gas (O&G) companies to adopt environmental management practices is necessitated by the potentially adverse implications of petroleum related operations primarily in developing countries where the enforcement of regulatory environmental frameworks tends to be marginal. This research aims to assess the environmental management practices of national and multinational oil companies and the level of integration achieved between health, safety and environmental systems taking the O&G companies in Lebanon as case example.

Accordingly, a survey questionnaire and in-depth interviews were conducted with O&G distributing companies and concerned stakeholders, respectively. Our findings asserted that the majority of O&G companies failed to systematically integrate the fundamental tenants of environmental management into their organizational and operational constructs. Almost all respondents were incapable of differentiating between health, safety, and environmental practices. An EMS was considered by various stakeholders as a tool to ensure that laws and regulations are effectively implemented.

This study underscores that while the significance of implementing environmental management practices is generally recognized; most firms primarily in developing countries underrate its importance and prioritize health and safety issues over environmental ones.

Keywords: Developing countries; Environmental performance; Health and safety; Sustainable development

1. Introduction

Oil and gas related activities can be highly disruptive to local and regional ecosystems, leading to a number of adverse health and environmental implications. Traditionally, O&G companies have adopted a reactive rather than proactive approach to environmental issues, with their safety and environmental regulatory regimes being customized towards simply complying with national governmental standards. The complexity and impacts of O&G industry operations, coupled with the occurrence of highly publicized large-scale transnational disasters highlighted the need to substitute commonly accepted health, safety and environmental practices with preventative, dynamic, and precautionary practices [1, 2].

Health, Safety and Environment (HSE) standards and managerial models have been developed considering that an integrated approach that tackles issues of health, safety, environment, and quality is more cost effective, as compared to multiple standards for each of the aforementioned aspects.

However, in practice, primarily in developing countries, the adopted protocols are primarily associated with safety issues rather than environmental aspects. Moreover, the availability of a comprehensive legislative framework is not sufficient to assuring that laws and regulations are implemented, as developing countries continue to struggle with enforcing legislations. Public and state funded institutions have limited human, technical, and financial capacity, which diminishes their ability to monitor O&G companies and uphold environmental laws [3, 4].

Safeguarding public and environmental health from the disruptive activities associated with O&G operations requires continuous scrutiny to ensure that they are in line with national and international regulations. Private firms are plugging the gaps left by local deficiencies, whether that be in terms of the absence of adequate legislation or the lack of monitoring schemes, through the adoption of self-regulatory voluntary standards and practices, such as self-reporting. However, the reliability of self-reported data ought to be validated by governmental organizations and independent third-party auditors [5, 6]. Private firms will always act in their best interests, which would entail that seemingly adopted norms and regulations may be overlooked should they compromise the ability of a multinational cooperation to compete in the international market.

An environmental management system (EMS) is a regulatory organizational framework whose prerogative is to generate a proactively sustainable construct capable of foreshadowing and mitigating the

environmental liabilities of an organization's services, operations, and products through preventive measures and risk management. An EMS engages the environmental dimension of an organization's activities in a holistic and systematic manner that enables a firm to continuously improve and acclimatize to ever-changing conditions and respond to increasing external pressures. In the absence of local directives, the corporate environmental self-regulatory practices induced by an EMS may be essential in curtailing the environmental impacts of a company's activities and compensating for the administrative and regulatory impairments plaguing public agencies in developing countries.

The subpar performance of governmental agencies in Lebanon particularly concerning environmental issues and the lack of priority given to the environmental aspects of developmental projects, necessitate a holistic and systematic approach to ensure environmental protection and continuously improve environmental performance. The introduction of an additional set of pollutants in a hitherto susceptible context, where the population suffers from high rates of chronic illnesses [7, 8], poses a tremendous risk on public health.

In the absence of local directives, the corporate environmental self-regulatory practices induced by an environmental management system (EMS) may be essential in reducing the environmental impacts of a company's activities and compensating for the administrative and regulatory impairments plaguing public agencies in developing countries. This research aims to (1) evaluate the level of integration of health, safety and environmental management practices of O&G distributing companies, (2) assess the incentives, barriers and limitations for implementing an EMS, and (3) explore stakeholders' concern regarding the environmental performance and prospects of the oil and gas sector in Lebanon.

2. Research Methodology

2.1 Study design

The targeted population of this study was the O&G companies operating in Lebanon totaling 63 registered companies. The main petroleum companies are gathered in the Association of Petroleum Importing Companies (APIC), which is a non-governmental association. The response rate for this study was approximately 68%, with 43 of the 63 contacted firms responding to the survey. Establishments that were owned and managed by a foreign corporation were termed as being multinational oil companies (MNOCs), while businesses that were domestically owned and were not overseen by a foreign entity were labeled as national companies. Due to the absence of a standardized national definition for the classification of companies in accordance to size, companies with a staff of less than 50 employees were designated as being small-sized, while firms with a workforce of 50 or greater were identified as being medium-sized.

In order to assess the third objective of our study, the qualitative research method, in particular the in-depth interview approach was adopted. This qualitative method for data collection relies on stimulating the interviewees into expressing their opinions and

interpretations concerning certain topics by presenting them with a preset group of open-ended questions.

Despite being focused on a particular set of themes, semi-structured in-depth interviews are designed to be flexible and fluid, allowing for participants to share personal experiences and touch upon issues they believe are important and correlated to the topic at hand. The recorded data would then be methodically analyzed to generate a comprehensive set of deductions [9, 10]; Massoud et al. 2019. Table 1 presents the list of key stakeholders interviewed.

Stakeholders	Main Role and Responsibilities
Industrial Research Institute (IRI)	- Monitors companies on behalf of ministries. - Develops rules and decrees alongside other governmental entities.
Ministry of Energy and Water (MoEW)	- Primary entity involved in the sector. - Requests permit for fuel carrying boats coming from abroad from the MoPW. - Monitors the process of unloading the fuel that is coming from abroad.
Minsitry of Environment (MoE)	- Highest authority in matters that concern the environment.
Ministry of Industry (MoI)	- Issues license for companies that distribute gas (butane, propane, etc.)
Ministry of Public Works (MoPW)	- Monitors fuel tank trucks with public license plates (red licensed). - Issues permits to fuel carrying boats coming from abroad to dock in Lebanon.
Association of Petroleum Importing Companies (APIC)	- Ensures quality and safety of the imported fuel. - Improves coordination between public and private sector. - Participates in the development of new laws and standards.
Lebanese Civil Defense (CD)	- Responds in case of fire incidences. - Provides safety trainings for public truck drivers.
Lebanese Petroleum Administration (LPA)	- Involved in the development of legislation concerning upstream petroleum activities
Lebanese Standards Institution (LIBNOR)	- Issues standards for ministries if requested.
Ministry of Finance (MoF)	- Monitors the financial dimension of the sector such as revenue generation, taxes, income statements or any other form of payment that companies need to submit to the government.

Table 1: List of the different stakeholders with their main role and responsibilities.

2.2 Data collection

Primary data were acquired using a bilingual (Arabic and English) questionnaire targeting 63 O&G companies. The questionnaire was designed following the structured questions method to provide useful insights into environmental performance and to investigate the level of integration between health, safety and environmental management practices.

Potential drivers, barriers and incentives to implement an EMS following the ISO 14001 standards were also examined. The questionnaire was pre-tested to ensure that the questions are understandable and clear to respondents and that the exact meaning of the questions was captured in the English-to-Arabic translation. The questionnaire was distributed via mail, e-mail, fax, and mostly face-to-face to respondents who would be more knowledgeable to answer the survey questions.

General managers, Health Safety and Environment (HSE) or Quality Health Safety and Environment (QHSE) managers or operation managers were asked to complete the questionnaires. The participants were asked to respond to a series of general questions regarding the company (ownership type, the services provided, and the availability of an environmental department) and its environmental management practices. They were also asked to select the 3 most prominent external or internal incentives, barriers, and drivers from a preset list of alternatives that they thought could potentially impact the feasibility of adopting the ISO 14001 EMS.

Consent was taken from the participants and they were informed that the name and data collected from the company will remain anonymous, and that all confidential and specific information gathered will only serve the analytical purposes of this research. Individual responses were not linked to individual companies or respondents. The information that the companies provided was treated confidentially and as such, company names have been withheld. The study took approval from the Institutional Review Board at the American University of Beirut.

In-depth interviews were conducted with key regulatory and administrative stakeholders directly involved in governing the petroleum sector. The interview guide (Table 2) focused on exploring their concerns regarding the environmental performance of the O&G companies in Lebanon, determining the prospects and risks that will be introduced should upstream activities commence, and interpreting the role that an EMS could have in mitigating some of the threats posed by O&G-related activities.

Leading questions that could influence respondents' answers were avoided. The interviews were conducted in Arabic and all the gathered data were documented by taking hand written notes. The interview commenced only after the interviewees had provided their consent.

Objectives	Questions
Explore stakeholders' concern regarding the environmental performance of the existing national and multinational oil companies.	1- What do you think are the environmental impacts and risks of petroleum exploration, development, production, and decommissioning? 2- How do you evaluate the environmental practices of the existing oil and gas companies based in Lebanon? 3- What governmental body monitors the existing oil companies' environmental performance? Does your institution have a certain role regarding this issue? 4- In general, how do you find the implementation of environmental legislation in Lebanon? 5- What do you think are the major environmental risks once oil and gas production activities are commenced in Lebanon?
Explore stakeholders' prospects of the oil and gas sector in Lebanon	6- Do you think the acquisition of an environmental management system (EMS) will enhance the organization's environmental performance? 7- Do you think that an EMS should be a requirement for the oil and gas companies? Please explain why? 8- What non-environmental benefits do you think the oil and gas sector would bring to the country?

Table 2: Summary of the Interview questions linked to the study objectives.

2.3 Data management and analysis

The data collected from the questionnaire was numerically coded and analyzed using the Statistical Package for the Social Sciences (SPSS) software [11]. The data were categorized, organized, and analyzed to identify patterns and trends by means of examining the frequency at which each result occurred. Analyses were carried out to investigate possible association between predictor variables or independent variables (i.e. size of company, ownership type, previous certifications and availability of HSE department) and the main outcome variables or dependent variables. To determine the correlation between the different categorical variables, statistical significance and strength of association were determined and analyzed. Bivariate cross tabulation matrices were conducted using SPSS to explore and present the patterns of associations between two variables.

The statistical significance of the results was evaluated through a chi-square test where the p-value cutoff limit was benchmarked at 0.05. However, statistical significance alone does not delineate the strength of the association between the two nominal

variables compared in the bivariate analysis. Therefore, Cramer's contingency coefficient (V) was used to quantify the magnitude and severity of established relationships. Nominally, Cramer's contingency coefficient varies between 0.00 and 1.00. Coefficients below 0.1 signify the existence of a limited and insignificant relation, while values between 0.1 and 0.3 suggest the presence of an intermediate level of correspondence, and lastly values above 0.3 indicated the occurrence of a substantial degree of interdependency. Accordingly, only statistically significant results that illustrated the occurrence of a substantial level of correlation (Cramer's V>0.3) were selected and discussed in detail.

Thematic analysis was employed to thoroughly examine and evaluate the recorded transcripts and achieve the objectives of this research. The interviews were categorized and coded into topics/themes where transcripts were sorted out according to the study questions. This procedure ensured that spread parts of information on the same topic are consolidated for a complete review. Also, trends and patterns that reappeared among different interviews were identified. Data analysis was conducted by hand, using grids and matrices to summarize themes and organize findings. Furthermore, direct quotes from participants were used to support common themes.

3. Results and Discussion

3.1 Profile of O&G companies

National corporations constituted 84% of the 43 industries that responded to the survey. The majority of the participants provide oil (42%) or oil and gas (51%) storage and distribution services and only 7% exclusively handle natural gas. Companies were predominantly medium-sized enterprises with more than 50 employees (61%). The majority (70%) of the 43 companies did not have a dedicated HSE department or personnel dedicated to environmental issues. Moreover, such environmental positions were existent only in the surveyed MNOCs. This is attributed to the pressure that is mainly exerted by the international mother companies on their sister companies forcing them to deal with environmental issues. The absence of environmental departments or positions in locally-owned companies that do not have sister international organization is mainly attributed to the lack of enforcement by the government.

3.2 Environmental management practices of O&G companies

The survey results revealed that a large proportion of companies, especially smaller ones, do not believe that their activities are a cause for environmental concern, as 67% considered that their practices have no impact on the environment, while 62% claimed that their environmental performance is not a barrier to sustainable development. Most companies stated that they are primarily involved in retailing an end product, operate only locally and that there were no clear legal regulatory measures to account for the environmental dimension of the sector.

They redirected the responsibility for the environmental consequences that result from consuming this commodity onto the public who, according to them, are the ones utilizing the product. Gas companies also added that, in their opinion,

natural gas is an environmental friendly product that, unlike petroleum, had a negligible ecological footprint. In fact, it is inferred that some of the interviewees believed that their institutions are contributing to the goal of environmental sustainability, asserting that the environmental performance of their business far exceeds what is legally required.

When asked about measures to improve environmental performance, about 51% of O&G companies reported that they undertook several initiatives. However, the majority of these initiatives are categorized under "safety measures" which include changing old containers, HSE trainings, installing valves and cleaning tanks. This may be attributed to the misconception between safety and environmental management practices among respondents. It was noted, however, that MNOCs were more likely to adopt environmental initiatives than national corporations. Companies that refrained from engaging in any environmental initiative predominantly argued that they did not have the adequate financial resources to implement environmental mitigation measures.

However, when asked to assess the overall environmental performance of local O&G operators in contrast to foreign nations, approximately 63% of respondents concluded that the petroleum industries based in other Middle Eastern countries employ better environmental regulatory practices and 60% reiterated the same notion in the case of companies based in Europe. They attributed their conclusions to the ability of foreign governments to enforce environmental legislations and laws unlike the case of Lebanon. The survey revealed that only 28% of the firms had acquired an international management system and specifically the ISO 9001. Most of the respondents considered that the process of acquiring ISO 14001 could be financially exhaustive for companies with deficient, outdated, and poorly maintained infrastructure, since a significant proportion of their equipment and groundwork would need to be overhauled. Companies prioritized attaining the ISO 9001 over all other certificates, given that the organizational merits offered by the degree could supplement the company's technical and regulatory capacity, an issue they were uncertain the ISO 14001 could accomplish. This was reflected by the disinclination exhibited by the majority of unaccredited firms (87%) towards pursuing ISO 14001 certification, in the near future. In contrast, most QMS certified firms (67%) showed interest in acquiring the ISO 14001 standard and thus, displayed greater apprehension and knowledge regarding the benefits of an environmental management system and the procedures pertaining its acquisition.

Moreover, results showed that only 35% of the O&G companies conduct periodic environmental audits. A lack of environmental commitment is noted since only 34% stated having an environmental policy. Most corporations were chiefly concerned with satisfying the legal, operational, and financial obligations of the sector, as 81% of participants confirmed having a mechanism to identify new legal requirements. About 80% verified the availability of staff training programs primarily related to issues of health and safety and tackling emergencies like fire and oil leaks.

The majority of firms had not developed any predefined measurable environmental targets and objectives. About 44% of correspondents expressed that the financial, legal, and operational impositions of a firm constituted the main factors influencing established environmental agendas. Our findings asserted that the majority of O&G corporations, including MNOCs, failed to systematically integrate the fundamental tenants of environmental management into their organizational and operational constructs. This is validated by the lack of environmental auditing programs and the absence of documented, clearly-defined, and goal-oriented environmental policies. The environmental targets, objectives, and strategies of most companies, including those that attested to possessing environmental policies, were characterized as being generic, vague, and inexplicit, lacking any measurable physical parameters.

None of the companies' representatives professed to the occurrence of any emergencies within their firms, maintaining that the adapted risk management programs had prevented the materialization of any major incidents. Several studies [12-14] have insinuated that a company's commitment towards environmental sustainability is partially reflected by its willingness to voluntarily disclose its social and environmental practices. Hummel and Schlick (2016) [15] argue that the quality and credibility of the disclosed data more accurately indicate the underlying realities of a corporation's environmental strategy and the extent to which environmental considerations had been integrated into the firm's operational model.

A bivariate cross tabulation (Table 3) of the gathered data revealed that medium sized companies with HSE departments were more likely to ingrain EMS associated principles into their regulatory frameworks. It was also found that acquiring the ISO 9001 standard might facilitate working towards ISO 14001 certification. A comparative evaluation of selected ISO 14001 components verified that MNOCs displayed a greater tendency towards environmental sustainability as compared to national firms. A positive correlation was established between the manifestation of EMS associated features and practices on one hand and transnational ownership on the other. Similar findings have been reported by other studies [16, 17].

The disparity between the environmental performance of domestic and foreign agencies may be attributed to several factors. Normally, MNOCs operate at a much larger scale and are far greater in size. Accordingly, they are endowed with extensive financial, technological, and administrative resources brought about by their ability to readily mobilize and translocate human and fiscal capital to wherever needed. Moreover, MNOCs have a more comprehensive understanding of the sector because of their ample experiences [18, 19, 16, 17].

Additionally, MNOCs are critically prone and vulnerable to external scrutiny and pressure. Since MNOCs are active in more than one country and are involved in transboundary operations, they are incentivized to enhance the sustainability of their environmental practices to eliminate any potential export barriers [16]. Their position as cross-national

entities would also entail that any accidents would have far-reaching consequences on their image, reputation, and stock value, if the firm is publicly traded.

		Ownership type		**Company size**		**Availability of HSE department**		**ISO 9001 certification**	
		Chi-square (p-value) Cramer's V							
		National	MNOCs	Small	Medium	Yes	No	Yes	No
Does the company have any of the ISO 14001 Components	Environmental policy	**0.038** **0.327**		**0.004** **0.452**		**0.004** **0.452**		0.057 0.300	
	Procedure to identify environmental aspects/impacts	**0.001** **0.509**		**0.000** **0.563**		**0.000** **0.563**		0.057 0.300	
	Compliance with legal requirement	0.167 0.292		0.631 0.076		0.631 0.076		0.85 0.03	
	Environmental objectives & targets	**0.01** **0.408**		**0.013** **0.392**		**0.013** **0.392**		0.064 0.293	
	Objectives and targets periodically reviewed	**0.02** **0.369**		**0.000** **0.574**		**0.000** **0.574**		**0.003** **0.475**	
	Environmental management program	0.071 0.285		**0.012** **0.396**		**0.012** **0.396**		0.156 0.225	
	Environmental management practices are documented	**0.000** **0.630**		**0.04** **0.325**		**0.04** **0.325**		**0.000** **0.701**	
	Procedure to identify potential accidents and emergencies	0.256 0.180		**0.000** **0.627**		**0.000** **0.627**		0.066 0.290	

Statistical significant correlation: P<0.05
Strong correlation: Cramer's V >0.3

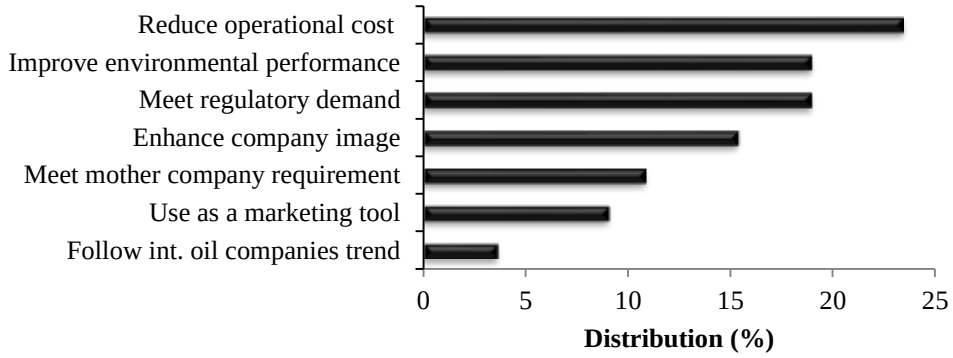
Table 3: Assessing the effect of ownership type, company size, availability of HSE department and ISO 9001 certification on the adoption of environmental management practices.

3.3 Adoption of an EMS: motivations and barriers

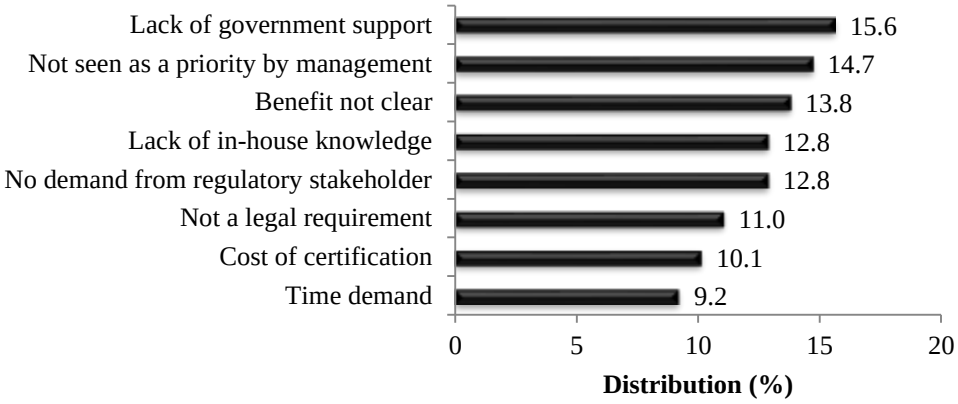
The O&G companies were primarily motivated into acquiring ISO 14001 certification by the prospect of improving profitability through operational cost reductions and supplementing contemporary environmental and regulatory practices, as shown in Figure 1. The three most widely selected incentives were the establishment of regulations and policies that encourage the adoption of an EMS and the collaboration between the public and private sector. Interestingly, none of their responses acknowledged the potential of the certification to improve the corporate image and its competitiveness, which is at odds with previous studies [20, 21]. Similar to other studies [22, 23], corporations were chiefly motivated by financial incentives such as tax reductions.

About 20% of the respondents viewed that the dissemination of awareness and knowledge regarding the certificate would incentivize its adoption, while approximately 14% and 13% regarded the lack of clarify concerning the benefits of an EMS and the absence of in-house knowledge as obstacles, respectively. The findings delineated that the most prominent external incentives that would stimulate companies towards pursuing ISO 14001 certification were predominantly in the financial domain, as companies profoundly welcomed prospects such as tax reductions and supported the initiation of public-private ventures. The positive impacts that an international environmental certificate can have on a firm's domestic market shares were not recognized by most participants, with the exception of QMS certified firms.

The lack of governmental technical and financial support programs was perceived as the most salient factor hindering the adoption of an EMS, followed by the absence of managerial commitment and the uncertainty surrounding the benefits and outcomes derived from obtaining an EMS. The additional costs companies had to bare because of the inadequate infrastructure services in the country drains resources that may have otherwise been utilized to invest in environmental initiatives. As such, environmental interventions were viewed as a burden rather than an opportunity. This may also be attributed to the difficulty in quantifying the positive economic benefits of an EMS, which are not guaranteed to materialize and could take a long period to manifest [24, 25]. The absence of public organizational support was conveyed as the principal barrier, since environmental regulatory programs are generally insufficiently endorsed in developing countries, such as Lebanon, where economic gains are given precedence over environmental concerns [26, 27]. The role of the government in effectively supporting and reinforcing environmentally sustainable behavior is attenuated by the lack of coordination between various public agencies, the unclear environmental legislation, the limited capacity of public organizations, the lack of accountability, the absence of sustainable environmental monitoring programs, and the low environmental fines and penalties. The knowledge gap experienced by a significant proportion of interviewees, most notably small-uncertified national firms without HSE units, was consistently maintained as a leading barrier for EMS certification.



(a)



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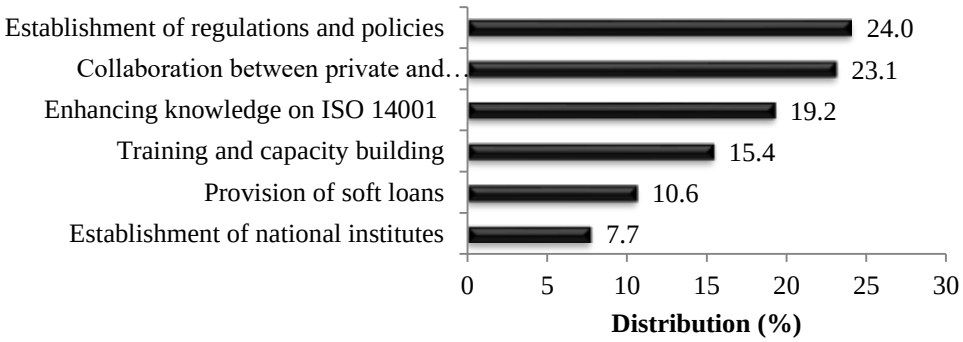

(c)

Figure 2: Perceived drivers (a), barriers (b) and incentives (c) affecting the adoption of ISO 14001 by the Lebanese oil and gas companies.

3.4 Environmental performance of O&G companies: stakeholders' perspective

Despite the involvement of a multitude of stakeholders within the petroleum sector, according to the interviewed participants, the primary entities concerned with monitoring the environmental performance of petroleum companies are the MoE, the IRI, MoPW and the MoEW. The MoEW was recognized as the principal public organization responsible for the overall management of the sector. The environmental responsibilities of the MoEW include monitoring incoming petroleum shipments, by supervising the process of unloading the imported fuel, and supporting the MoE in the process of developing environmental legislation of the sector. However, the chief public entity responsible for safeguarding the country's ecological systems from the impacts of the O&G sector is the MoE, which was identified as the public enterprise charged with auditing the environmental performance of O&G companies. This notion was consistently reiterated by most participants including the MoEW and the MoE itself. One of the interviewees stated:

"MoE is the authority responsible for monitoring the implementation of environmental regulations, and this is the case not only for the petroleum sector, but for all industries in general. The MoE is the foremost authority responsible for anything that concerns the environment."

However, the operational capacity of the ministry is hampered by budgetary constraints, limited human resources, the large number of stakeholders involved in the sector, and the vagueness of the Lebanese environmental legislation. All these factors contribute in diminishing the MoE's authoritative presence, and dilute the coercive impact of legislations, hampering the institutionalization of laws and regulations. Public entities, including the MoE, claimed that governmental authorities are in an incapacitated state that renders the prospect of having proactive monitoring programs implausible. One of the interviewees who stated that companies are rarely, if ever, subjected to environmental audits, substantiates this point. The lack of public investments has caused ministries to rely on the companies themselves to report on their environmental practices, which draws concerns regarding the validity of the submitted information, because of the presence of potential conflicts of interest. Self-reported data is subject to the interpretations and perceptions of the party submitting them and because of the increase in public consciousness regarding environmental issues, the content of the reports may be manipulated to place the corporation in more favorable conditions.

Furthermore, the jurisdiction of each public institution was not always clearly defined, which caused the responsibilities of ministries and other public entities to occasionally overlap. Moreover, there were apparent communication gaps between the various ministries, whereby information was not readily exchanged between public bodies. In fact, some of the public bodies had conflicting interests with one another, with each agency competing to exert greater control over the sector, at the expense of the other. Several participants related the environmental problems that Lebanon is facing to the social, economic, and political risks and uncertainties that the

country has been facing in for decades. Accordingly, environmental concerns have been deprioritized, as governmental authorities continue to persistently push for greater economic development. This was evident in the manner the government handled infrastructure projects, with environmental issues coming to the forefront only in the case of emergencies.

Representatives from APIC, CD, LIBNOR, LPA, and MoF exhibited a level of reservation when commenting on the environmental performance of O&G companies stating that they are not responsible for environmental monitoring. However, the remaining stakeholders unanimously agreed that there is a huge deficiency when it comes to implementation. As mentioned by one of the major stakeholders:

"*Several violations are occurring in the sector, because there are conflicts of interest between the various stakeholders, the incomplete legislation, and the inability of governmental agencies to properly monitor companies*".

Risks	APIC	CD	IRI	LIBNOR	LPA	MoEW	MoE	MoF	MoI	MoPW
Water pollution and impacts on aquatic life	√	√	√	√	√	√	√	√	-	√
Air pollution from green house gases emissions, acid rains etc..	√	√	√	√	√	√	-	√	-	√
Oil leakage and spills	√	√	√	-	√	√	-	√	-	-
Hazardous waste production and improper waste management practices	-	√	√	√	√	-	-	-	-	-
Natural resources consumption and utilization	-		√	√	-	-	-	-	-	√
Global warming	-	√	√	-	-	-	-	-	-	-
Impacts due to political / geopolitical risks	-	√	-	-	-	-	-	-	√	-
Impact due to weak environmental laws enforcement	-	√	-	-	-	-	√	-	√	√
Soil pollution	-	√	√	-		-	-	-	-	-
Noise pollution	-	-	-	-	√	-	-	-	-	-
Exposure to Naturally Occurring Radioactive Materials	-	-	-	-	√	-	-	-	-	-
Impacts on tourisms	-	-	-	-	√	-	-	-	-	-

Table 4: Environmental risks of oil and gas production activities.

Some of these stakeholders also stated that most companies are not abiding by legislations because of the lack of any coercive pressures. The majority of stakeholders were vaguely aware of the far-reaching impacts and implications of offshore activities. There responses were mostly generic and touched upon some direct environmental impacts, such as water pollution, impacts on aquatic life, air pollution, oil leakages and spills. The main risks that were identified by the various stakeholders are summarized in Table 4. These impacts are likely to be amplified by the weak regulatory regime and the lack in environmental knowledge among public authorities. Certain themes and notions were continuously reiterated by most participants, such as the lack of accountability and the absence of an overarching administrative framework for the sector.

Benefits of EMS	**APIC**	**CD**	**IRI**	**LIBNOR**	**LPA**	**MoEW**	**MoE**	**MoF**	**MoI**	**MoPW**
Companies abide by the rules	√	√	-		√	√		√	√	√
Better risk management approaches	-	-	-	√	-	-	√	√	√	-
Companies constantly monitored	-	√	-	-	√	-	-	-	√	√
Enhance company's image	√		√	-	-	√	-	-	√	-
Decrease pollution	√	-	-	√	-	√	-	-	-	-
Increase competition between companies	√	-	-	√	-	-	-	√	-	-
Continual Improvement	-	-	-	√	√	-	-	-	-	-
Decrease conflict of interest	-	-	-	√	√	-	-	-	-	-
Improve the quality of the product	-	√	-	-	-	-	-	-	√	-
Increase consumer trust	√		-	-	-	-	-	-	-	-
Achieve sustainable development	-	-	-	√	-	-	-	-	-	-
Improve workers health	-	-	-	-	-	√	-	-	-	-
Better documentation	-	-	-	-	-	-	-	-	√	

Table 5: Benefits of implementing an EMS.

An EMS was cited as a tool for fighting institutional corruption and establishing accountability, as companies would be monitored by foreign agencies alongside governmental bodies. The adoption of EMS will guarantee that O&G companies are increasingly scrutinized. Moreover, the EMS can help companies ensure that their management practices conform to environmental regulations. Other than being

scrutinized, interviewees reflected that an EMS could be a tool to both ensure that laws and regulations are effectively implemented and that a pro-active risk management approach is adopted. Table 5 represents the perceived benefits of the implementation of an environmental management system. Several interviewees believed that the major benefit derived from an EMS is that companies would be increasingly scrutinized, since several of the interviewed representatives believed that the government is incapable in its current state to properly monitor petroleum companies. Moreover, there was a sense of uncertainty that was expressed among several stakeholders regarding the entities that will be responsible for governing the petroleum sector, once upstream operations have been initiated. Stakeholders also agreed that the development of the upstream O&G sector in Lebanon would have a certain negative impact on the country's environment. Moreover, in order to detect, quantify, and control these impacts an environmental baseline assessment should be done. The stakeholders were able to point out several non-environmental benefits derived from the development of the O&G sector in Lebanon. Financial and economic benefits, diversification of income, reduce fuel import, and decrease the country's debts were among the most perceived benefits of developing the O&G sector in Lebanon.

4. Conclusion

Our findings show that the majority of O&G companies failed to systematically integrate the fundamental tenants of environmental management into their organizational and operational constructs. This is validated by the lack of environmental auditing programs and the absence of documented, clearly-defined, and goal-oriented environmental policies. The environmental targets, objectives, and strategies of most companies, including those that attested to possessing environmental policies, were generic, vague, and inexplicit, lacking any measurable physical parameters. Despite a large proportion of the companies declaring that they implement stringent health, safety, and environmental regulations, most firms did not possess HSE or environmental, departments. Additionally, all participants failed to report on the occurrence of any accidents or emergencies during the past few decades, a result that is improbable. In addition, despite more than half of the participants proclaimed that their organizations had undertaken measures to diminish their environmental impacts, most of these interventions were found to be related to health and safety measures. The majority of correspondents were incapable of differentiating between health, safety, and environmental practices, viewing them as indistinct overlapping elements.

Acknowledgement

The authors would like to extend their appreciation and gratitude to the Munib and Angela Masri Institute of Energy and Natural Resources for funding this research project.

References

1. Dahle IB, Dybvig G, Ersdal G, et al. Major accidents and their consequences for risk regulation. In Berenguer C, Grall A, Soars CG (eds) Advances in Safety, Reliability and

Risk Management. CRC Press Taylor and Francis Group, London (2012).

2. Mills RW, Koliba CJ. The challenge of accountability in complex regulatory networks: The case of the Deepwater Horizon oil spill. Regulation and Governance 9 (2015): 77-91.
3. Alba EM. Environmental governance in oil-producing developing countries. Oil, Gas and Mining Policy Division Working Paper. Extractive Industries for Development Series 17 (2010).
4. Tienhaara K. Foreign investment contracts in the oil and gas sector: a survey of environmentally relevant clauses. Sustainable Development Law and Policy 11 (2011): 6.
5. Graham D, Woods N. Making corporate self-regulation effective in developing countries. World Dev: 34 (2006): 868-883.
6. Raufflet E, Cruz LB, Bres L. An assessment of corporate social responsibility practices in the mining and oil and gas industries. J Clean Prod 84 (2014): 256-270.
7. Doocy S, Lyles E, Hanquart B, et al. Prevalence, care-seeking, and health service utilization for non-communicable diseases among Syrian refugees and host communities in Lebanon. Confl Health 10 (2016): 21.
8. Zeidan RK, Farah R, Chahine MN, et al. Prevalence and correlates of coronary heart disease: first population-based study in Lebanon. Vasc Health Risk Manag 12 (2016): 75.
9. Longhurst R. Semi-structured interviews and focus groups. Key methods in geography 3 (2003): 143-156.
10. Clifford N, Cope M, Gillespie T, et al. Key methods in geography Sage (2016).
11. Venables WN, Ripley BD. Modern applied statistics with S, 4th ed. Springer, New York (2002).
12. Clarkson PM, Li Y, Richardson GD, et al. Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. Account Organ Soc 33 (2008): 303-327.
13. Mahoney LS, Thorne L, Cecil L, et al. A research note on standalone corporate social responsibility reports: Signaling or greenwashing? Crit Perspect Account 24 (2013): 350-359.
14. Ahmad WNKW. Rezaei J, Tavasszy LA, et al. Commitment to and preparedness for sustainable supply chain management in the oil and gas industry. J Environ Manage 180 (2016): 202-213.
15. Hummel K, Schlick C. The relationship between sustainability performance and sustainability disclosure–Reconciling voluntary disclosure theory and legitimacy theory. J Account Public Policy 35 (2016): 455-476.
16. Cole MA, Elliott RJ, Strobl E. The environmental performance of firms: The role of foreign ownership, training, and experience. Ecol Econ 65 (2008): 538-546.

17. Albornoz F, Cole MA, Elliott RJ, et al. In search of environmental spillovers. World Econ 32 (2009): 136-163.
18. Christmann P, Taylor G. Firm self-regulation through international certifiable standards: Determinants of symbolic versus substantive implementation. J Int Bus Stud 37 (2006): 863-878.
19. Magrini A, dos Santos Lins L. Integration between environmental management and strategic planning in the oil and gas sector. Energy Policy 35 (2007): 4869-4878.
20. Mariotti F, Kadasah N, Abdul Ghaffar N. Motivations and barriers affecting the implementation of ISO 14001 in Saudi Arabia: an empirical investigation. Total Qual Manag Bus 25 (2014): 1352-1364.
21. Martín-Peña ML, Díaz-Garrido E, Sánchez-López JM. Analysis of benefits and difficulties associated with firms' Environmental Management Systems: the case of the Spanish automotive industry. J Clean Prod 70 (2014): 220-230.
22. Massoud MA, Fayad R, El-Fadel M, et al. Drivers, barriers and incentives to implementing environmental management systems in the food industry: A case of Lebanon. J Clean Prod 18 (2010): 200-209.
23. Salim HK, Padfield R, Lee CT, et al. An investigation of the drivers, barriers, and incentives for environmental management systems in the Malaysian food and beverage industry. Clean Technol Envir 20 (2018): 529-538.
24. Heras-Saizarbitoria I, Molina-Azorín JF, Dick GP. ISO 14001 certification and financial performance: selection-effect versus treatment-effect. J Clean Prod 19 (2011): 1-12.
25. Prajogo D, Tang AK, Lai KH. Do firms get what they want from ISO 14001 adoption? An Australian perspective. J Clean Prod 33 (2012): 117-126.
26. Waxin MF, Knuteson SL, Bartholomew A. Drivers and challenges for implementing ISO 14001 environmental management systems in an emerging Gulf Arab country. Environ Manage (2017): 1-12.
27. De Oliveira Neves F, Salgado EG, Beijo L. Analysis of the Environmental Management System based on ISO 14001 on the American continent. J Environ Manage 199 (2017): 251-262.