

Supply Chain of Energy Resources and Its Alternatives Due to the Arab Spring: The Case of Egyptian Natural Gas Flow to Jordan

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Abstract

The main aim of this research study is to place the distinct experiences of Jordan's acquisition of energy in a broader empirical set of research, and to place Jordan's energy sector in the larger context of the global economic crisis, the Arab Spring, and the Egyptian Revolution. The methodology that was adopted for this study described as qualitative by conducting several semi-structured interviews with managers in medium and top-level positions that were related to energy sector as targeted respondents, 32 managers were participated in this study. Further, reviewed the related literature in order to collect the necessary and required qualitative data from secondary sources such as statistical reports, previous studies, etc. As a result, to achieve effective managing of supply chain energy resources, the Jordanian government's short-term solution due to the reduced natural gas supplying from Egypt was alternatively purchasing the necessary quantities from some Gulf countries such as Qatar and/or Saudi Arabia, which can be imported with two possible methods. The first method is to rent a ship equipped with a liquefied natural gas (LNG) terminal, which is currently operating. The second method requires equipping the Aqaba port with an LNG terminal, which also is currently operating. In the long-term, a viable solution to depending on importing expensive and often unreliable natural gas supplies from surrounding countries is to depend more heavily on renewable supply energy, including solar, wind, and water energy.

Keywords

Energy supply resources, Arab spring, Liquefied natural gas (LNG), pipeline, Jordan.

1. Introduction

In the last eight years, it was challenging years for the Jordanian economy, which caused a variety of negative effects from the Arab Spring, which was taken place in neighboring countries. Since 2011, Jordan has experienced catastrophic shocks in the increased prices of imported goods, due to a large extent to the Arab Spring, specifically in Egypt. The cessation of a reliable source of gas from the Arab Gas Pipeline has heightened existing tensions within Jordan, including a decrease in tourism and internal as well as external political tensions. Production of natural gas within Jordan in 2011 was only 3% of the country's needs, with the majority being imported from Egypt, with this figure being 806 million cubic in 2011 alone (IMF, 2012; MEMR, 2011; and MPIC, 2013). This is a 65% decrease from 2010, due to instability from the Arab Spring within Egypt, which led to 13 bombings of the Arab National Gas Pipeline in 2011, and a -84.2% decrease in the supply of that year. This forced Jordan to substitute natural gas with heavier crude oil, resulting in a 58% rate of increase in its use, as well as a rise in diesel oil consumption by 433% from 2010 to 2011 (IMF, 2012). These heavier fuels are much more expensive than natural gas, placing a huge stress on the Jordanian economy (MPIC, 2013). Since 2012, the Arab Gas Supply Pipeline, which carries natural gas from Egypt through the Sinai Peninsula and to Jordan and Israel, has been attacked more than forty-two times. Jordan imported around eighty percent of its necessity of natural gas (about 250 million cubic feet of natural gas per day) from Egypt to generate particularly electricity, while twenty percent being produced locally. Jordan has utilized multiple alternatives to address the interruption of the available natural gas supply from Egypt. The Jordanian distributed power plants now rely on the use of heavy fuel oil and diesel for electricity generation; in this case, costing

Jordan about four times that of natural gas. Fuel oil and diesel were alternative options instead of Egyptian natural gas supplies, which is coupled with the thirty-two percent rise in global fuel prices. This has led increased Jordan's energy import bill by over fifty percent in 2011, reaching more than sixteen percent of the 2011 GDP. The increase in the cost of electricity generation pushed the Jordanian economy to borrow from multiple internal and external resource channels, thus increasing the public debt.

In 2012, the government began a strict tightening of the budget and the implementation of a three-year agenda to decrease overall debt. The International Monetary Fund noted in 2012, the main reason for such a significant increase in the debt to GDP ratio has been due to the increased borrowing by Jordan's National Electric Power Company in order to import these alternative fuels (Swiston, 2008). This, coupled with the low levels of economic growth per year, presents Jordan with a crisis that must be addressed. This monumental decrease in available natural gas to Jordan since 2011 has highlighted an imperative need to diversify sources of energy to create a stable and reliable energy supply, and most importantly, finding ways to develop domestic sources of energy. In theory, Jordan has all the resources necessary to build its solar, wind, and water energy sectors: a large, able, and well-educated workforce to not only develop but also operate these sectors, an infinite amount and unobstructed availability of solar energy, an adequate resource of wind, and water supplies in the form of the Dead Sea. Solar energy is a lucrative alternative in this country with limited resources, but an infinite amount of solar energy being available year-round, with no possibility of external threats to this energy source. Unfortunately, up to this point, the necessary development of solar energy has not occurred at adequate rates of growth for the country. This has been primarily due to the minor amount of monetary investment in the sector. Though the interest in investment has been high in both solar and wind energy, the lack of funding has caused these viable options to go untapped, with renewable energy constituting only 2% of Jordan's total energy consumption in 2011 (Khammash, 2012; and MEMR, 2011).

2. Literature review, key principles and background

2.1 The Global energy sector

In 2008, the entire globe felt the effects of the global economic crisis. According to the International Monetary Fund (IMF) (IMF, 2013), this crisis included the plummeting prices of stocks, the actual exchange rate appreciating drastically, and the United States policy rate expanding. The financial situation in the Middle East was put under further stress in 2011 with the onset of the Arab Spring, and the accompanying turmoil that deterred international investment and led to an additional drop in stock prices.

2.2 The Jordanian energy sector

The Energy sector in Jordan supports a population of roughly 6.7 million, with this number constantly changing due to the historical influx of refugees including those from Palestine, Iraq, and Syria. According to Tanya Khammash of Jordinvest, there were 1.5 million non-Jordanian refugees living in the country in December 2012. After the crisis intensified in those countries over the summer of 2011, this number has reached much higher levels and affected on the oil demand for electricity generation and consumption (Khammash, 2012; and Jordinvest, 2012). With the average electricity consumption per capita being 2,296 kWh and rising, energy is a highly lucrative and limited resource in Jordan (Khammash, 2012; and MPIC, 2013). A country without any native energy resources that is land locked on all sides other than the small port at Aqaba, importing energy for Jordan is completely dependent on the relationships with surrounding countries and the stability of those states. Jordan has a small relatively open economy that thrives on its very close relationships with the rest of the world. According to an interviewee who works in Jordan's energy sector, like its economy, the "stability of the political and legal environment [in Jordan] is very important for the electricity sector". The problems that have historically faced the energy sector include the almost complete dependence on foreign energy, the increasing demand for energy within the state, and the lack of resources available to fulfil Jordan's energy needs (MPIC, 2013).

While Jordan does have its own energy production, this local production only accounts for 2.4% of its total consumption, with the rest being imported in the forms of Crude and other oil products, natural gas, and electricity (CEGCO., 2011; and MPIC, 2013). According to an anonymous source working closely with both the public and private energy sectors, the energy sector is divided into the generation sector and the distribution company. The electricity generation companies in Jordan are owned by a private sector, while the distribution company "is only one

and owned by the public sector” (anonymous employees of both the public and private portions of the Jordanian energy sector). The relationship between private and public begins when the public sector provides the private sector with a limited supply of oil per month, which it in turn refines and re-sells back to the public sector, which is run by the state (NEPCO). An interviewee explained that the “public sector is responsible for supplying the electricity generating companies with the fuel needed for production.” The natural gas that the public sector has sold to the generating companies over the last 10 years, “has been dependent on Egyptian gas”, with more than “90% of the generating electricity” being dependent on Egyptian gas, according to an employee of the Energy sector (CEGCO., 2011; MEMR, 2011; and MPIC, 2013). Relying so heavily on a single source of energy has left this country highly vulnerable to unrest in Egypt, which eventually led to an energy crisis in Jordan. According to Mahdi Raissi in the 2012 International Monetary Fund Report, having an adequate level of international reserves’ in energy is vital to strengthen Jordan against unrest and shocks in the international world (IMF, 2013).

In 2007, the Jordanian government reacted to extended increase in energy prices and unrest in the surrounding regions by creating a diversified Master Energy Plan for the years 2007-2020 (Jordinvest, 2012). Hopes have been for this trend towards diversification to hopefully ensure that outside factors, including unrest in surrounding countries will prevent the dominance of one source of energy, in order to ensure the protection of Jordan’s energy. Rather, the Kingdom planned to re-distribute the sources of energy consumption throughout a variety of sources and forms. Jordinvest expects the share of energy coming from crude oil to drop from over 80% in 2010 to a mere 40% in 2020, with the rest of the consumption being spread much more evenly between renewable energy, natural gas, imported electricity, oil shale, and nuclear energy (Jordinvest, 2012; and MPIC, 2013).

2.3 History of Egyptian Gas Flow to Jordan Country

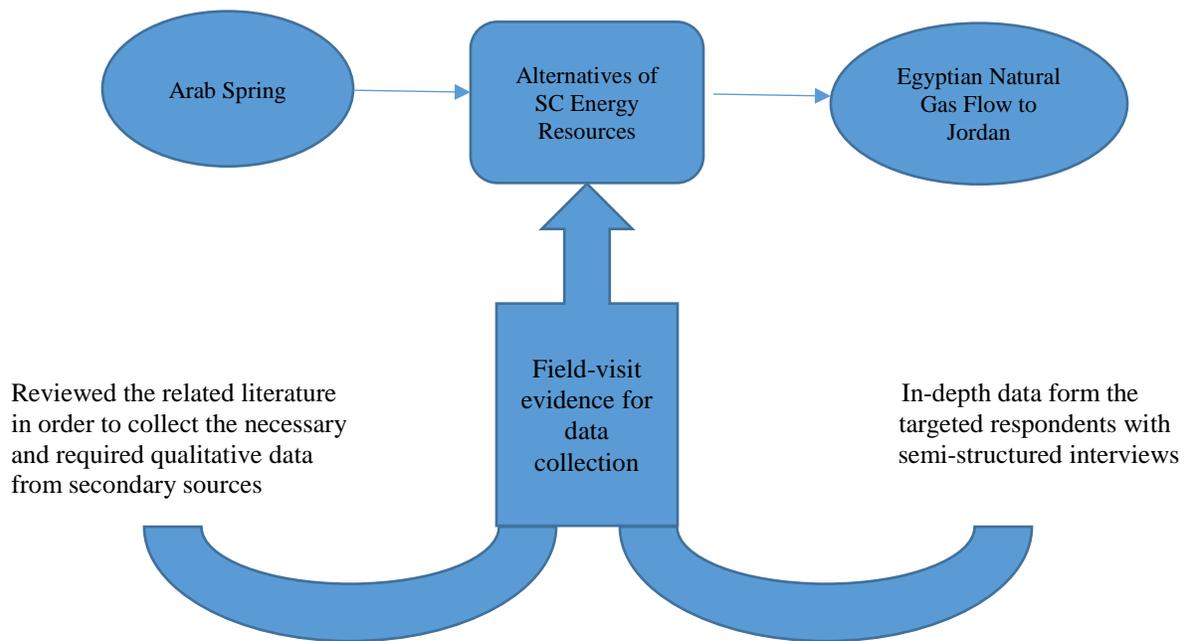
According to Jordinvest and an anonymous source, 80-90% of Jordan’s energy supplies have been imported from Egypt (MEMR, 2011; and MPIC, 2013). This energy supply has come in the form of natural gas, imported from the natural gas supply line. “The price and distance of the Egyptian gas were behind the dependence of the Egyptian gas”, according to an anonymous source. When analyzing Jordan’s economy in 2012, Raissi of the IMF stated, “any sudden stop of capital/current inflows could expose Jordan to significant shocks” (IMF, 2013). Though the Master Energy Plan of 2007 attempted to reduce this risk, the 2011 Egyptian Revolution exemplified the susceptibility of Jordan’s energy sector to regional instability. Unfortunately, the slow diversification of energy supplies away from Egypt beginning in 2007 was slight in comparison to what would commence in 2011 with the unrest following Egyptian Revolution. This uprising led to over 13 attacks on the gas line, making Egypt an unreliable source of energy for Jordan (MEMR, 2011). Important to this event is the input of an energy sector expert, who noted that, “the Egyptian gas issue is not new; it started two years before the Arab Spring.” the natural gas to electricity has proved to be a stable option for the country until the year 2009, when Egypt experienced a depletion in its natural gas supply, from being able to provide itself with 90% of its natural gas to a mere 50%. This pushed its government to give Jordan the option of either drastically decreasing its quantity of natural gas or a massive increase in the price of gas. Jordan was put into a tense situation when its imports from Egypt decreased from 430 million/ m² Btu per day to a mere 150 million/ m² Btu (CEGCO., 2011; and Jordinvest, 2012).

The Ministry of Energy and Mineral Resources has noted that in 2011, the import of natural gas from Egypt dropped 1279.6 bcm due to the bombings of the Arab Gas Pipeline in Egypt (MEMR, 2011). Seeing that 90% of electricity was produced from natural gas (anonymous interviewee), the crisis was overwhelming. Costly heavy gas replaced the natural gas imports for the electricity generation companies to convert, costing the country about four times the original price. The IMF noted in its report that the heavy fuel that replaced Egyptian gas increased the cost of energy imports by an astounding 50% in 2011 (MEMR, 2011). Further, the amount that the National Electric Power Company (NEPCO) had to borrow in order to supply the country with heavy fuel energy amounted to a US 1.1 billion dollars debt for the state (MEMR, 2011). Echoing voices of two of the IMF’s reports on Jordan in 2012, as well as the government’s stated reasons for restructuring the Master Energy Plan in 2007, an anonymous source noted that the “full dependence on the Egyptian gas is the main weakness of the Jordanian energy sector” (MPIC, 2013).

3. Research methodology

3.1 Qualitative research study

The research methodology employed in this study can best be described as qualitative (AL-Shboul, 2016). Qualitative studies enrich in-depth understanding of several real-world phenomena in logistics and supply chain discipline (Voss *et al.*, 2002). According to Strauss and Corbin (1998), this type of methodology covers, any type of research that produces findings not arrived by statistical procedures or other means of quantification. Therefore, qualitative research may refer to research about people's lives, lived experiences, behaviors, emotions and feelings, as well as about organizational functioning, social movements, cultural phenomena and interactions between nations (AL-Shboul, 2016). Hence, qualitative research's interdisciplinary qualities provide for an in depth understanding of a specific event, and its nature of specificity allows it to necessarily lead to concrete results that are at the same time, true to life and full of ideas (Ruyter and Scholl, 2008). In order to increase the reliability of the analysis, as recommended by Takashima and Kim (2016), the unit of analysis for this study is restricted only to managers and decision makers who are responsible to keep continually flowing of Egyptian natural gas to Jordan from both countries at the medium and top-level positions that were related to energy sector as targeted respondents. Figure 1 shows the process for elaborating the supply chain of energy resources and its alternatives due to the Arab Spring, based on an inductive research approach.



Source: Stank *et al.* (2017) with some modifications by Authors.

Figure 1: Research study approach

3.2 Data collection

Data was collected over five-month period, between August and December 2018. Ministries of Energy and mineral resources, electricity-generating companies, electricity distribution companies, and petroleum refinery companies were involved in energy sector from both countries Jordan and Egypt. All the participated and selected Ministries and companies were similar in that they engaged in planning, generating and distributing energy activities. Both Ministries and all companies had over 250 employees, and operated their own in-house energy producing activities.

3.2.1 Interviews

The questions were included in semi-structured interviews, focused on, to a greater or lesser extent the following areas: the effect of the Arab Spring on the energy sector; the impact of Egyptian natural gas flow on the cost, and

ability to produce electricity; the alternatives of Egyptian natural gas flow if are or not possible; at least in the short term; and finally, the need to concentrate on solar energy is a must in this case (AL-Shboul, 2018). The main topics covered in the interviews came from the literature. More specifically, in total 32 interviewee were participated in this study; several interviews were conducted with senior managers, business people, CEOs, Vis-presidents, supervisors, and government policy makers from both countries to provide higher data reliability (Eisenhardt and Graebner, 2007); (for more details, see Table 1).

Table 1: Semi-structured Interviews and evidence of data-collection

Ministry/Company	Interviews (Interviewee, no. of interviews, interviews length in min.)	Evidence of data collection (Location, no. of hours spent)
Ministry of Energy and Mineral Resources	(Planning manager, 2, 45) (Operations manager, 2, 65)	(Jordan, August 2018, 2h)
Ministry Of Electricity & Renewable Energy	(Production manager, 2, 35) (Logistics manager, 1, 40)	(Egypt, October 2018, 1.5h)
Central Electricity Generating Company (CEGCO.)	(CEO, 1, 35) Vis-president, 2, 30)	(Jordan, September 2018, 1h)
Electricity Distribution Manufacturing Department Company	(Vis-president, 1, 55) (Senior manager, 2, 25) Production manager, 1, 55)	(Jordan, November 2018, 3h)
National Electric Power Company NEPCO.	(CEO, 1, 20) (Vis-president, 1, 55) (Senior manager, 2, 25) Production manager, 1, 55) Logistics manager, 1, 45)	(Jordan, September 2018, 4h)
Jordanian Egyptian Fajr for Natural Gas Transport and Supply	(Operations manager, 2, 65) (Senior manager, 2, 25) Production manager, 1, 55) Logistics manager, 1, 45)	(Jordan, December 2018, 3h)
Egypt Natural Gas Company	(Vis-president, 1, 25) (Site manager, 2, 70) Production manager, 1, 30) Logistics manager, 2, 40)	(Jordan, October 2018, 3h)

All interviews were translated from Arabic into English language then recorded and documented. Two-research assistants provided great potential support with translating and documenting the targeted interviews. The targeted respondents were in the medium and high-management levels, which were concerned in the following topics:

- The Jordanian Energy sector before and after the Arab Spring;
- The problems facing the sector after the Arab Spring;
- The cut of Egyptian gas after the revaluation;
- The cost of using the heavy oil for generating electricity on the government and the market;
- The obstacles for finding alternatives;
- The possibility of using the solar energy;
- The short-term and long-term solutions.

3.2.2 Field visits

Seven field visits were conducted in order to investigate the place the distinct experiences of Jordan's acquisition of energy in a broader empirical set of research, and to place Jordan's energy sector in the larger context of the global economic crisis, the Arab Spring, and the Egyptian Revolution. Table 2 illustrates an overview of the evidence of data-collection from the seven Ministries and companies that were participated in this study from both countries Jordan and Egypt. According to Ketokivi and Choi (2014), it is so important to provide such like these information that already were summarized in table to increase the reliability of the research at data collection process. For future researches who are, concerning to replicating this type of studies need to consider how collected the required data for this research in order to leads to the research outcomes and conclusions.

4. Results, analysis and discussion

4.1 Losing Egyptian gas after Arab spring

The loss of a stable supply of Egyptian gas began in 2009, when the state had exhausted its natural resource. As mentioned earlier, this pushed its government to give Jordan the option of either drastically decreasing its quantity of natural gas or a massive increase in the price of the gas. In effect, Jordan lost a vital 280 million m² Btu of gas from Egypt, or 2.8 times less gas than before (MPIC, 2013). Two years later, the Egyptian Revolution further injured the energy sector in Jordan, with the loss of natural gas costing the state billions of dollars. With the energy bill costing the Kingdom 51% more in 2011 than that the previous year, the Kingdom was pushed to look towards alternative sources of energy (CEGCO., 2011). Experts in the energy sector confirmed this in the interviews:

“The Egyptian gas issue is not new; it started two years before the Arab Spring”.

It was also confirmed that:

“The Egyptian government was pushing to increase the price and the quantity of the gas flow to Jordan for more than two years”.

The Kingdom was not prepared for the unexpected uprising in Egypt, and as such, the hurried diversification of energy resources cost the country 3.84 billion, or a 51% increase in the price from the year 2010 (Jordinvest, 2012; and MPIC, 2013). Specifically, the use of heavy fuel oil (HFO) pushed the price of energy up from 40 Fils Watt to 200 Fils Watt. The interviews clarified that:

“The Jordanian Electricity sector depends a lot on Egyptian gas”.

It also showed that:

“During the last 10 years, more than 90% of electricity generation depended on Egyptian gas”.

The monetary losses to the public energy sector, or National Electric Power Company, have amounted to about \$3 billion Jordanian Dollars (JD). In this situation, it is the government, much more than the people of Jordan that is being hit the hardest. The government has historically subsidized its electricity, which controls the effects of the ebbs and flows of energy costs. However, the sudden extreme hike in prices has ended up lasting years, and with no fiscal responsible solution replacing the exorbitant cost of HFO, the possibility of obtaining these lost funds is not in sight (MEMR, 2011). Hopes have been that this trend towards diversification will hopefully ensure that outside factors, including unrest in surrounding countries will not devastate the country, since the resource will no longer come from a concentrated location, but rather be distributed more evenly throughout a variety of sources and forms. Jordinvest expects the share of energy coming from crude oil to drop from over 80% in 2010 to a mere 40% in 2020, with the rest of the consumption being spread much more evenly between renewable energy, natural gas, imported electricity, oil shale, and nuclear energy (Jordinvest, 2012; and MPIC, 2013).

4.2 Options looking forward

After losing \$3 billion JD, a heightened urgency has been placed on the search for a permanent alternative solution of energy. These solutions include finding an alternative port, the burning of oil shale, Iraqi gas, Iraqi energy, and a partnership between the public and private energy sectors. This issue was confirmed by an expert in an energy sector as follows:

“Alternatives for the Egyptian gas are very important at this stage”.

The first solution entails renting a ship equipped with a liquefied natural gas (LNG) terminal, which requires a minimum of three years to come into operation. Additionally, equipping the port at Aqaba with an LNG terminal would provide the necessary technology to import liquefied gas. The second method requires equipping the Aqaba port with an LNG terminal, which will also take three years to complete. Gulf States, including Qatar, have offered to fund the 60 million JD construction fees, in order to export their liquefied gas to Jordan. The problem with this solution comes with the completion date. If construction began today, conclusion of the project would not come until mid of 2020. The urgency for natural gas in Jordan is too great to solely rely on this project, for every two weeks, NEPCO, loses \$60 million JD, or the cost of the port itself. One of the interviewees confirmed this:

“Buying gas from Qatar needs a LNG port”.

Another interviewee added:

“An LNG port needs 3 years to be ready to work”.

According to Jordinvest, the Kingdom planned to spend \$1.4-3.8 million JD on oil shale exploration from the year 2007-2020 (MEMR, 2011). This investment will hopefully tap into the 40 billion tons of shale in the country. Burning oil shale requires advanced technologies that were offered to Jordan by Estonian Shale companies, along with a fund from the Gulf States to build the necessary plant to extract energy. Once again, time is of the essence, and the timeline of construction includes a 2018 completion date. The interviewees stated that:

“The shale oil is another alternative”.

Another expert in the energy sector explained that:

“Using shale oil needs at least four years, a generating station is needed”.

4.3 The case of Iraq

The Jordanian composition of energy consumption has been discussed in the Kingdom’s Master Energy Plan, including the hopes of a major increase in imports of natural gas from Iraq. This solution, which would include a simple pipeline from Iraq to Jordan, is the most straightforward and least costly solution. Unfortunately, like with Egypt, political unrest in the region has prevented this option from maturing into reality. In this context, this was confirmed during the research:

“The Iraqi Gas is an option but it is not possible at the moment because of the political situation there”

4.4 Towards adopting solar systems

In a country, that only receives 200 mm of rain each year; solar energy seems an obvious solution. Currently, families throughout the country use solar energy to heat their water. However, although there is an almost unlimited amount of solar energy in Jordan, the lack of technology to store large amounts of this energy prohibit this option from solving any major source of Jordan’s energy problems in the near future. A one of the interviewee confirmed this:

“Solar energy can help in solving only 15% of the problem”.

4.5 The case after Egyptian revolution

From anonymous sources in the Jordanian Energy sector, be them a specialist or prominent employee, a clear distinction has been drawn between the regime in power in Egypt, and the occurrence of bombings on the Egyptian gas pipeline. In 2012, Mohammed Morsi, chairman of the Muslim Brotherhood’s “Freedom and Justice Party”, was elected as the new head of state to replace Hosni Mubarak, the final Prime Minister of Egypt. During the first Egyptian Revolution, the Egyptian Pipeline to Jordan was attacked 13 times. Notably, after Morsi came into power, the pipeline ceased to be attacked. Unfortunately, since Morsi was removed in July 2013 by the military, the pipeline has been attacked twice more. By monitoring the pipeline attacks, one finds reasonable doubt that the attacks have been politically motivated. This was confirmed during the interviews:

“The Egyptian revolution cuts the gas flow to Jordan”.

Another energy expert also confirmed that:

“Politics reasons are behind the cut after the revolution”.

5. Conclusions

This research has filled an important breach in the knowledge of the Jordanian energy crisis, with a particular emphasis on the economic impact on the Kingdom, with the general conclusion that in order to address the difficulty, both the public and private energy sectors must work in conjunction in order to solve the energy crisis. Since the setbacks faced are all outside of the country’s borders, private profits must put aside to accelerate securing alternative sources of energy.

The main aim of this research was to place the distinct experiences of Jordan’s acquisition of energy in a broader empirical set of research, coming to conclusions and recommendations based upon experience and observation rather than theory or logic, and to place Jordan’s energy sector in the larger context of the global economic crisis, the Arab Spring, and the Egyptian Revolution. The success of Jordan’s energy sector was found to be completely dependent on

the stability of surrounding countries, as well as the international economy. Egypt was found to be of chief importance to a stable import of energy, specifically with the loss of multiple billions of dollars at beginning in 2009, when the restrictions on imports and the bombings of the gas line in 2011 ultimately stopped most imports of natural gas, the source of 80% of Jordan's electricity. This, along with the lack of any immediately available domestic or international sources of natural gas has led to the use of heavy oil, dramatically driving up the cost of energy and creating a seemingly endless cycle of loss for the Kingdom. Many studies found a relationship with the political regime in power in Egypt and the bombings of the Egyptian pipeline, more importantly the availability of stable and affordable energy. Since 2009, the cost of energy has increased the government subsidies of gas and electricity increased, and with no viable solution to this. Despite the options theoretically available to diversify, instability in Iraq, and the several yearlong process to create the necessary structures and infrastructure in short do not cut it. An expedited timeline must take place to end the catastrophe that has hit the country's economic future.

At this point, the private and public sectors must work together in order to create an environment in which the funding from Gulf States can be used most effectively. More capital must be pooled in order for these funds to be helpful to the Kingdom. Poor planning in the diversification of energy resources has further complicated the situation. For future research, there is a huge need to find where this economic capital can come from, and how the construction of an alternative port for liquefied natural gas can be expedited, in addition to researching how to store solar energy in the longer term.

5.1 Research limitations and further research

The analysis presented in this study suffers from some weaknesses and point it as follows:

First, this study, due to a time limitation, relies mainly on secondary data for the data collection process (AL-Shboul, 2016). The researcher was only able to conduct few and limited number of interviews with managers' who are responsible for the energy sector in Jordan. Due to the highly demanding positions of management in the sector, they were either too busy and/ or did not want to cooperate with the researcher and were not able to give him an opportunity to meet them in interviews to collect the required data (AL-Shboul, 2016). Second, the use of a small number of managers rather than many in different positions is not sufficient to collect accurate data about the supply chain of energy resources, and may result in the inaccuracy of some measurements and/ or results (AL-Shboul, 2016). Therefore, the researcher suggests using many targeted managers in leading positions, who are responsible for planning and organizing the supplying of energy from different resources in Jordan for data collection purpose in future research (AL-Shboul, 2016).

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Biography

Dr. Eng. Moh'd Anwer AL-Shboul currently is an Assistant Professor in Business Administration Department at Princess Sumaya University for Technology (PSUT), King Talal School of Business and Technology, Amman/Jordan, since Sep., 2018. I already had worked for five years in Logistics Sciences Department at German-Jordanian University/GJU, Jordan, since 2013 until Sep. 2018. He has published many articles in leading international Journals in the areas of SCM, logistics sciences, operations management and its implementations, Jordan in particular, Arabic and regional countries in general. Dr. AL-Shboul earned his PhD from Bradford University, UK (2012); MBA from Yarmouk University in Jordan (2002); additionally, AL-Shboul has double major (BSc.) in the areas of Electrical Engineering/Telecommunication from JUST (1992) and Business Administration from Yarmouk University (2000), Jordan. Dr AL-Shboul has long academic and professional experience in the areas of teaching as an instructor in Business and Electrical Engineering; had worked at Jordan Customs for more than ten years and more than ten years in Electrical Engineering in several Jordanian companies. His current research interests include lean and agile supply chain, supply chain management, Logistics sciences, supply chain responsiveness, and operations management.