



Research article

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## Increasing the energy and economic security – considering the unconventional oil in resource diversification in the Middle East

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### A B S T R A C T

The world energy markets are characterized by economic and political uncertainty due to the resources' strategic importance. Oil is currently the most convenient energy source, which has shaped the economic development of the twentieth century. There is a wealth of evidence that suggests that oil will continue to be irreplaceable as the main fuel for the twenty-first century's global economy. Most of the known energy resources in the Middle East are oil and gas, which until now have been considered conventional and more abundant than the so called heavy oils. While some of the Persian Gulf countries are going to be facing a historical challenge to diversify their economies in order to balance the decline in conventional reserves, it is argued in academic literature that the Middle East will continue to increase its importance as an oil production hub, moving from being dominant to being very dominant. Risk management is critical from both an importer's and an exporter's perspective. As the petroleum exporting countries rely mostly on their income from the crude oil, they are extremely vulnerable to instability and volatility of global oil markets. In the importer countries, the vulnerability in energy security derives from the oil's absolute dominance in the transportation sector. The question is: What is the best approach to managing this scenario, while the political instability continues to distress the region, causing turbulence to the oil prices in the short and medium run? In the long run it is still hard to say what kind of role the unconventional oil resources will gain in the traditional oil producing nations as we do not yet know how significant the resources for unconventional oil and gas in the Middle East region are.

#### Keywords:

Energy Economics

Persian Gulf

Petroleum

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### 1. Introduction

Oil is currently the most convenient energy source that has shaped the economic development of the twentieth century. Oil is the principal source of commercial energy throughout the world. There is a wealth of evidence suggesting that oil will continue to be irreplaceable as the main fuel for the twenty-first century's global economy. Since the 1950s the world's oil consumption has increased more than ninefold, from 10 million barrels per day (1950) to 91 million barrels per day (2013), and constitutes almost 32 percent of total primary energy supply,

while more than 95 percent of the transportation sector runs on oil. This fact reflects the issue of high vulnerability in the energy security (International Energy Agency, 2011, 2013a, 2013b).

The price of oil is driven by market power. According to Wirth et al. (2003) "market mechanisms can help address the various economic, environmental and security interests at stake". The global oil markets are surrounded by a unique combination of economic circumstances, namely (Smith, 2009): very high price volatility, the prominent role of oil cartel OPEC,

the absolute size and scope of the oil industry and its important links to industrialization, economic growth, global distribution of wealth, sustainability of the oil resource base, environmental impacts of the fossil fuels, and finally the geopolitical issues related to the distribution of the oil resources. Due to these economic circumstances, the development of alternative forms of energy, such as unconventional oil and gas, is highly appreciated.

Most of the known energy resources in the Middle East are in the form of oil and gas, which until now have been considered conventional and more abundant than the so called heavy oils (Smith, 2009 and International Energy Agency, 2005, 2013b). According to the International Energy Agency (*ibid.*), "any source of hydrocarbons that requires production technologies significantly different from the mainstream in currently exploited reservoirs is described as unconventional."

Alternatives, such as shale oil and gas, which are critically important for diversification of energy resources, seem to have been neglected. Not that any of these alternatives seem to replace the conventional oil reserves as the world's main energy source in the near future, but rather in order to look for a long term energy strategy that will provide the oil markets stability and therefore ensure economic security in both supply and demand countries. For instance, Dargin (2014) and Alhajji (2014) argue that shale oil gas production in the United States will become a competitive threat to the Persian Gulf states as it will affect their diversification plans significantly. Thus it is important to study the impact of adapting the unconventional energy resources in the Middle East on both economic and political levels. The oil producer's cartel OPEC (Organization of the Petroleum Exporting Countries) operates on both political and economic levels and the increase in unconventional oil and gas will have direct and indirect impacts on the cartel.

A considerable number of academic studies (e.g. Krasner, 1973, Russett, 1979, Moran, 1981, Alazard and Montadert, 1993, Roncaglia, 2003, Yergin, 2006 and Vivoda, 2009) have contributed to the field of energy strategy and security. Especially since the first oil crisis, great focus was put on the sufficiency of energy resources and on discussion of oil as a political weapon in the oil oligopoly OPEC. However, over the past decades less emphasis has been put on the research of unconventional energy resources in the Middle East, especially from the point of view of diversification. Part of this can be traced to the political preference of the Persian Gulf over 'geopolitics of oil' (Foster, 2008).

Following the oil crisis in the 1980s a great deal of the studies (e.g. Hnyilicza and Pindyc, 1976, Cremer and Weitzman, 1976 and Moran, 1981) were talking about the monopolistic role of

the OPEC and the oil producers of the Persian Gulf countries. The Game Theory developed by Nash (1950) was used to understand the complicated relationship between the 'spender countries' and the 'saver countries' in the realm of energy. These studies were inspired by the pursuit for greater energy security and further understanding the role of the OPEC and Gulf states in the oil markets.

Whenever there was a major disruption in oil supply, considerably more academic research was contributed to energy security studies. Fascinating questions awaiting new research include "how intentional has the neglect of the availability of alternative energy resources been?" And furthermore, has this been motivated by the Persian Gulf states' desire to maintain their dominance in the strategic energy markets by, for instance, limiting the investments in oil infrastructures (Foster, 2008)?

Interestingly, due to both underinvestment and the effects of sanctions in 2001, Iraq's crude oil production was 31 percent below the 1979 level, and Iran's was 37 percent below its 1976 level. On the other hand, if there is no political will to explore unconventional oil reserves, then there are even less economic incentives to do so when the production cost, for instance, for shale oil is considerably higher (Verrastro and Ladislav, 2007). Even though the production cost for oil in the Middle East is much lower than in other parts of the world (IEA, 2013b), the real cost of oil is much higher, caused by the fiscal policies of the oil producing nations and their energy subsidies. In the energy intensive countries there are major inefficiencies (Fattouh and El-Katiri, 2012).

Holding up investments can lead to underinvestment, which would be detrimental and result in higher macroeconomic cost caused by much higher oil prices. Both oil importers' and exporters' total benefit would be lower as compared to a case in which the investment is done on time. Without major investments into the oil production in the near future, this is a very likely scenario whereas the current infrastructure is aging and insufficient for considerably higher production. (Meng and Bentley, 2008).

According to Al-Rawashdeh *et al.* (2013), the Persian Gulf countries are going to be facing a historical challenge to diversify their economies to balance the decline in conventional reserves. As the petroleum exporting countries rely mostly on their income from the crude oil, they are "extremely vulnerable to instability and the volatility of global oil markets." Disturbance and instability in the oil and gas markets affect the entire supply chain. Further, as the domestic oil consumption increases, for instance in Saudi Arabia, less oil is produced for export, which provides the majority of the kingdom's income.

Jordan, for instance, has explored the oil shale and other heavy oil resources to achieve significant domestic energy production and reach towards higher diversification. (Jaber and Probert, 1997). For Jordan, a diversified and reliable energy supply is a key to its survival and domestic energy production seems an idealistic solution. When it comes to other Persian Gulf states rich in oil reserves, finding alternatives for oil does not seem to inspire support. Also, it is not clear how flexible their economies are to changes in fuel sources.

This paper examines the aspects of energy and economic security in the light of diversification through introducing unconventional oil resources in the Middle East. An emphasis is placed on issues that increase energy security through source diversification. The role of unconventional oil in Middle East energy security and the political and economic stability is discussed in this paper. The Persian Gulf countries get most of their energy from oil. Therefore it is critical to answer the question of how economic security can be increased by introducing alternative forms of oil resources to complement the existing energy production.

First the concept of energy security is introduced; then the academic discourse of unconventional energy resources is discovered, through which the issue of economic stability in the Middle Eastern oil producer economies is discussed to shed more light on their impact on long term energy strategy, through oil supply security. Finally the conclusions of the study are presented.

## 2. Energy Security and Diversification – Concepts and Literature Review

The concept of energy security has been discussed in numerous academic studies (e.g. Yergin, 2006, Vivoda, 2009 and International Energy Agency, 2013b). Most of the energy security studies emerged after the first oil crisis in the 1970s. International Energy Agency (2007, 2013a, 2013b), which was founded in 1974 to address oil security issues on an international scale, defines energy security as "the uninterrupted availability of energy sources at an affordable price". Economic security, in contrast, is considered to be the condition of having a stable source of financial income, which allows for the ongoing maintenance of a standard of living presently and in the foreseeable future. In this respect, an undisturbed and predictable energy supply is a critical denominator. A great deal of academic literature on energy security concentrates on oil resources.

In his study, Vivoda (2009) discusses the importance of oil import diversification for the overall energy security of major oil importing states. In addition to the physical oil production and supply chain, the market trading of oil provides security to both importing and exporting nations. Multiple participants in the market trading of oil ensure liquidity and flexibility of financing. According to Yergin (2006) "large, flexible, and well-functioning energy markets provide security by absorbing shocks and allowing supply and demand to respond to quickly and with greater ingenuity than a controlled system could".

What if the market economy, and the 'speculators of the oil markets' are unable to provide enough security? A small number of suppliers in the oil markets is one source of energy insecurity. The existence of an oil suppliers' cartel, or a monopoly, may also be a source of energy insecurity from a demand perspective. This may especially be the case if the cartel controls a major share of the oil supply or its decision making is based on political agenda rather than on pure financial gain.

Finding the right balance in the diversification of energy supply sources is critically important, but other factors in addition to diversification need to be assessed. Vivoda (2009) lists measures that increase energy security, including the diversification of types of fuels used, diversification of transport routes (e.g. production and export capacities of alternative supply routes), securing access to energy at source, energy conservation, energy efficiency, technological innovation, stockpiling, increased domestic production, improving energy infrastructure, increasing international cooperation among the importers, and improving political relations with the exporters. There is a clear difference between diversifying the energy source and diversifying various suppliers and supplier regions. For instance, substituting oil with gas in the short or medium run may not be feasible as there is less spare capacity available for gas production (IEA, 2013b).

According to Vivoda (2009), successful policy to diversify energy supply relies on the political relationships between the importing and exporting nations, quality and diversity of transport infrastructure and the existence of energy security policies. In addition, "the available economic, political, and military resources can be utilized to secure access to alternative oil".

Energy security is a combination of multiple factors, and diversification of the energy sources is only one but very important part. The next chapter reviews the changes in the energy security discourse and introduces the unconventional oil resources.

### 3. Unconventional Oil Resources and Middle East Energy Security – Considering the Economic and Political Stability

Developing substitutes for conventional oil is critically important. It began in the 1970s following the first oil crisis when oil dominated the energy production. The price of imported crude oil skyrocketed, increasing uncertainty in the energy supply and, furthermore, causing immense pressure on the world economies. The reality was difficult; there were no more stable, predictable oil prices. Economic security was at stake. The Arab oil embargo following the defeat of the Arab armies by Israel in the 1973 Yom Kippur War stimulated interest among the industrial nations to develop alternative domestic energy sources. The International Energy Agency was established in 1974. Part of this new quest was to explore the unconventional oil resources, namely the heavy oils, including shale oil and gas.

Ericsson and Morgan (1978) explore in their study the economic feasibility of shale oil through an economic model. One of their main questions is how much shale oil could be profitably produced, taking into account the state of the technology, the resource supplies, and the environmental constraints. Their finding was that significant energy diversification can be obtained through larger, commercially feasible resource production, which, in the case of unconventional oil, is only profitable when the oil price is higher. Alazard and Montadert (1993) conclude the same in their paper on twenty first century oil resources. At the point of writing their paper, the breakeven point for large scale commercial extraction and refining for petroleum products from oil shale was still too high relative to the market price of oil.

Since the 1970s, the oil importing countries began diversifying their energy sources. The oil producing Middle East countries, however, did not have any major desire to find alternative methods and sources of energy. It was understandable as the production price of oil in the super-giant and giant Saudi-Arabian oil fields was just a fraction of that of unconventional oil and the estimated unutilized conventional oil reserves in the region were very high (International Energy Agency, 2011 and 2013b). As the oil price gradually increased, one would assume to have seen more exploration on alternative oil resources, but in reality progress has been much slower. Further, the lack of economically accessible water in the Persian Gulf countries needed for the process of hydraulic fracking<sup>1</sup> can slow down the development of unconventional energy resources.

One of the key statements in the International Energy Agency's (2013b) 'Resources to Reserves' publication is the question, "Are we running out of economically accessible fossil fuels?" According to the report, the answer lies in technological development. Therefore, "if the capital investment in the projects is sufficient, new hydrocarbon resources can be unlocked from unconventional resources, deepwater offshore locations, or in countries where geopolitical factors have restricted investment... Technology development decreases costs and reduces the environmental risks associated with resource extraction, providing more attractive returns for investors." These developments enable new resources to be developed in a cost-effective manner and speed up the implementation of new projects (see Figure 1).

The Middle East is regarded as a region with substantial volumes of unconventional oil and gas resources under consideration for development. According to American Association of Petroleum Geologists (2013), there is a lack of consistently structured resource assessments concerning the unconventional oil reserves. The absence of a resource database wide enough to assess the unconventional oil resources in developing countries such as those in the Middle East region, is a real challenge, the report states.

The Unconventional Energy Resources review for 2013 states (ibid.) "The research on unconventional energy resources is rapidly changing and exploration and development efforts for these resources are constantly expanding". The rapid climb in oil price has made exploration and production of unconventional oil resources very attractive. However, issues such as how to extract, produce and upgrade the unconventional oil resources in an environmentally sustainable way are currently, on an international level, the most the critical issues for the future of resource development, which has slowed down the commercialization of the resource.

According to Alazard and Montadert (1993), the unconventional oil reserves are more equally distributed from a geographical standpoint, where the largest reserves are estimated to be in Canada, the United States and Venezuela. The recovery rates of oil shale, tar sands, kerogen oil and extra heavy crudes are still low, but even with the current recovery rates these resources "suffice to guarantee the world's oil supply until the end of the 21st century". There are various estimates of how long such reserves could last (Smith, 2009). The International Energy Agency (2013b) estimates that the conventional oil reserves will last around 68 years (2011 levels),

<sup>1</sup> The fracking method is used to access the shale oil and gas embedded in rock formations

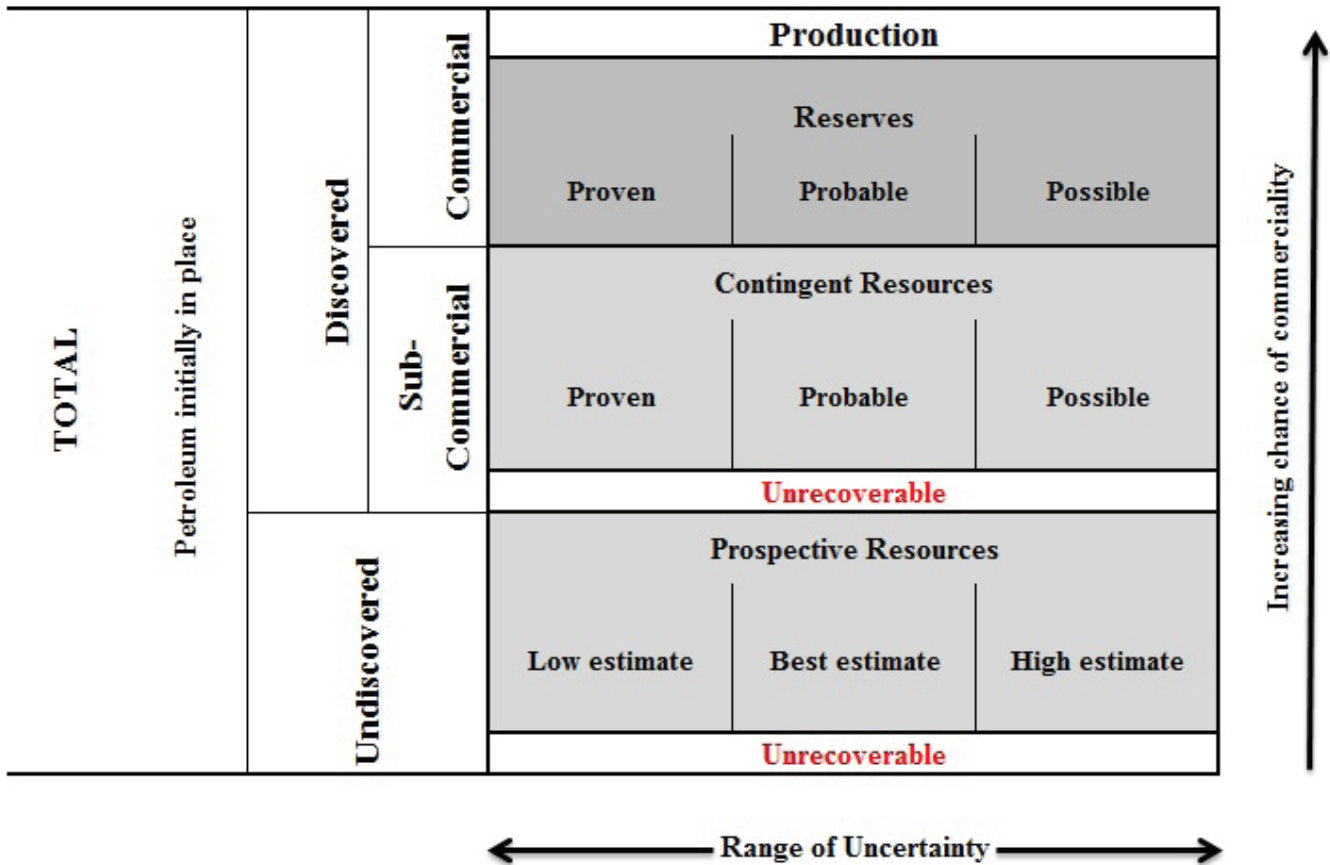


Figure 1: Resource classification system (IEA, 2013b)

while the unconventional energy resources are estimated similarly. Alazard and Montadert (ibid.) conclude that because there are major concerns in oil production in terms of political risks, and financial oil exploration and production, considerably more effort should be placed on exploring alternatives for the conventional oil. They say that this is possible when the price per barrel of oil increases.

Technical issues are not the only ones slowing down the process for exploring the unconventional oil resources in the Middle East. Also, the energy subsidies in most of the Arab world are discouraging saving energy and exploration of alternative energy forms as the consumers are used to cheap conventional petroleum. According to Fattouh (2012) "energy subsidies distort price signals with serious implications on efficiency and the optimal allocation of resources". Thus the policy of maintaining tight control of domestic energy prices has characterized the political and economic environment in most Arab countries.

However, in order to understand what affects the decision making process, it is important to define what is the role of OPEC, the oil producers' organization. OPEC plays a

monopolistic role when setting limits for production and prices of oil. As Moran (1981) puts it, OPEC tries to maximize the economic benefits received by the cartel by making sure that the price for oil is not too low so as to deprive its members of revenue, but not too high either as this would induce conservation, stimulating substitution, and would damage the economic health of the consuming countries. Moran also discusses the model developed by Hotelling (1931) in which he views the economics of exhaustible natural resources, such as oil, as any capital assets which can yield return to the owner either through dividend or capital accumulation. Therefore, "the value of a resource in the ground must be growing fast enough to equal to the value of future sales for a producer to be willing to leave it there."

Would the major oil producing nations allow significant investments in alternative, unconventional oil resources, or would they prefer the current energy production mix in which the oil is dominant? As discussed earlier, OPEC's goal is to maximize oil producers' revenue in the long term. Thus, short and medium term gains and changes in capital accumulation and dividend are less important. The long term strategy

provides insight into the political and financial planners when, for instance, decisions are made on expanding oil production. According to Moran (1981), in the case of an exhaustible resource, "the existence of a fixed stock of a commodity has important independent impact on the structure of the monopoly pricing decision." Therefore, adding a significantly large energy resource, such as shale oil, to compete with the conventional oil producers would reduce the cartels' potential to make profits. The cartel of conventional oil producers would have a competitive edge over the unconventional oil producers as long as the production price of conventional oil is lower than the competing resource's. However, this is only from the resource point of view. It could be that the oil producers' real flexibility over fuel changes and the oil prices is quite restricted.

How the game theory developed by Nash (1950) would describe the tension between the importers and exporters of oil? Game theory was a breakthrough in understanding the behavior of individuals in the markets. According to the basic assumptions of the theory, individuals are "highly rational, each can accurately compare his desires for various things, that they are equal in bargaining skill, and that each have full knowledge of the tastes and preferences of the other". Interestingly, following the set-up of the game theory, the members in the cartel may feel tempted to cheat and sell more oil than what was generally agreed in order to maximize the monopoly's profits. If one or more decides to cheat, the cartel's total profit will end up being lower (consider the basic 'Prisoners' dilemma<sup>2</sup>). Nash developed a basic mathematical model which has since been adapted to answer even more complicated problems in behavioral economics. In their study, Hnyilicza and Pindyck (1976) discuss different interests within the cartel, and emphasize the importance of understanding and predicting OPEC's behavior in its decisions to change price or level of production.

Economic stability is equally important both for the oil consumers and suppliers. According to Hamed (2013), "the common denominator between all Gulf economies is their extreme instability and the tie between their economies and the oil market volatility". The oil price fluctuations play an important role in the Persian Gulf state budgets. Therefore one would like to ask what is the role of OPEC in increasing or decreasing the economic security, and how does it contribute to the changes in the oil markets? Also, will the presence of an oligopoly encourage finding alternative energy sources, or will it be against it? In the current situation one would say that

OPEC might prefer to keep the production as it is, and wait and see if the market price will increase.

It seems that the oil price will increase in the future. However, one can argue about how significantly the oil price will increase in the coming years. Further, it has been argued that the oil production areas outside OPEC are gradually reaching the 'peak oil' and because the price for the unconventional oil reserves is still much higher, the traditional oil production in the Middle East would still have a competitive edge against the new fields. Yet large investments are required to upgrade the production, which will increase the marginal price.

#### 4. Conclusions

Without access to modern, reliable energy sources, economic development is not possible. Oil has a dominant position in the world economy. As discussed earlier, many of the Persian Gulf oil producer countries will face a historical challenge in sustaining their regimes and fiscal policies while trying to diversify their economies to face the looming decline in economically accessible oil reserves. However, the opposite is the case with Saudi-Arabia, Iran and Iraq, which still have major unused but proven oil reserves. Because of high dependency on income from crude oil, the petroleum exporting countries are very vulnerable to the instability and volatility of global oil markets. Disturbance and instability in the oil and gas markets affects the entire supply chain and will have damaging effects on global economic growth.

Despite occasional new oil discoveries outside the Middle East due to developments in exploration and extraction technology, and due to higher oil prices and demand, which encourages exploration and production from the more expensive wells, there is no doubt that in the future the oil production will be more centralized to the Middle East, as it was before the first oil crisis in the 1970s. This is mainly because of the high concentration of the global proven oil discoveries in the Persian Gulf countries.

Based on a number of sources of academic literature, it is seriously argued that the Middle East will continue to increase its importance as an oil production hub, moving from being dominant to highly dominant. Risk management is critical from both an importer and exporter perspective. In the long run it is still hard to say what kind of role the unconventional oil resources will gain in the traditional oil producing nations as

<sup>2</sup> Prisoners' dilemma is an example of a game analyzed in game theory. See Flood and Dresher, 1950. RAND Corporation. [www.rand.org](http://www.rand.org).

we do not yet know how significant the unconventional energy resources these nations actually have are. It seems likely that energy poor Middle Eastern nations such as Jordan will continue to develop the resources out of pure necessity. However, due to low qualities and higher production price, it will not challenge the traditional oil production in the near future, and therefore might not be a 'game changer'. What is more important for future research is to understand how flexible the Persian Gulf countries are toward fuel changes.

On the other hand, how can the unconventional oil reserves be utilized to increase the economic security, and to diversify the energy supply? It is important to note that the price of oil responds to changes in macroeconomic conditions albeit with a delay. Thus, the changes in the crude oil are transmitted to the retail energy prices and, further, to the national economies. This will shift the emphasis toward unconventional oil resources.

Considering the future research, some of the academics have argued that in addition to the unconventional oil in the Middle East, one should consider the possible impacts of oil and gas exploration in the Arctic regions. Due to the higher oil prices, increases in technology and the drastic melting of glaciers and ice due to global warming, these regions are more economically accessible for oil production. Therefore, as the technology develops, the Arctic regions, in addition to the other unconventional oil production regions, may become a competitor with the Persian Gulf countries' oil and gas.

Finally, until now, not enough research effort and financial resources have been invested in finding complementary energy resources to the dominant oil in the Persian Gulf region. The focus of future study should be on finding a more integrated approach to the energy resources management in the countries with major oil production and reserves. As mentioned earlier, it is very important to study the changes not only of the unconventional energy but also other forms of alternative sources in the Persian Gulf countries and in the wider Middle East region on both economic and political levels. The world economy is thirsty for a steady flow of oil.

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## References

- Alazard, N., Montadert, L., 1993. Oil Resources for the Next Century: What's Ahead? *Nonrenewable Resources*, Vol. 2, Issue 3, 197-206. Doi: 10.1007/BF02257915.
- Alhajji, A.F., 2014. Shale Revolution has Direct and Indirect Impacts on OPEC, *World Oil*, January 2014.
- Al-Rawashdeh, R., Al-Nawafleh, H., Al-Shboul, M., 2013. Understanding Oil and Mineral Resources in the Political Economy Context: The case of the Middle East and North Africa, *Miner Econ*, Vol. 26, 13–28.
- American Association of Petroleum Geologists, 2013. Unconventional Energy Resources: 2013 Review, *Natural Resources Research* 2013.
- Ericsson, N.R., Morgan, P., 1978. The Economic Feasibility of Shale Oil: An Activity Analysis, *The Bell Journal of Economics*, Vol. 9. No. 2, 157–487.
- Dargin, D., 2014. Impact of US Shale Gas Echoes around Gulf, *Natural Gas Daily*, 12 February 2014.
- Fattouh, B., El-Katiri, L., 2012. Energy Subsidies in the Arab World, *Arab Human Development Report 2012*, UNDP.
- Foster, B.M., 2008. Peak Oil and Energy Imperialism, *Monthly Review*, Vol. 60 Issue 3.
- Hamed, Z., 2013. Shale Oil: On the Cusp of an Energy Revolution? *Arab Center for Research and Policy Studies*.
- Hnyiliczka, E., Pindyck R.S., 1976. Pricing Policies for a Two-Part Exhaustible Resource Cartel, *European Economic Review*, Vol. 8, 139–154.
- Hotelling, H., 1930. The Economics of Exhaustible Resources, *The Journal of Political Economy*, Vol. 39. No. 2, 137–175. Doi: 10.1007/BF02464433.
- International Energy Agency, 2007. Oil Supply Security, *OECD – IEA*.
- International Energy Agency, 2011. Oil Market Report 2011, *OECD – IEA*.
- International Energy Agency, 2013a. Key World Energy Statistics, *OECD – IEA*.
- International Energy Agency, 2013b. Resources to Reserves: Oil and gas Technologies for the Energy Markets of the Future. *OECD – IEA*.
- Jaber, J.O., Probert. S.D., 1997. Exploitation of Jordanian Oil-Shales, *Applied Energy*, Vol. 58, No. 2-3, 161–175.
- Krasner, S.D., 1973. The Great Oil Sheikdown, *Foreign Policy*, No. 13, 123–138.
- Meng Q.Y., Bentley, R.W., 2008. Global Oil Peaking: Responding to the case for 'Abundant Supplies of Oil', *Energy*, Vol. 33, 1179–1184.

- Moran, T.H., 1981. Modeling OPEC Behavior: Economic and Political Alternatives, *International Organization*, Vol. 35, No. 2, 241–272.
- Nash, J.F., 1950. The Bargaining Problem, *Econometrica*, Vol. 18, No. 2, 155–162.
- Roncaglia, A., 2003. Energy and Market Power: An Alternative Approach to the Economics of Oil, *Journal of Post Keynesian Economics*, Vol. 25, No. 4, 641–659.
- Russett, B., 1979. World Energy Demand and World Security, *Policy Sciences* 11, 187–202.
- Smith, J.L., 2009. World Oil: Market or Mayhem? *The Journal of Economic Perspective*, Vol. 23, No. 3, 145–164.
- Verrastro, F., Ladislav S., 2007. Providing Energy Security in an Interdependent World, *The Washington Quarterly*, Vol. 30, No. 4, 95–104.
- Vivoda, V., 2009. Diversification of Oil Import Sources and Energy Security: A Key Strategy or an Elusive Objective? *Energy Policy*, Vol. 37, 4615–4623.
- Wirth, T.E., Grey C.B., Podesta J.D., 2003. The Future of Energy Policy, *Foreign Affairs*, Vol. 82, No. 4, 132–155.
- Yergin, D., 2006. Ensuring Energy Security, *Foreign Affairs*, Vol. 85, No. 2, 69–82.