IASP International Association of Science Parks and Areas of Innovation

34th IASP Annual World Conference
Istanbul, Turkey

Development of Oil and Gas Areas of Innovation in Iran

Workshop 1
"Rethinking STP services"

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EXECUTIVE SUMMARY

Areas of Innovation (AOI) is a concept developed in many countries with the aim of enhancing sustainable economic development by combining variety of different scientific, economical and infrastructural asset within an area. This paper presents some results concerning the conceptual design carried out for establishment of two AOI in southern Iran emphasizing on oil and Gas. The first area is located in Shiraz and Bushehr provinces focusing mainly in gas production technology. The main characteristic of this project is the presence and support of a major gorvernment company (NIGC) to creat an ecosystem for technology development in the natural gas sector. The second area is located in Khuzestan province which is rich in oil fileds. The main characteristic of this project is the strong presence of the private sector, which makes it interesting in a government dominated economy.

INTRODUCTION

Iran is one of the major oil and gas producers in the world. This provides a great potential for development of a knowledge based local content. While, during the recent century, international O&G (Oil and Gas) companies have played a key role in the O&G exploration and production projects in Iran, the activity of local Iranian companies has been mainly limited to the management of EPC (Engineering, Procurement and Construction) projects, provision of some low to mid-tech devices and systems and the general construction activities. It is therefore essential to create infrastructures and run programs to support the development of a higher quality local content in Iran. Similar ideas have been developed and implimented in other countries.

The strategic program OG21 of Norway was developed in year 2001, and revised in 2005. The main objectives of this program have been to increase the value generation form oil export and to enhance new technology exports from Norway. The Stavenger region in the south-west shore of Norway is the host for many of the main activities in Norway, with an estimated export of 5 billion dollar for the O&G products and services. Similar programs were undertaken in the Aberdeen region in Scotland. The objective of Aberdeen project was to attract the well-known international companies for efficient production of oil in the region. Although the obectives of the programs run in Stavanger and Aberdeen were essentially different, the outcome of both projects similarly lead to the empowerment of local companies and considerable increase in the R&D activities and patents registration. Other local content development programs in Brasil, Nigeria and Malaysia include first hand experiences and customised programs and solutions, with important impacts on the O&G industry in those countries.

In more than one hundred years history of oil production in Iran, the largest portions of the O&G technology projects have been directed towards international companies, and many of the local companies have not been involved in the advanced and value adding technical activities. Developing AOI with emphasis on oil and gas industry in southern oil producing regions of Iran (Figure 1 and 2) makes good sence. Most of natural gas production are concentrated in southern provinces of Bushehr and Fars. On the other hand, oil producing reserviors are mostly located in Khuzestan province. The idea of establishing sectoral AOI in these regions started several years ago.

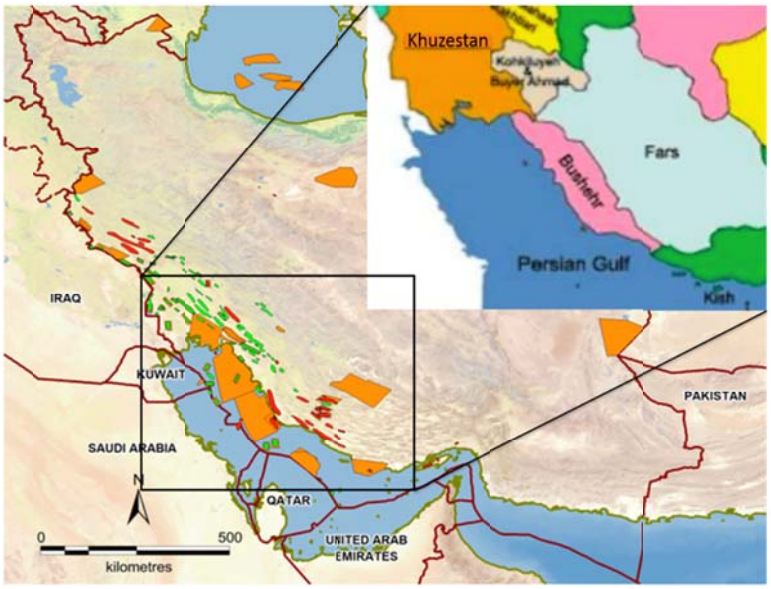

Figure 1. Oil and gas fields in southern provinces of Iran

Figure 2. Distribution of oil (purple) and gas (red) fields in Iran.

Areas of Innovation (AOI) is a concept developed in many countries with the aim of enhancing sustainable economic development by combining variety of different scientific, economical and infrastructural asset within an area. The aim of this paper is to present conceptual design for two AOI focusing on oil and gas in southern Iran.

IRAN GAS DEVELOPMENT ZONE (GDZ)

In recent years the National Iranian Gas Company (NIGC) has pioneered an effort to create a Gas Development Zone (GDZ) in the southern provinces of Iran. The GDZ-AOI is a package of physical infrastructures, special programs and a few flagship projects, with a mission of helping the development of local Iranian companies and increasing their share in oil and gas projects, at the national and international levels.

For the conceptual design of the GDZ, it was necessary to perform a survey of local companies active in the O&G sector. In this study from a list of more than 2000 companies, 200 were selected, and asked to fill out a questioner. More than 60 companies were also directly interviewed, eight of which active in large scale EPC projects. Based on our studies and estimations the following facts can be outlined:

1. Seventy five percent of a total of about 250 local O&G companies surveyed are active in the gas sector, with broad range of midstream to downstream activities.
2. More than 75 percent of companies are equipment providers, although most of them are importers from international companies. Most of these companies work with large local O&G producers.
3. Unlike countries like USA and Norway, the Iranian companies are mostly active in the mid to downstream activities (Figure 3).
4. Despite the diversity of O&G projects throughout the country, most of the companies are based in the capital city of Tehran.
5. More than 85 percent of companies can be categorized as SMEs, which is in accordance with the average of international statistics.
6. Almost 10 percent of companies have been active for more than 30 years.
7. About 15 percent of companies have relatively good financial situation.
8. Based on the webometry carried out on 1146 active companies, about 13 percent are ranked as weak, 62 percent at the mid level, and only 25 percent ranked as good to relatively strong companies.
9. Most of the studied companies are relatively weak in terms of knowledge and technology, and only about 15 percent are ranked as good to excellent from this point of view (Figure 4).

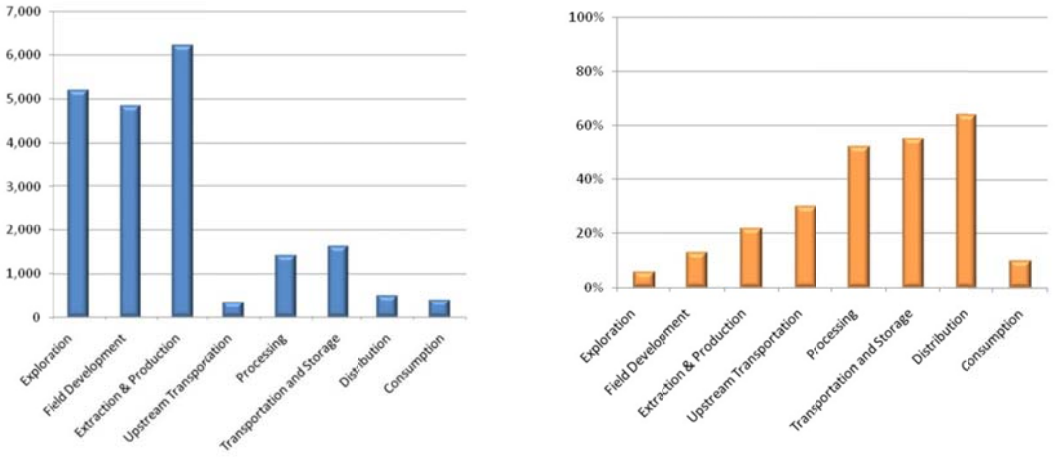

Figure 3. Left: Number of American companies in differtnet parts of value chain

Right: Percentage of Iranian companies in differtnet parts of value chain

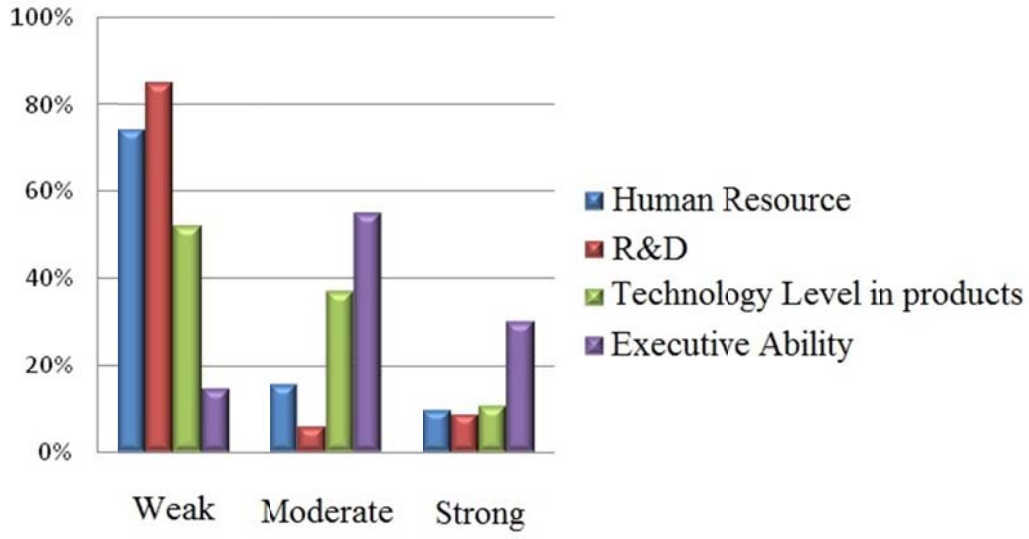

Figure 4. Situation of Iranian Companies in Knowledge &Technology Indexes

Figure depicts a typical flow diagram in an O&G project. EPC[148] contractors play a central role in conducting a project and acts as a hub for interactions among the employer, financing institutes, engineering design companies, integrators and equipment providers. Equipment providers have their own sources including importers, manufacturers of conventional and high-tech equipment, etc. Other very important, yet less visible, players in the O&G industry throughout the world are small and medium size enterprises (SMEs), which usually act as the sub-contractor of larger companies, and have a share of about 50 percent of the financial turn over globally.

A SWOT analysis was performed in order to recognize major challenges for the local content development and to develop strategies for the establishment and operation of the GDZ. The most important challenges against the share increase of the local companies from national and international engineering market were identified and categorized as shown in Figure 5. Three of these challenges are discussed below:

Challenge 1: Traditionally, the main producers of O&G in Iran are huge government-owned companies, which at the same time are the main employers of local engineering projects. They have been expected by law to be the main providers of financial resources for other sectors of government by producing and selling the oil in the international market. Also they have been responsible for providing gas, petrol and other energy carriers for the nation. No uniform and generally accepted long-term vision can be traced in the history of such companies. In terms of efficiency, for example, these companies are ranked very low among their competitors worldwide [7] and have failed to increase and establish their share and role as international integrated companies, with clear economic objectives at the corporate level. This fact has been a major reason for lack of national efficient local content development programs in the sector of O&G in Iran.

Challenges 2&3: Finance and license provision from abroad, has been a long tradition in the Iranian O&G projects. This fact imposes real constraints and limitations for the smaller Iranian companies to acquire a minimum share of the O&G market even in the local projects. However, those firms which are active in the conventional, and usually low profit, construction projects have been relatively more successful.

[148] Engineering, Procurement and Construction

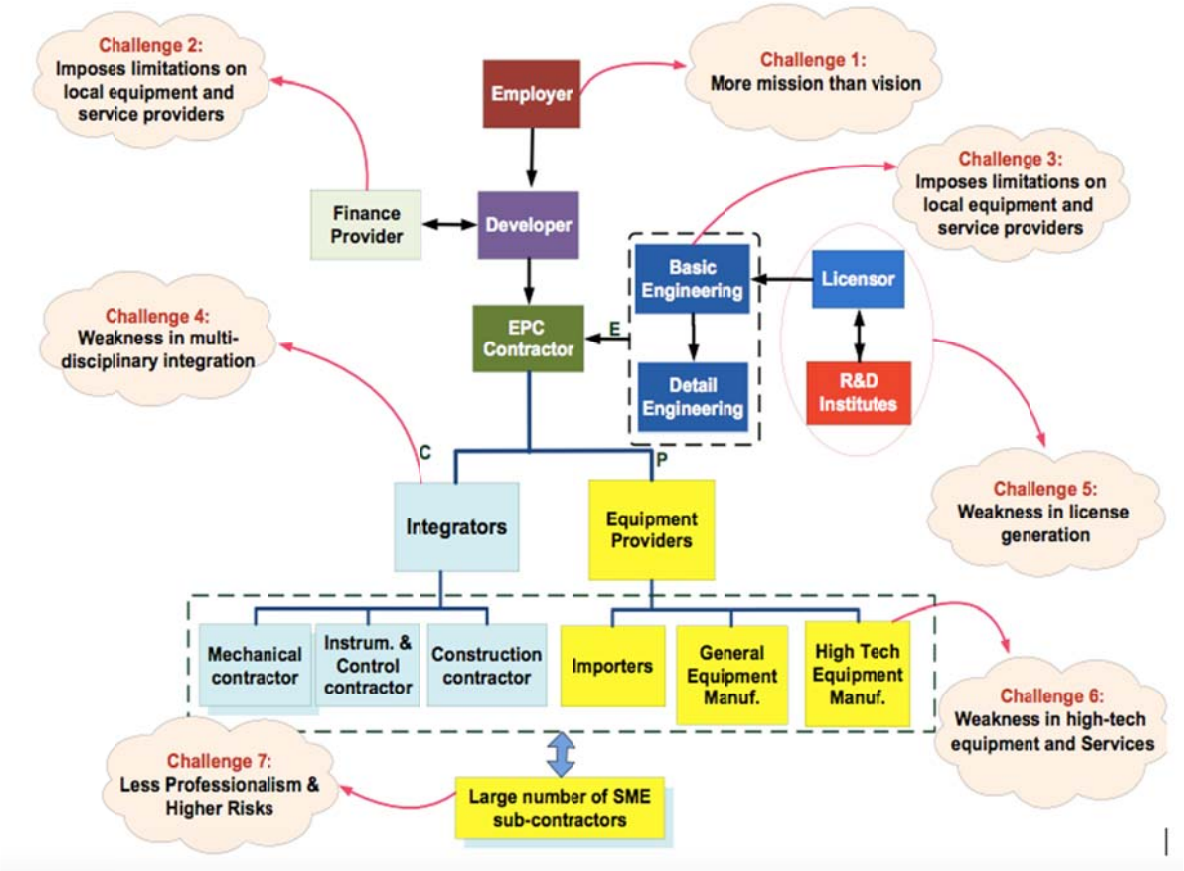

Figure 5. Flow diagram of a typical O&G development project. Challenges deduced from extensive case study in Iran.

Two aspects of GDZ, namely, the GDZ programs and physical structures are developed. Various programs suggested, i.e., market development, capacity building, firms empowerment, high-tech development and international marketing. Some of these programs may be started even before the establishment of GDZ. For example, the market development program focuses on establishing structural and legal provisions to increase the share of Iranian companies in the oil and gas development projects. Also a few flagship projects, including a small scale LNG technology development plan and construction of some unique flexible research plants, are proposed.

To design a successful technology development zone, it is important to identify potential clients and stakeholders for GDZ based on information gathered from companies and organizations active in the O&G industry. Two types of such clients and stakeholders are identified (Fig. 6). The first category, includes clients and companies who directly benefit from the establishment of GDZ. Such companies could directly benefit from the GDZ programs which are planned and tailored according to their specific needs. The second category includes various other stakeholders who could collaborate with GDZ in providing added value services to the focal clients. It should be emphasized that the second category includes well-established national and international companies or institutes, whose expertise and professional links could provide unique opportunities for the main clients of the GDZ. In order to attract such important partners, certain incentives are considered and proposed which will be presented in the paper.

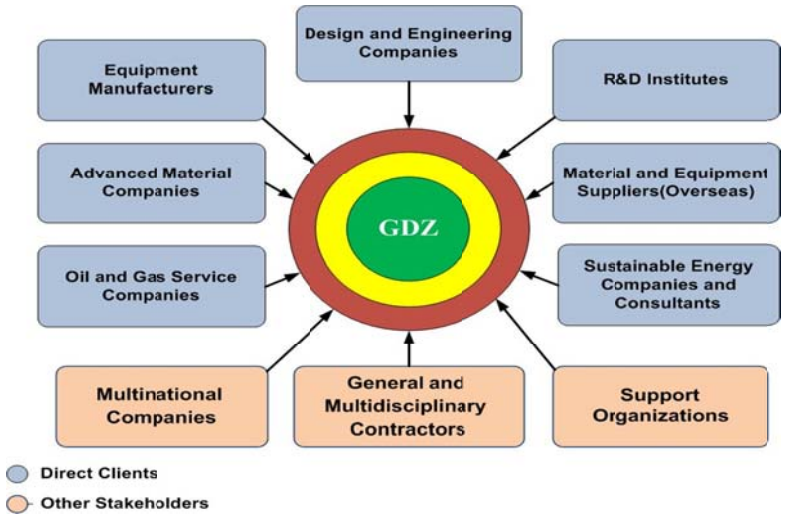

Figure 6. GDZ clients and other stakeholders

The most important challenges against the share increase of the local companies from national and international engineering market are identified and categorized in Figure 7. EPC contractors play a central role in conducting a project and acts as a hub for interactions among the employer, financing institutes, engineering design companies, integrators and equipment providers. Equipment providers have their own sources including importers, manufacturers of conventional and high-tech equipment, etc. Other very important, yet less visible, players in the O&G industry throughout the world are small and medium size enterprises (SMEs), which usually act as the sub-contractor of larger companies, and have a share of about 50 percent of the financial turn over globally.

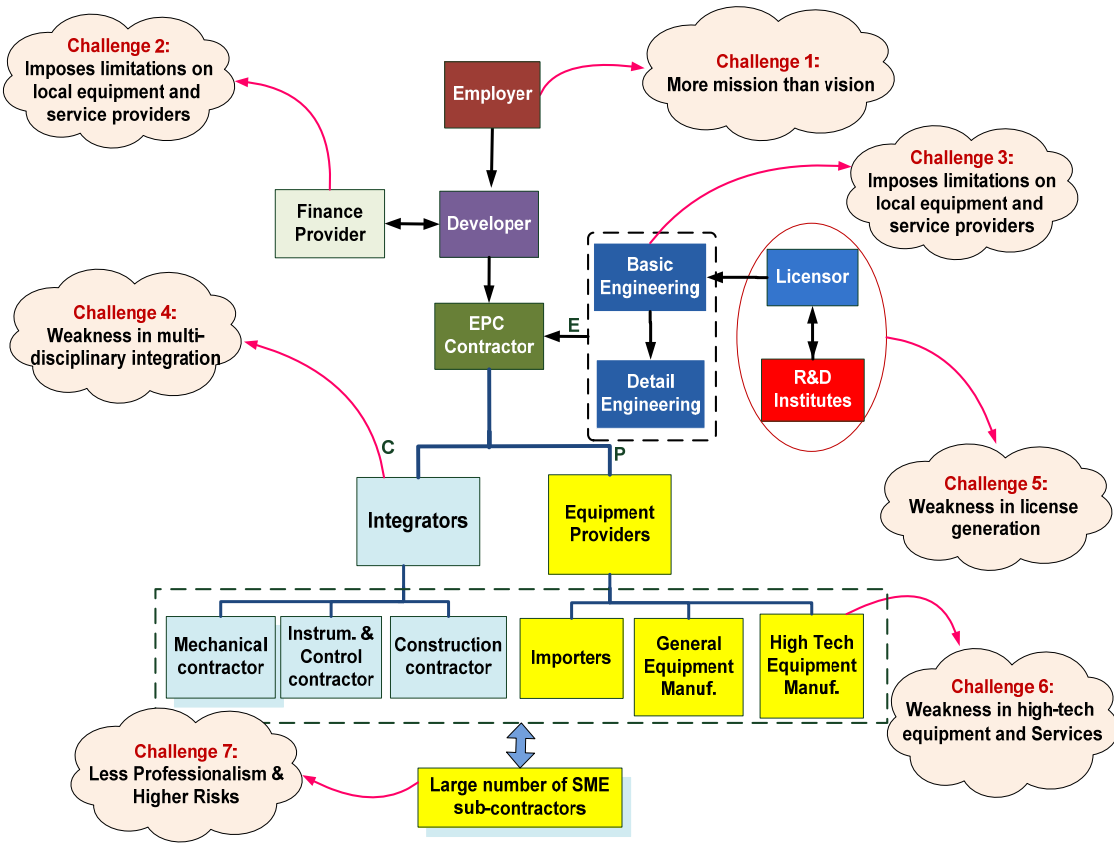

Figure 7. Flow diagram of a typical O&G development project. Challenges deduced from extensive case study in Iran.

Such programs and facilities are to be implemented in three physical and geographical layers (Figure 8). A Gas Technology Park in the city of Jam, located in southern province of Bushehr, is proposed for companies that need to be located near the main gas fields to provide services for exploration and also to refineries located in that area. Additionally, different kinds of operational and educational simulators have been proposed for this park. The second layer of GDZ will be located in the vicinity of Shiraz, the capital of the Fars province, which will provide facilities to tech-based companies that prefer to be located in a large city like Shiraz. This preference is due to the existing science and technology infrastructures, universities, science parks and research centres and further more the high standard developing residential areas for high class human resources and entrepreneurs. The third layer of GDZ is proposed at the national level and it includes other science and technology parks, incubators, universities and research centres in major cities such as Tehran, Isfahan and Mashhad. In this layer no additional major physical structure is envisioned, but GDZ programs are to be implemented by science and technology institutions as part of the network managed by GDZ.

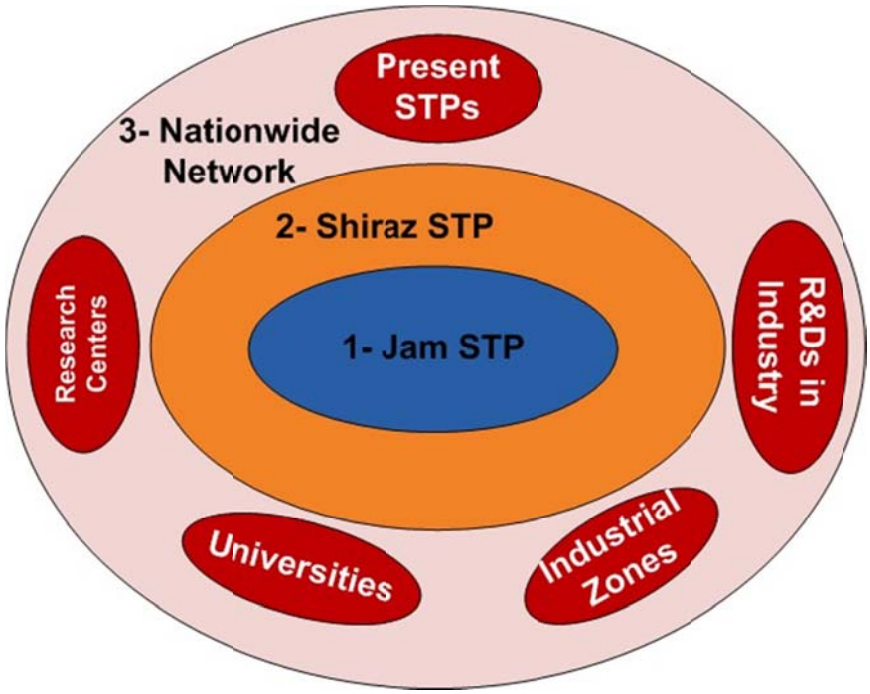

Figure 8. Physical Structure of GDZ

KHUZESTAN ENERGY CORRIDOR (KEC)

The second project has started in the oil rich Khuzestan province. The information and concepts produced the Gas Development Zone (GDZ) was instrumental for the design of Khuzestan Energy Corridor (KEC). The project was initiated in 2015 by a large network of local oil and gas manufacurers and also companies active in energy sector (Figure 9). The local provincial government, universities, science and technology park, and major national oil companies active in the region as well as the Vice-Presidency of Science and Technology are supporting the initiative. The main characteristic of this project is the strong presence of the private sector, which makes it interesting in a government dominated economy. Close cooperation among local and national government organization, science and research institutions and private sector is beginning to shape and form. This is evident through creation of a company with private and public shareholders that is going to manage KEC. Negotiation of KEC Management Company with national oil companies in the region is leading to projects on the demand side. On the other hand, different consorciums are forming to promote innovations and technology development on the supply side.

The project was in line with previous activities of the private sector. A cluster of of companies in the oil, gas and petrochemical sector was established in 2007 with 200 member companies. This cluster has more than 400 members now. These companies are palying a major role in the development of KEC. In addition, nationally owned oil and gas companies, universities and research centers, science and technology park, provincial power and water companies and industrial zones are considered major stake holders in the formation of KEC (Figure 9). These stakeholders are geographically distribute around the city of Ahwaz, the capital of the Khuzestan Provice, thus creating a potentila establishing an energy corridor (Figure 10).

There are many chalenges and barriers in front of KEC as well as GDZ programs. However, creating such ecosystems of cooperation among major players of oil and gas sector is promising.

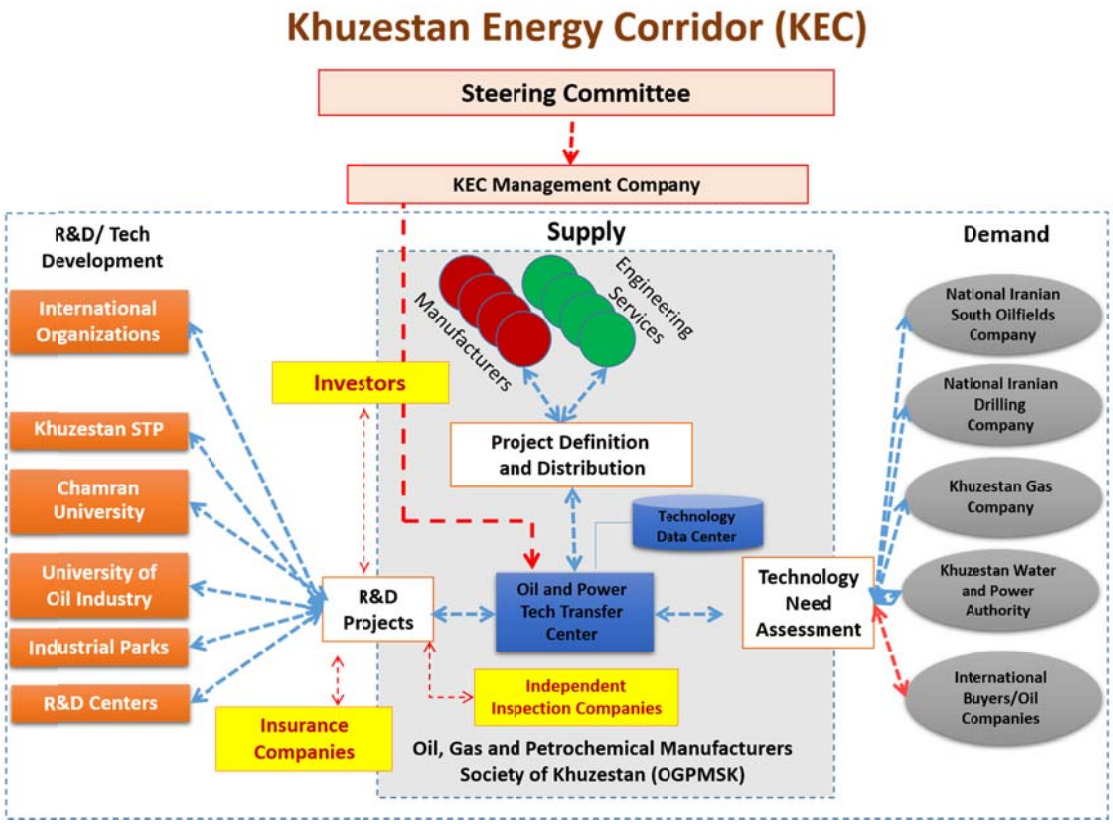

Figure 9. KEC organization for networking

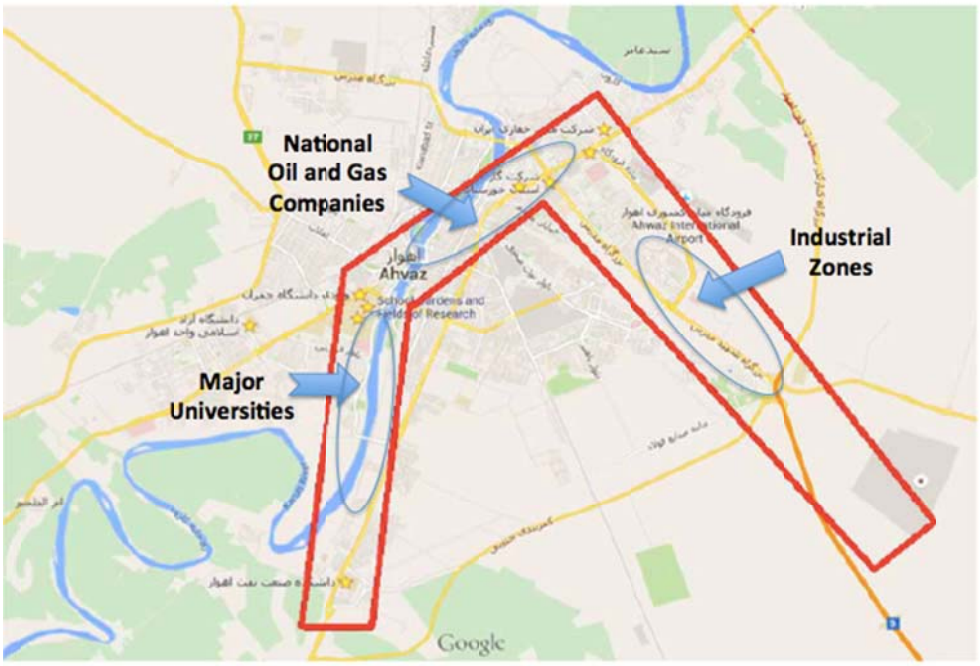

Figure 10. Physical distribution of stakeholders in KEC

CONCLUSIONS

Iran is a country with vast oil and natural gas reserves. In the past 100 years, this natural resources has been the major source of revenue for the country. However, the country has made little progress in developing the necessary technologies in this sector. At the same time, Iran has good universities and research centers and well educated human resources. Establishmentof Areas of Innovation (AOI) has captured the attention of government as well as private enterprises in the oil and gas sector. National Iranian Gas Company (NIGS) has been working with two provinces in southern Iran (Fars and Bushehr) to establish a Gas Development Zone. The main objective of the GDZ is to help the development of local Iranian knowledge-based companies in the field of O&G (Oil and Gas) and increasing their share in the development projects, at the national and international levels. On the other hand, a cluster of private companies in the oil rich Khuzestan province with cooperation of provincial government, nationa Iranian oil companies, universities and research centers and Scienc and Technolgy Park are working to establish the Khuzestan Energy Cooridor (KEC). The main purpose of this cooridor is to develop technologies needed for major national oil and gas companies.