SOCIALLY RESPONSIBLE MINING IN EAST IRAN: THE SANGAN IRON ORE MINES

Prof. Dr. Jürgen Kretschmann
President of Technische Fachhochschule Georg Agricola, University of Applied Sciences
Herner Straße 45
44787, Bochum, Germany
(E-mail: Kretschmann@tfh-bochum.de)

*Ravanbakhsh Amiri
PhD Student, RWTH Aachen University, Faculty of Georesources and Materials Engineering,
Institute of Mining Engineering I
Wüllnerstraße 2
52062, Aachen, Germany
*(*Corresponding author: ravanbakhsh.amiri@rwth-aachen.de)*

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ABSTRACT

The Islamic Republic of Iran is a very important producer of raw materials in the world. The country holds 68 types of minerals, including salt, sand and gravel, chrome, lead, zinc, copper, coal, gold, and iron-ore. With more than 37 billion tons of measured and indicated reserves and 55 billion tons of total mineral resources, Iran is ranked among the 15 major mineral-rich countries.

Sangan iron-ore mines (SIOM) is one of the biggest iron ore mining complexes in Iran, located in a remote, but strategically important area near the Afghanistan border. The Iranian government has planned several mining projects in this region for a stepwise development over the next 5 years to satisfy the growing demand of the Iranian steel industry. In cooperation with private companies, these projects shall be realized as sustainable as possible.

This paper introduces SIOM and describes socially responsible activities undertaken during the initial development of this mining complex. The effects of these activities will be demonstrated. Unique attributes of the Sangan area have a significant impact on the acceptance of SIOM by regional stakeholders. The government has made several social investments that benefit workers´ families and the community. They are attempts to build social capital for the mining operations and demonstrate a commitment for socially responsible mining to the communities and the local population. They aim to create a balance between the local and regional expectations and requirements and the necessity to secure the corporate profitability at a reasonable and sustainable level.

Investment in socially responsible activities is not a choice but a necessity to improve the relations between mining companies and stakeholders in the communities. It is recommended that social investments should be carefully planned and implemented from the early stages of mining activities, and should proceed throughout the life cycle of the mines.

KEYWORDS

Iran, Sangan iron-ore mines, Sangan iron mines project, Socially responsible mining

INTRODUCTION

The Islamic Republic of Iran is located in the southwestern part of Asia (Middle East). It covers 1,648,195 square kilometers of land area and has a population of about 75.5 million inhabitants, of which around 52.3 million (two-thirds) live in urban areas.

Iran has over 3,000 mining operations with mineral extraction growing at an annual average rate of 10 % in recent years. Exceptional in terms of its mineral diversity, Iran produces 68 minerals, and is ranked among the world's 15 most mineral-rich countries. According to a report from the former Ministry of Industries and Mines, total mineral resources (at 'shallow depth') are estimated at 55,000 Mt, of which 37,300

Mt are in the measured and indicated categories (Rashidinejad, 2008). It must be noted that only minor amounts of these resources (mostly copper deposits) are JORC compliant.

In accordance with the statistics published by the Statistical Center of Iran, there were 4,116 active mines and 75,458 employees throughout the country in 2008 (CBI, 2008). In accordance with the statistics published by the Central Bank of Iran (CBI) in the same year, the share of this sector in the Gross Domestic Product of the country was 0.8 % (CBI, 2007, 2008). Iran has the world's largest zinc reserves, in addition to the 2nd largest reserves of copper, the 9th largest reserves of iron and the 11th largest reserves of lead (Center for Techno-Economic Mineral Policy Options, 2011).

DESCRIPTION OF SIOM, SIMP AND IEIOC

The Sangan area in Khaf County has its own special geographical and geopolitical attributes that make this area distinct from other parts of Iran: severe weather conditions, low precipitation, semi-desert region, special geographical location on the border to Afghanistan, infrastructure limitations, water shortage, low rate of employment, and suitable areas for crimes like smuggling. Combined, these are the reasons that the region is less developed and poor.

SIOM, as the most important and biggest iron-ore mining complex in the Zanjan-Semnan-Mashhad iron-ore zone in Iran, belongs to Iranian Mines and Mining Industries Development & Renovation Organization (IMIDRO). It is the main part of one of Iran's major iron-ore resources, which is located 300 km southeast from Mashhad and 18 km northeast from Sangan town at latitude N34°24', longitude E60°16' in the northeastern Khorasan Razavi Province, 30 km west of the Afghanistan border. The maximum altitude of iron-ore deposit is about 1,650 m asl and the plain starts at the foot of the hills at approximately 1,200 m (Danieli, 2008). There are two access roads from the mine site to Mashhad, which together with schematic view of Khaf County (black circle), are shown in left and right side of Figure 1, respectively.

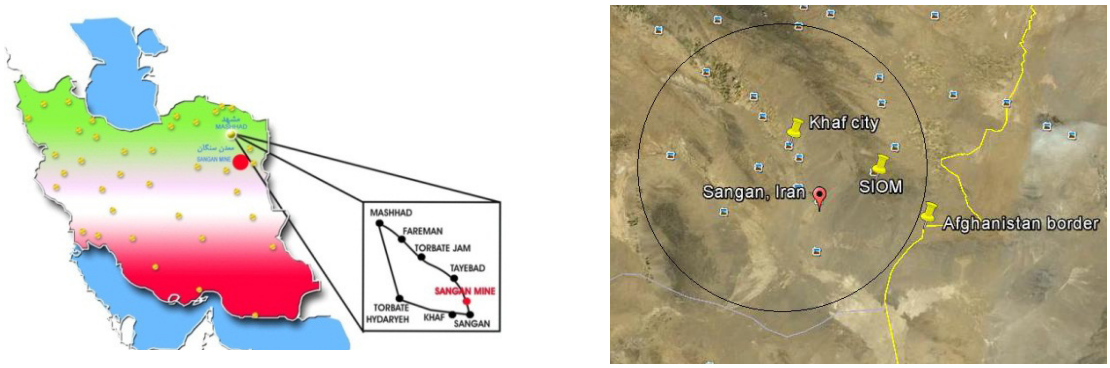

Figure 1 – SIOM area geographical location (Madankav Engineering Co, 2012- Google earth)

The deposit of SIOM in total is one of the largest iron-ore deposits in Iran, and also considered to be one of the Middle East's richest deposits. It is located in a rectangular area 26 km long by 8 km wide. SIOM has been divided into three major district zones: western, central and eastern. Each of these zones contains several deposits (Figure 2).

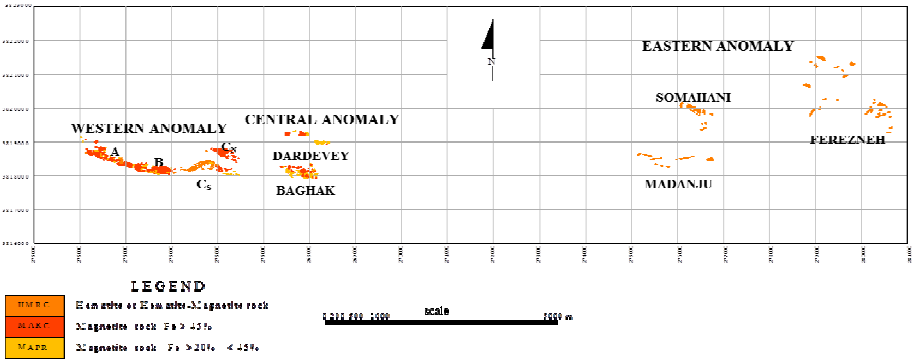

Figure 2 – SIOM three major zones (Madankav Engineering Co, 2012)

The SIOM iron-ore deposits contain a total geological resource of 1.2 billion tons of mostly magnetite, with a Fe grade ranging from 27–61%. The ore deposits are located mainly in the western and central zone. Detailed exploration of the eastern zone is still ongoing (IMIDRO, 2011). In Table 1, the latest exploration details regarding Mineral Resources & Reserves of SIOM are shown, according to United Nations Framework Classification (UNFC) Code of Mineral Resources and Mineral Reserves.

Table 1 – Exploration details of SIOM according to UNFC code (Madankav Engineering Co, 2012)

Exploration zone	Name	Resources and reserves (Million tons)					Total amount
		Proved	Probable	Measured	Identified	Inferred	
Western	A	-	-	90	48	35	173
	B	109	22	57	35	12	235
	Cn	51	10	8	28	7	104
	Cs	-	-	108	14	35	157
	A'	-	-	-	14	25	39
Central	Dardvey	99.4	4.2	-	-	31.4	135
	Baghak	139.4	5.7	-	-	39.9	185
Eastern	Anomaly I	-	-	-	-	1	1
	Anomaly II	-	-	-	-	5	5
	Anomaly III	-	-	-	-	10	10
	Anomaly IV	-	-	-	-	10	10
	Anomaly V	-	-	-	-	58	58
	Anomaly VI	-	-	-	-	62	62
Approximate total amount		398.8	41.9	263	139	331.3	**1,174**

The Iranian government has been carrying out exploration (since 1983), building infrastructure (since 2000), preparing mines and constructing an iron ore concentrator plant (since 2008) as the first phase of a mining project by IMIDRO called Sangan Iron Mines Project (SIMP). SIMP is the biggest national project in eastern Iran. Besides this project, the Iran East Iron-Ore Company (IEIOC) – a governmental company – has been producing fine and lump iron-ore in SIOM since 1989. Its annual production capacity is currently about 1.5 Mt. The total capital costs spent in SIOM area through the SIMP and IEIOC were approximately 420 million USD at the end of 2012.

Development of SIOM Projects

IMIDRO intends to develop an open pit mine complex and supporting facilities in SIOM for the production of 20 Mt/yr of iron oxide concentrate and pellets in four phases (IMIDRO, 2011). During the first phase (SIMP), the production rate of iron-ore concentrate and pellets is planned at 5 Mt/yr. The first iron ore concentrator plant with the capacity of 2.6 Mt/yr has been operated since May 2012. The second concentrator plant with a capacity of 2.4 Mt/yr and a pelletizing plant with a capacity of 5 Mtpy are under construction to guarantee the planned output. The development of phases two and three, in which the same technology as in the first phase will be implemented, has recently begun. The development in phase four depends on the exploration results of the eastern zone, which are currently being gathered. The preliminary timetable for development is shown in Table 2.

Table 2 – Preliminary timetable for SIOM projects (IMIDRO, 2011)

Phases	Performance duration							
	Before	2012	2013	2014	2015	2016	2017	2018
One								
Two								
Three								
Four								

The development of the SIOM projects by IMIDRO and IEIOC has a wide range of advantages for the Sangan region, such as increased employment, increased standard of living in the mining area, improvement of education and health care in the community, positive economic development in this remote region, reduction of migration into the cities and establishment of new settlements, introduction of new technologies in different fields, improvements to the social situation in the communities and decreased crime rates. These impacts contribute to sustainable development of the whole region.

For example, the annual unemployment rate in Khaf county was approximately 7.5 % between 1996 and 2001, but because of new job opportunities created by mining activities, the rate decreased to 3.5 % in 2009 (Tavakoliroodi, 2012). Figure 3 shows average direct employment of SIMP and IEIOC from 2006–2011. The numbers in the Figure 3 were calculated based on SIMP and IEIOC Human Resources Management monthly statistics.

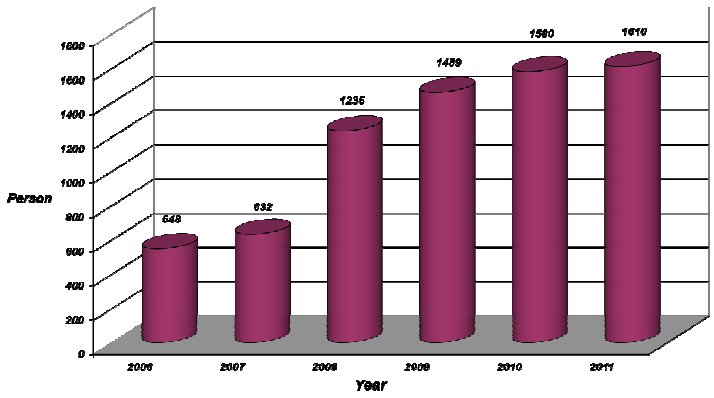

Figure 3 – Average SIMP and IEIOC direct employment in recent years

Climate

Climatic data have been recorded at the mine site since 1987. The area is semitropical/arid and semi-alpine with high relief (1,700 m altitude in the mineralized areas). Maximum temperatures of 35–40 °C are experienced in July/August while minimum temperatures of -5 to -15 °C occur in January/February. Annual rainfall is less than 150 mm/yr, mainly from torrential showers in April and May. Drainage is generally to the south-west into the alluvial flats of the Khaf (the nearest mine county) basin. Evaporation exceeds rainfall throughout the year, and the district experiences the Herat high constant winds of 30–120 km/h in the summer. Dusty conditions are present. Surface soils are generally of poor quality, with gravel predominant.

Agriculture is generally limited to irrigated areas. Limited water supply severely restricts vegetation and wildlife. Due to its average annual precipitation of 145 mm and its permanent water shortage, the Sangan area has never been considered as a rich agricultural area. The water supply for the mine/processing comes mainly from underground sources and operation wells. A detailed water allocation plan has been developed by the government for the different users, because water shortage might lead to a conflict between SIOM projects and local stakeholders in the future. Table 3 summarizes the climate data of Sangan site.

Table 3 – Climate data of Sangan (Rashidinejad & Naraghi, 2011)

Parameter	Value
Average Altitude (m asl)	1,240
Latitude (Ore body B)	34°28' N
Longitude (Ore body B)	60°26' E
Mean Rainfall (mm)	145
Maximum Daily Rainfall (mm)	20
Mean Freezing Days (days)	7
Maximum Annual Evaporation (mm)	3,900
Maximum Recorded Daily Snowfall (mm)	15
Height of Primary Crusher Area (m asl)	1,440
Height of Complex Buildings Area at Plant Site (m asl)	1,150
Maximum Temperature at Plant Site (°C)	40
Maximum Temperature at Mine Site (°C)	32
Minimum Temperature at Plant Site (°C)	-2
Minimum Temperature at Mine Site (°C)	-15

CORPORATE SOCIAL RESPONSIBILITY (CSR)

CSR has become an important topic for the exploration and mining industry. CSR was defined by the World Business Council for Sustainable Development as "the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large" (Prospectors & Developers Association of Canada, 2007). The European Commission (2001:5) defined CSR as "essentially a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment" (Hamann & Kapelus, 2004).

The Canadian government's 2006 National Roundtables on mining and social responsibility defined CSR as "the way firms integrate social, environmental and economic concerns into their values, culture,

decision-making, strategy and operations in a transparent and accountable manner and thereby establish better practices within the firm, create wealth and improve society". CSR is the social responsibility a corporation has in its operations, whether it is directly related to social assistance to communities, protection and sustaining the environment, or ensuring that employees and investors are treated in a responsible manner (Hackett, 2009).

In the mining sector, CSR refers to a company's voluntary actions to either reduce the negative impacts of mining (economic, social, and environmental) or to improve the living conditions of the local communities where they operate. CSR programs often include investments in hospitals, schools, and roads, as well as building social and human capital (Westphalen, 2012). A key challenge for mining companies to act in a social responsible way is that the expectations and requirements of the stakeholders are often not clear, so it is difficult to build a strategy, guidelines or measures on them (Hackett, 2009). Another key challenge is that best management practice systems for applying CSR are not readily available. There are no internationally recognized CSR standards against which a company can benchmark its efforts (Prospectors & Developers Association of Canada, 2007). Communities, when responding to any potential project, should be consulted at the earliest possible stage to enable an analysis about their expectations and their goals. This allows a company to consider how to collaborate best with a community and successfully balance their expectations. Mining companies also need to adequately assess possible opposition groups and their reasons in opposing the project (Adey et al., 2011).

SOCIAL LICENSE TO OPERATE (SLTO)

The SLTO is an unwritten social contract. Unless a company earns that license and maintains it on the basis of good performance and community trust, there will undoubtedly be negative implications. In summary, the SLTO means that a project is accepted by a majority of its hosts, both local communities and the stakeholders of the host nation. It is possible to obtain legal licenses to operate from national governments but be rejected by neighboring communities, leading to disruptions and unrest that can render a project unviable. To gain and maintain a social license to operate, projects need to do more than just communicate with community members. They will also need to invest time and money into community projects (Macdonald, & Schloeffel, 2012).

CSR IN SIOM

Historically, the mining sector has brought important economic gains to both mining companies and local communities (win-win situations). The main economic benefit for the communities has been an increase in employment opportunities and increased direct and indirect cash flow into the community from mining operations. When communities receive additional direct benefits such as improvements of local education, infrastructure and health care through CSR programs, they are presumably more likely to accept and support mining activities (Westphalen, 2012). This can be shown in the case of SIOM.

There is no doubt that the huge iron-ore resources in east of Iran have become the main development target in this particular region. SIMP and IEIOC, as governmental sectors in SIOM, have carried out actively managed social and cultural responsible activities from the beginning of their operation. Managers of SIMP have collaborated with administrative counsel members of Khaf County. They have been involved in a financial variety of cultural, educational, civil and sports initiatives in order to improve the acceptance of SIMP and other projects within the region. Some of the most important examples of Social Responsibilities Activities (SRAs) realized within the SIMP and IEIOC during the last 25 years in the remote Sangan region are the following.

Building a highschool for girls

One of the most important SRAs at the beginning of SIMP was the building of a highschool for girls in Sangan town (boys and girls in Iran are educated in separate schools) (Figure 4). Since there had not been such educational facility in Sangan, the opening of this highschool was a great success and a useful contribution to the community. The highschool was inaugurated with a special opening ceremony on the first day of autumn in 1992, and 920 students have graduated since establishment. The highschool building was constructed in less than 2 years in an area of 15,000 square meters dedicated by Sangan council members. The two-floor building includes 12 classrooms with the total area of 2,000 square meters. Construction costs amounted to 380,000,000 Rial, equal to $264,541 USD (average exchange rate in 1992: 1USD = 1458.5 Rial). In addition to the 12 classrooms, the project includes examination halls, laboratory, library, warehouse, non-local teachers' rest room and a house for school watchman. The entire necessary equipment provided to this school had comparatively high quality.

Figure 4 – Girl's highschool in Sangan town

Ten graduates from this highschool progressed to medical schools in different universities, and some have returned to work as doctors in Sangan or other Khaf towns. Other graduates are studying in different academic fields such as paramedical, electrical engineering, agricultural engineering, law, geography, and accounting. Some of them are now working for SIMP and IEIOC. Also, during recent years, most of the managers and teachers were locals who graduated from this highschool.

Construction of a new technical school

In 2001, a technical school named Khajeh Nasiraddin Toosi was opened in Sangan near the mine, starting with limited equipment and space available for only 30 mining students (Figure 5). SIMP provided the educational staff. The development of resource operations created demands for skilled staff, and therefore taking steps to build a new technical school using and teaching modern technology was inevitable. It was realized by a joint project of SIMP, IEIOC and Khorasan Razavi School Tooling and Renovation Organization. This joint project with total costs of 1.5 billion Rials started in 2006 and was finished in 2010. One-third of the costs, 0.5 billion Rial (SIOM financial department) equals to $483,793 USD (average exchange rate in 2010: 1USD = 10,335 Rial) was covered by SIMP. This school, with its magnificent architecture, is located at Sangan town entrance. It covers an area of 27,000 square meters. A dormitory for students, a self-service restaurant and a library provide a suitable environment for studying and apprenticeship.

Figure 5 – New technical school in Sangan town

In 2012, 350 students were studying in fields like mining, mechanics, computer and surveying. Some graduates went to well-known universities and even earned M.S degrees. In the Table 4, the total number of graduates since inception and a breakdown of subsequent careers are shown. According to the SIMP and IEIOC Human Resources Department, 59 graduates (about 11 % of total) are now working directly in SIMP and IEIOC.

Table 4 – Technical school graduates statistics since inception*

Study year	Mining (person)	Mechanics (person)	Computer (person)	Surveying (person)	Total (person)
2001–2002	30	-	-	-	30
2002–2003	29	15	-	-	44
2003–2004	28	20	-	-	48
2004–2005	27	23	-	-	50
2005–2006	20	22	-	-	42
2006–2007	19	23	-	-	42
2007–2008	13	21	15	-	49
2008–2009	13	24	24	-	61
2009–2010	14	23	13	-	50
2010–2011	9	21	14	15	59
2011–2012	8	22	11	19	60
Sum	210	214	77	34	**535**

* Source: Khaf County educational department report

SIMP and IEIOC employees' charity

SIMP and IEIOC employees' charity was established in 2004. In 2012 the charity had 275 members: 215 locals and 60 non-locals. The number of members has been increasing every year. It is managed by a board of trustees. At the beginning of the Iranian New Year, a list including all members' names was prepared by the board of trustees, including everybody's monthly payment to the charity. This list is signed by the members and given to the financial department of the mine, so the department can deduct the determined amount of money from the personal salaries for charity. Based on the board of trustees act, the total obtained money is given to the destitute students of Khaf County twice a year in the form of cash and in-kind

contributions. Information related to the aid paid by Sangan mine employees' charity from the beginning of the establishment to the end of 2012 is shown in Table 5.

Table 5 – Brief Information related to the aids paid by SIMP and IEIOC Employees' Charity

Persian calendar	Equivalent in Gregorian calendar	Paid amount (Rial)**	Average exchange rate for 1USD (Rial)***	Paid amount (USD)
1383	Mar 2004 – Feb 2005	15,836,000	8,719	1,816
1384	Mar 2005 – Feb 2006	29,300,000	9,023	3,247
1385	Mar 2006 – Feb 2007	17,059,250	9,195	1,855
1386	Mar 2007 – Feb 2008	75,681,000	9,285	8,151
1387	Mar 2008 – Feb 2009	71,400,000	9,574	7,458
1388	Mar 2009 – Feb 2010	53,638,900	9,917	5,409
1389	Mar 2010 – Feb 2011	132,128,000	10,335	12,785
1390	Mar 2011 – Feb 2012	122,430,000	10,962	11,169
until 1391/9/30	Mar 2012 – Dec 20, 2012	60,000,000	12,260	4,894
	Sum	577,473,150		56,783

** Source: The last SIMP and IEIOC employees' charity board of trustees report
*** Source: Central Bank of Iran (CBI)

Construction of three residential homes

Unfortunately in October 1990, three workers in the exploration drilling unit of SIMP were killed in a car accident. As it was in the beginning of the exploration activities, the accident created undesirable side-effects on the mine personnel and local people and caused a disappointed atmosphere related to the mine activities. After the accident, the SIOM management decided to build three new residential houses for the killed workers' families on their own land by getting the required legal grounds. The houses, which were modern in comparison to the previous ones were built with at a cost of 15,900,000 Rials (SIMP financial department, 1991), equal to $234,513 USD (average exchange rate in 1991: 1USD = 67.8 Rials). This activity was not a legal necessity. It was merely to support the killed workers' families and to improve the mental and physical atmosphere in the mining area. Fortunately, this strategy caused the desired effects.

Assistances to different organizations of Khaf County

However, from the beginning of mining operations, SIMP has been the biggest industrial and economic unit in Khaf County. Based on the abovementioned regional conditions, and regarding the government goals in social sustainable development, SIMP and IEIOC supported different governmental and non-governmental organizations in Khaf County (Table 6). This assistance was often based on the delivery of second-hand used goods but worthwhile. The prices of secondhand used goods were estimated based on SIMP and IEIOC financial department documents.

Table 6 – Assistances paid to different organizations of Khaf County by SIMP and IEIOC

Unit of help target	Total goods	Value (USD)
Khaje Nasiraddin Toosi Technical school of Sangan	3,449	240,839
Girl's highschool of Sangan	547	33,666
Khaf County educational department	245	12,132
Khaf road police and Sangan police force	96	2,026
Sangan Sheriffdom	10	1,756
Two regional guidance schools	81	1,219
Khaf red crescent	4	580
Others	233	1,590
Total	4,665	293,808

Table 7 describes the total costs of assistance (in USD) covered by SIMP and IEIOC for the Khaf County as SRA to December 20, 2012.

Table 7 – Total costs of assistances paid by SIMP and IEIOC as SRA

Description	Value (USD)
Highschool for girls	264,541
New technical school	483,793
Sangan mine employees' charity	56,783
Construction of three residential homes	234,513
Governmental and non-governmental organizations	293,808
Sum	**1,333,438**

ASKING PEOPLE ABOUT SIOM, SIMP AND IEIOC, RESULTS AND CONSEQUENCES

To get useful ideas and comments from local people related to mining activities and future projects of SIOM, a questionnaire, including 21 questions about SIOM, SIMP, IEIOC and related topics was distributed to a statistical population living in the direct influence of the mine site around Sangan. About 200 filled forms were subsequently gathered in December 2012. Six questions of the questionnaire are directly related to the topic social responsibility.

There are some small private companies active around SIOM for iron ore placer mining. They create useful and harmful effects on the surrounding environment and the society. As these companies create jobs, some of the local people have been involved with them. To make comparison between them and SIMP and IEIOC in this regard, three questions about private companies SRA are included in this survey. The answers are shown in the Figure 6.

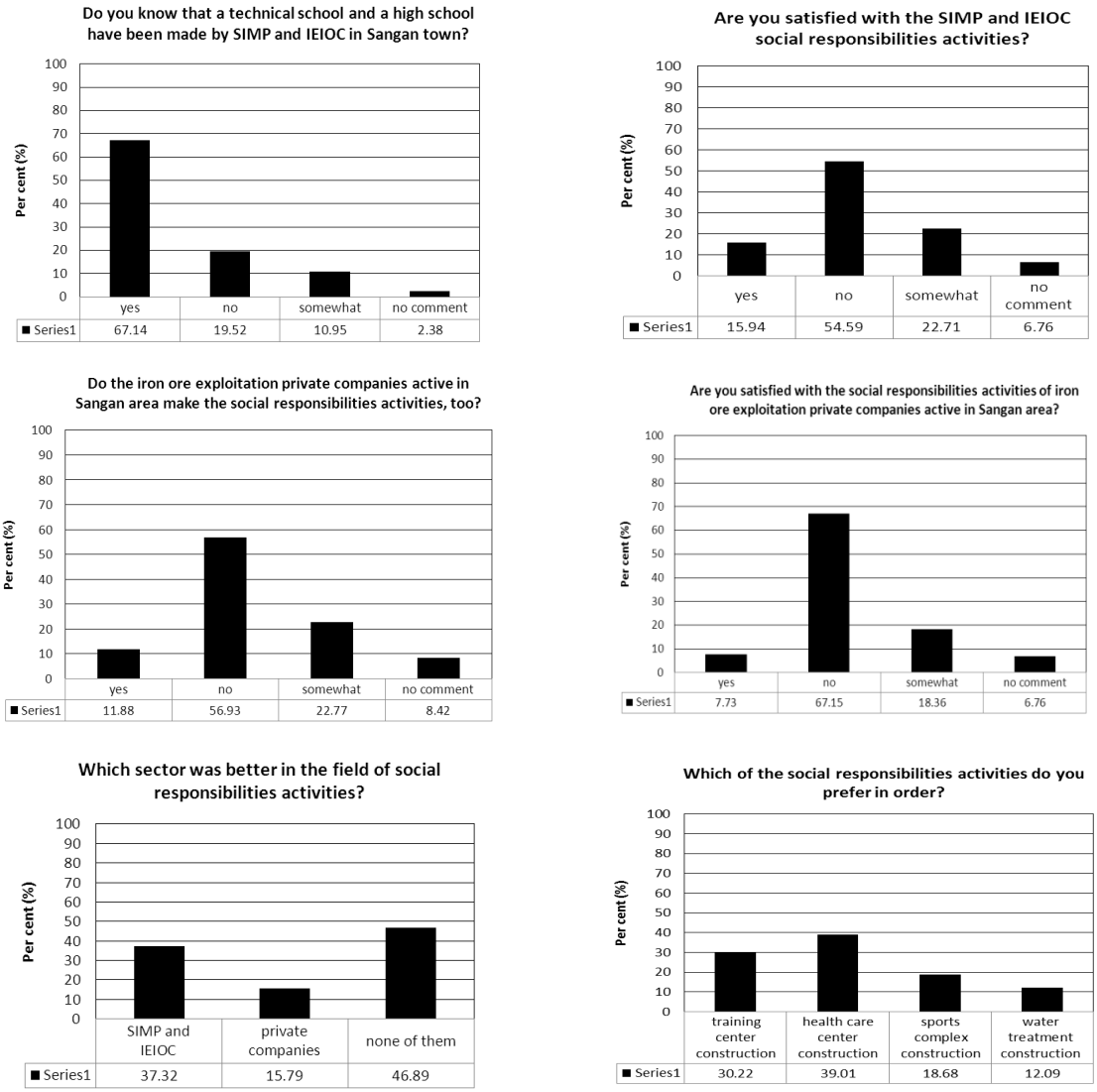

Figure 6 – Graphs related to questions about SRA in SIMP

Approximately 67 % of the respondents were aware of the construction of a new technical school and a highschool for girls in Sangan by SIMP and IEIOC. However, about 55 % of the people were not satisfied with the SIMP and IEIOC SRA. Since there is not any concrete social development plan for this region, it seems such activities have not been based on a strategic plan developed by mutual agreement between the local community and SIMP. The assistance has been considered ad-hoc and more or less ineffective by the respondents.

Approximately 12 % of the respondents believe that other private iron-ore mining companies active in Sangan area realize SRA, but 67 % of them are not satisfied with their activities. This result shows that these private companies should be encouraged by the government and local authorities in Khaf County to enforce

social responsibility measures in their own activities. In this regard, a training program showing the benefits of SRA for better performance will be useful for both private companies and local communities.

37 % of the respondents believed that SIMP and IEIOC as state-owned companies are paying more attention to SRA than private companies (16 %). Based on former activities by SIMP and IEIOC in the mine area, it is partly reasonable. Approximately 20 % have not been aware of the two main and important SRA in Sangan (construction of a new technical school and a girl's highschool).

Approximately 47 % of the respondents believed that neither SIMP and IEIOC nor private companies are performing well in the field of SRA. This is an indicator that mining companies should improve their SRA, and/or improve their communication and message about their SRA.

About 39 % of the respondents preferred the construction of a health care center as a new SRA. 30 % have voted for a new training center, 19 % for a new sports complex and 12 % for new water treatment facilities. The preferences of the people are directly related to their needs and they depend on the local situation and other SRA in the communities. As a consequence of these interviews, a new medical and health care center in Sangan will be planned in cooperation between SIMP, one of its main contractors and Mashhad Medical Sciences University. A draft agreement has been prepared and is ready to be signed by Khaf County governors, the SIMP executive director, the contractor, representatives of the Mashhad Medical Sciences University and the mayor of Sangan. Afterward, the project will be started immediately.

CONCLUSIONS

Social responsibility is a necessity for a better and future orientated performance of a mining company. Corresponding measures bring benefits for the mining companies and their projects especially when they are realized from the beginning of new mining activities. But SRA should be planned and realized in accordance with the governmental rules, society requirements and financial limitations. If SRA are not guided by a strategic plan developed as a mutual agreement between the local community and the mining company, the assistance could be ad-hoc and less effective.

About $1.333 million USD have been spent for SRA by IMIDRO and IEIOC in the Sangan mining area, which is 0.32 % of the total capital costs. In order to get better acceptance in the mining area, these activities and their useful impacts should be promoted better in the different parts of Khaf County.

Furthermore it will be helpful to realize a Social Impact Assessment in the area directly influenced by SIMP and IEIOC and other SIOM projects. After that, aims should be defined based on a social management plan and measures planned and realized. Their impacts should be assessed.

Based on the results from the questionnaire, it seems that SIOM did not get a social license to operate completely. Nevertheless, regarding to the special conditions of SIOM area, the amount of SRA in SIOM area is higher than in other mining areas in Iran. It is work for social sustainable development in progress.

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