

Original article

The socio-economic impacts of mining on local communities: The case of Jordan

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ABSTRACT

This paper compares selected socioeconomic indicators (e.g. unemployment, Human Development Index, poverty, education, health and environment) in the Southern Region of Jordan with those of its northern and central parts, with the aim of exploring what impact mining has had on local communities. According to the development indicators examined, the South Region of Jordan lags behind, developmentally, the rest of the country as a whole, and that there appears to be a correlation between mining activities in the country and lower-than-average performance, as measured by development indicators. However, this correlation may not be causation and could be due to other factors at work, mining communities may be better off than they would have been otherwise. Before and after mining comparisons of socioeconomic indicators for the locality of Ma'an provide no indication of faster development relative to the rest of the country for the same time period. Mining activities in Jordan appear to largely fail to benefit local communities beyond what is happening in the country as a whole. Policies and rules need to be developed for redistributing part of the Jordanian mining companies' wealth to local communities and in order to offset the local cost of mining.

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1. Introduction

The mining sector has been a major source of revenue for the Government of Jordan since the establishment of Jordanian Phosphate Mines Company (JPMC) and Arab Potash Company (APC) in 1953 and 1956, respectively. During this period, the Jordanian industrial sector has been composed mainly of the "mining and quarrying" and related "manufacturing" sub-sectors. The most important phosphate-finished fertiliser products are Di-Ammonium Phosphate (DAP), mono-ammonium phosphate and triple superphosphate. The principal activity of APC is the production of potash, which is also one of the main constituents of N-P-K fertilisers. By 2013, mining contributed 3.3% of Gross Domestic Product (GDP) but in combination with its related manufactured products (e.g. fertilizers), its contribution reached 9% (Natural Resources Authority, 2014).

Though Jordan has some metallic and non-metallic minerals distributed in the Northern and Central Regions of the country, most of the mining revenues are generated in the Southern Region, where the main potash and phosphate mines are located. These mines contribute more than 95% of the country's total mining

revenues. The Kingdom's largest sources of phosphate are located near Ma'an, the largest city located in the South. The majority of the potash reserves are found near the Southern city of Karak.

As Al Rawashdeh and Maxwell (2013) reported, because of Jordan's geographical proximity to major oil-producing states, significant capital inflows from the oil economies during the 1970s enabled development of key sectors of the economy, including mining and some manufacturing while enhancing the nation's infrastructure. However, declining real oil prices and falling worker remittances during the 1980s led to painful readjustments and adversely impacted on Jordan's economic development. The oil price boom in 2008 had a smaller impact on economic growth for Jordan as Jordan did not enjoy as many spillover benefits as compared to the oil price boom in the seventies. There was less aid available from oil-rich countries, fewer job opportunities for Arab workers in the Gulf, and less money flowing from oil rich countries to resource-poor countries. Consequently the Government of Jordan had a budget deficit of JD1.5 billion in 2011. Nevertheless, The direct and indirect benefits of minerals and energy extraction at home and in nearby nations played a role in placing Jordan in the high human development category—positioning the country 77th out of 187 countries and territories (World Bank, 2014).

There are many peer-reviewed studies that have examined the impact of mining operations on local communities within the academic literature (examples include: Badera and Kocan, 2015;

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Bin et al., 2015; Moffet and Zhang, 2014; Campbell and Roberts, 2010). Beyond the jobs and income generated by mining operations, one of the concerns identified is the impact of mining on the overall wellbeing of the local community. The opening of a large mine has economic, environmental and social consequences at the national, state and provincial/local levels. Large mines can generate foreign exchange earnings and tax revenues and create employment directly and indirectly that benefit the country as a whole. However, local communities have become more and more concerned that they shoulder most of the negative impacts of mining but do not receive enough of the benefits. This is a particular problem for capital-intensive large mining operations because they may generate only a relatively small number of local jobs as compared to more labor-intensive industries.

While the local community bears most of the environmental and other social costs of mining, much of the profits or rents realized may flow elsewhere given the national and international nature of mining. Has mining been beneficial or a negative factor for the local communities in South Jordan? What needs to be done to improve the benefits to the local community of the mining? This paper will explore the correlation between mining and local community wellbeing with comparisons across a range of socioeconomic and health characteristics for the three main regions of Jordan. The paper will compare socioeconomic indicators (e.g. unemployment, Human Development Index, poverty, education, health and environment) in the Southern

Regions of the country with those of the non-mining Northern and Central Regions to study what impact mining may have had on the Southern communities. The following section of the paper will discuss the socio-economic situation of Jordan and the significance of the mining sector to the Jordanian economy. The next section of the paper will review the literature on the impact of mining on local communities. This section is followed by a detailed comparison of socio-economics factors of the main cities in the regions of Jordan and how mining activity may correlate with the results. Then the socio-economic changes of the Ma'an region in response to increased mining activity will be focused on. The paper concludes with a discussion of the results and what has been learned.

2. Jordan

Jordan is a small Middle Eastern country with a developing economy. With a population of about 6.5 million in 2014, its estimated Gross Domestic Product was just over \$US 33.3 billion for a GDP per capita at Purchasing Power Parity (PPP) of a modest \$US 6100 per annum. Life expectancy had reached 74.1 years with an adult literacy rate of 99.1%.

Jordan has 12 governorates which are located in one of three regions: the North Region which includes Irbid, Jerash, Mafrqa and Ajlune, the Central Region which includes Amman, Zarqa, Madaba and Balqa and the Southern Region which includes Karak, Tafila,

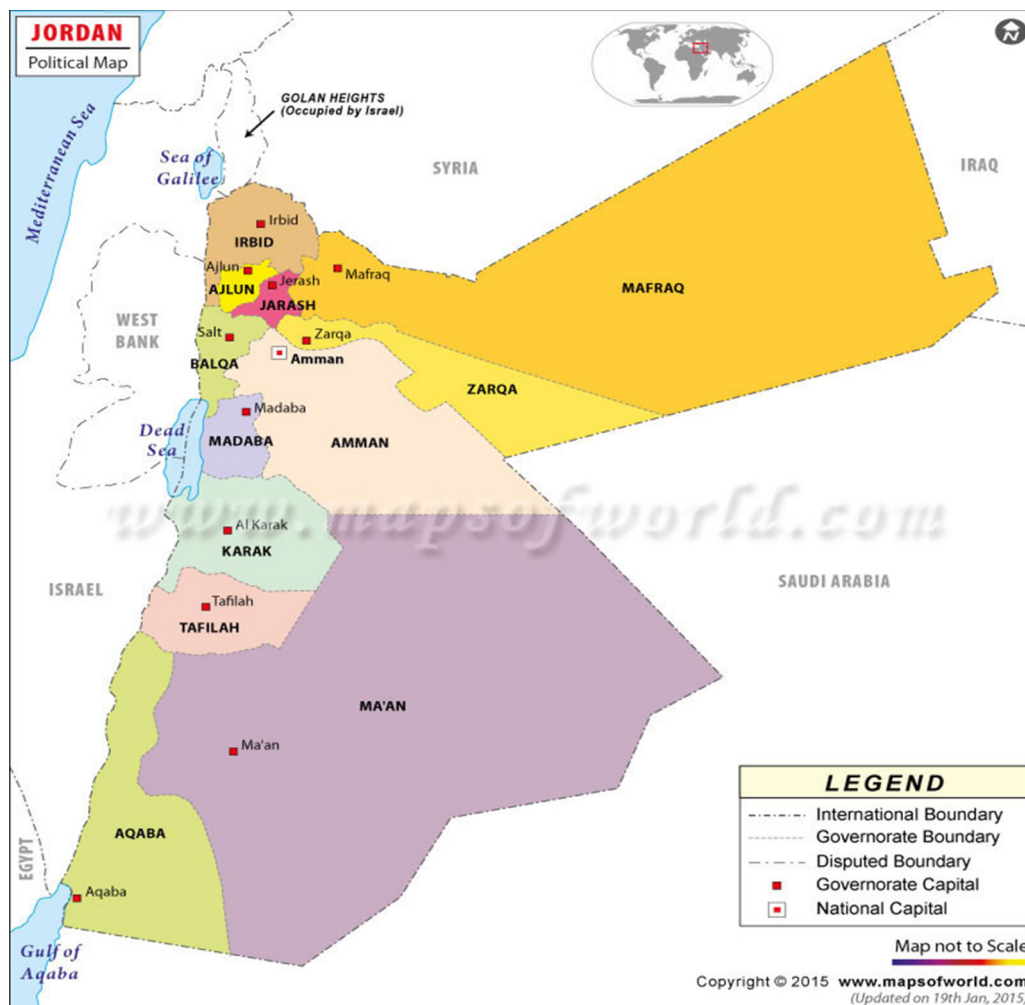


Fig. 1. Jordan Map.

Table 1
Major development indicators in the Jordanian economy from 1970 to 2013.

Year	Human Development Index	GDP per capita (at constant 2005 prices, USD)	Population below poverty line (%)	Life expectancy at birth	Infant mortality (per 1000 lives)	Adult literacy rate
1970	–	1221	–	60.2	65.4	–
1980	0.59	2109	–	66.2	43.3	–
1990	0.62	1799	30	69.9	30.0	90.5
2000	0.71	1926	16	71.6	23.3	98.9
2010	0.74	2817	14	73.4	17.5	98.8
2013	0.75	2855	14	74.1	16.0	99.1

Source: World Bank (2014).

Ma'an and Aqaba. These three geographical regions are based on area geographical connectivity and distance among the population centers (see Fig. 1). The largest provinces by area are Ma'an, Mafraq, and Amman. The largest provinces by population is Amman, which holds the national capital and the largest city that is home to over 2.2 million people, followed by Irbid, Zarqa, and Balqa with populations of 1.1, 0.91 and 0.41 million respectively.

Jordan has approached development from a holistic perspective, realizing that poverty, illiteracy and health form a triangle that must be addressed together. Table 1 shows the major development indicators for Jordan. As shown, its Human Development Index rose from 0.59 in 1970 to 0.75 in 2013. Its GDP per capita at constant 2005 prices increased from USD 1221 in 1970 to around USD 2855 in 2013 with the percentage of people living below the poverty line declining from 30% in 1990 to around 14% in 2013.

Health conditions in Jordan are among the best in the Middle East. This is due in large part to the Kingdom's stability and to a range of effective development plans and projects that have included health as a major component. Jordanian's life expectancy at birth increased from 60.2 years in 1970 to 74.1 years in 2013. Its infant mortality per 1000 lives declined from 65.4 in 1970 to 16.0 in 2013.

The education system of the country has also improved consistently, and it has played a significant role in the development of Jordan from a predominantly agricultural society to an industrialized nation. Adult literacy rate has increased from 90.5% in 1990 to 99.1% in 2013.

2.1. Significance of mining to the Jordanian economy

The mining sector in Jordan can be subdivided into mineral extraction industries and mineral manufacturing industries. Phosphate, potash, salt, calcium carbonate, treated zeolite, treated silica, travertine, other quarries and mines products are part of the extractive industries while the mineral manufacturing industries are composed of two branches: the chemical industries (fertilizers, chemical acids, aluminium fluoride, quick and quenched lime) and the construction materials industries (white cement, rock wool and building materials).

The direct contribution of the mining sector to Jordanian GDP has been typically small. For example, it was only 0.6% between 1955 and 1960, but it rose after that time, reaching a maximum 4.1% between 1985 and 1990 and then declined during the 1990s back to about 3%. More broadly based economic growth in 1990s enabled Jordan to become less dependent on the mining sector and so there has been a steady contraction of the mining sector's contribution to GDP in this time period, but since 2003 there has been a gradual rise in mining contribution to GDP reaching to 3.7% from 2009 to 2013 as shown in Fig. 2.

Jordan has also large reserves of phosphate and potash. According to United States Geological Survey (USGS) (2014) its

phosphate and potash reserve base is 1.3 billion and 40 million tonnes, respectively. The economic exploitation of these minerals helped laying the foundation for Jordanian private and public investments, modernization of its infrastructure, and the expansion of public services sector such as education and health. In 2013, the service sector made the highest contribution to GDP—approximately 73%.

As shown in Fig. 3, the contribution of mining to total exports revenues reached its highest percentage, about 51% of total export, in 1974 and fell to 45% in 1988 and 16% by 2013 (Central Bank of Jordan, 2014). This indicates that there has been a considerable success in diversifying the Jordanian export economy away from its traditional reliance on exports of phosphates and potash.

Weber-Fahr (2002) classified Jordan among her group of 51 “mineral dependent” developing nations. Jordan was ranked twenty-second according to the relevance of mining for exports from 1990 to 1999. An alternative rule is to define mineral based economies as those where mineral exports are at least 40% of their total merchandise exports (Davis, 1995). If one used this rule, as Fig. 3 shows, Jordan would have only been classified as a mineral economy eight times for the years 1966, 1974, 1975, 1976, 1980, 1986, 1988 and 1989 with minerals share of total merchandise exports of about 41.4%, 50.8%, 50.1%, 40.5%, 41%, 43.4%, 45.2% and 42.1% respectively, but after 1990 it has become a consistent non-mineral economy country.

Fig. 4 shows the most important minerals product¹ exports as a percentage of total minerals revenues in 2013. Potash made up 34% of total revenues, phosphate 22%, fertilizers 16%, cement 10%, bromine 7%, phosphoric acid 5%, aggregate 3%, calcium carbonate 2%, dimension stone 1% and natural sand 0.5%.

The mining industry has been expected to play a role in alleviating the major unemployment problem. However, the share of mining in the industrial sector employment decreased from 10% in 1992 to 3% in 2013 while its contribution to total employment fell from 2.5% in 1992 to 1% in 2013. Nevertheless, mining may have been responsible for many new jobs throughout the economy.

Some of Jordan's minerals mainly depend on local demand instead of export markets. These minerals include aggregates (100%), natural sand (97%) and cement (92%). Bromine, fertilizers and phosphate rock by contrast depend on export markets rather than local markets and they represent 99%, 90%, and 89%, respectively. Table 2 shows the percentage of mining products that was exported or consumed locally in 2013.

Generally, mining creates backward and forward linkages. The term ‘forward linkage’ is used to indicate this kind of interconnection of a particular sector to those sectors to which it sells its output (Miller and Blair, 1985). The backward linkage effect is the direct and indirect effect on the production of all the industries,

¹ This includes mining and its related manufactured products.

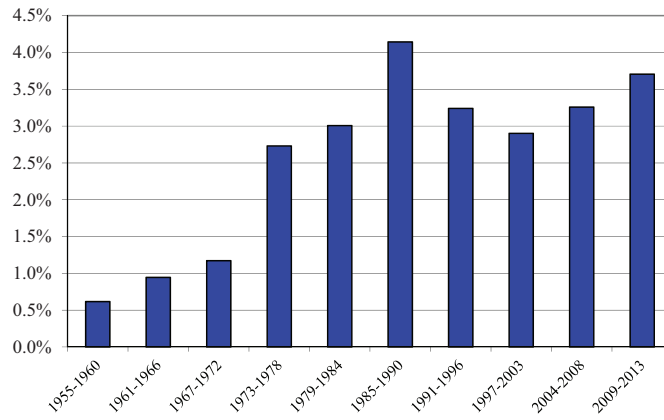


Fig. 2. Contribution of the Mining sector to Jordanian GDP from 1955 to 2013.

Source: Central Bank of Jordan (2014).

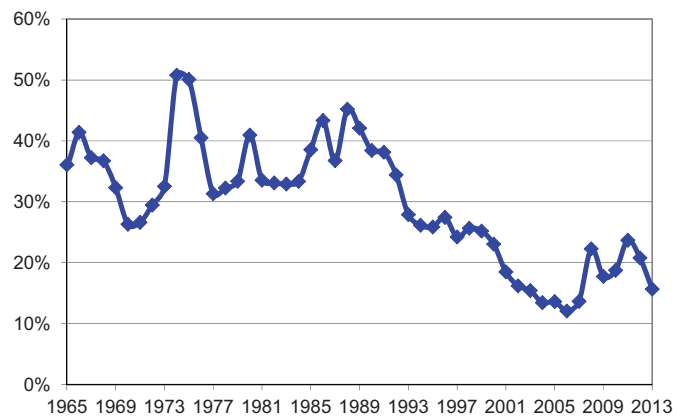


Fig. 3. Contribution of Mining sector to total exports from 1965 to 2013.

Source: Central Bank of Jordan (2014).

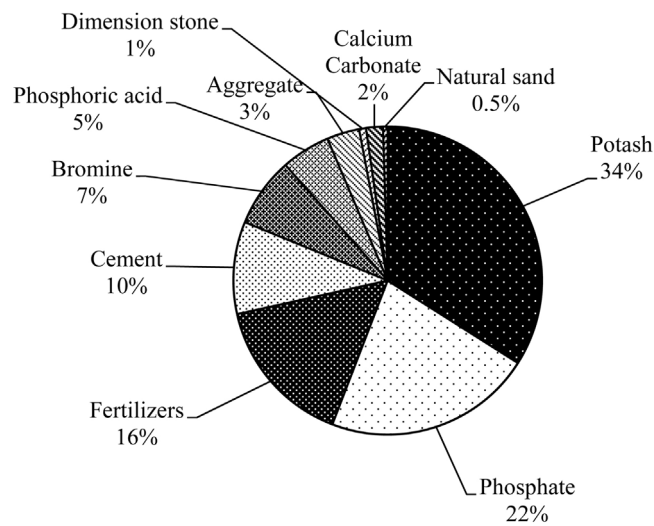


Fig. 4. Mineral product exports as a percentage of total mining revenues in 2013.

Source: Natural Resources Authority (2014).

which provide the intermediate inputs necessary for the production of a particular industry being invested (Kim et al., 2002). As a common rule, sectors with high-forward linkages in relative terms should be expected to induce opportunities in these sectors that

utilise their products as inputs. On the other hand, sectors that constitute strong overall backward linkages should be expected to induce investment opportunities to those sectors that supply their inputs through expanded production. Al Rawashdeh and Al-

Table 2

Local and export percentages of mining products in 2013.

Mineral product	(%) Consumed domestically	(%) Exported
Aggregate	100	0
Natural sand	97	3
Cement	92	8
Bromine	1	99
Fertilizers	10	90
Phosphate	11	89
Calcium carbonate	12	88
Dimension stone	13.3	86.7
Potash	22	78
Phosphoric acid	23.8	76.2

Source: Natural Resources Authority (2014).

Thyabat (2012) emphasized the significance of mining to the Jordanian economy and showed empirically that mining is one of the major five key sectors in the economy. Through its backward and forward linkages, they also showed that mining has a strong backward linkage and it is ranked tenth among all the sectors in the Jordanian economy and it has a strong forward linkage and it is ranked ninth among all the sectors in the economy.

The Government of Jordan has suffered from a high budget deficit for long periods of time and taxes and royalties revenues generated from mining have assisted in covering some of its current and capital expenditures needs. Corporate taxes and mining fees (particularly from JPMC and APC) contributed to around 3% of total government revenues in 2013 (Central Bank of Jordan, 2014). Total taxes and royalties increased from USD 47 million in 2002 to USD 84 million in 2013 (see Fig. 5). In 2008, when both of Jordan's major mining companies achieved high profitability in 2008 due to high phosphate and potash prices, the Government of Jordan generated total tax revenues and royalty payments of USD 141 million. Due to high demand for fertilizers in 2011 and 2012, total government revenues from mining rose to its highest amounts of USD 180.4 million and USD 152.3 million respectively. As Fig. 5 shows, the majority of government revenues received from mining came from potash especially in the period from 2008 to 2013.

Jordan's economy operates according to free market and free trade principles. In its attempt to help its mining sector, a major legal and institutional reform has been in progress in the last ten years. Incentives have been introduced and recognized according to the Investment Promotion Law and its bylaws. Article 117 of the Constitution of Jordan allows foreigners to invest in mineral

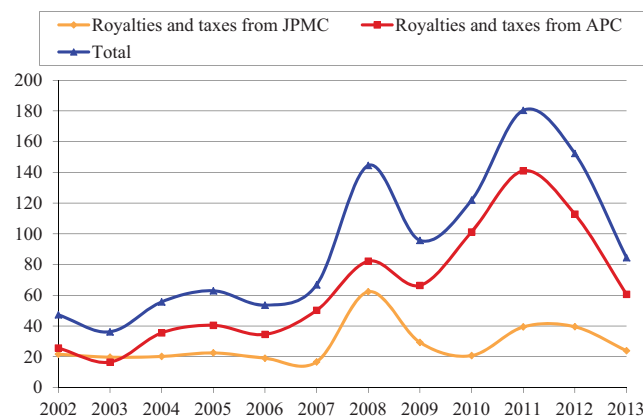
resources under special agreements. These are negotiated with prospective investors on a win-win basis and thereafter sanctioned by parliament as special laws, binding the government to the extent of their articles. To encourage investment in the Jordan phosphate industry, mining and manufacturing projects are entitled to 100% exemption of customs duties on imported fixed assets for the first three years from the commencement of operation. Industrial projects, where mining is involved, enjoy a two-year full exemption from income tax as well as a permanent exemption from property taxes. The government has also encouraged Jordan Phosphate Mines Company to set up joint ventures in the country. Since the establishment of Japanese and Indian joint ventures, the company was given five years royalty fees exemption on any rock imported by the joint ventures for the manufacturing of phosphoric acid. The government has also considered private external financing and equity participation leading to some dilution of the Government's share in the equity (e.g., privatisation of Phosphate Mines Company in 2006).

2.2. Geographical distribution of mining in Jordan

Table 3 shows a detailed distribution of minerals in the Northern, Central, and Southern parts of Jordan. As can be seen ore and minerals are valued at USD 15.8 million, USD 42.2 million and USD 2071 million respectively reaching to a total wealth of around USD 2129 million of which 97% is concentrated in the South Region. The most valuable minerals in the North are volcanic tuff and limestone valued at USD 4.1 million and USD 3.2 million respectively. Both commodities are used in construction material and manufacturing industries and are most commonly found in Mafraq.

The most valuable minerals in the Central parts of the country are quarries, clays and gypsum valued at USD 14.7 million, USD 13.2 million and USD 6.4 million respectively. Quarries are commonly present in all areas in the Central Region, but the majority of quarries are located in Zarqa. Clay used as a building material is commonly found in Zarqa and Balqa and is valued at USD 12.9 and USD 0.32 million respectively. Gypsum is common in the Balqa area and is extensively used in producing Portland cement and as a soil conditioner for large tracts of land.

The South Region produces a variety of minerals including gypsum, limestone, basalt, clay, glass sand and quarries. However, as Table 3 shows, phosphate and potash are the most valuable minerals present. In 2013, phosphate rock was produced in the Ma'an area (Al-Shidiyah mine), Karak area (Al-Abiad mine) and

**Fig. 5.** Government revenues in (USD million) from mining royalties and corporate taxes from APC and JPM from 2002 to 2013.

Source: Jordan Phosphate Mines Company (2014) & Arab Potash Company (2014).

Table 3
Distribution of Minerals wealth in Northern, Central and Southern parts of Jordan in 2013.

	City	Major minerals and ores	Quantity of production (Tons)	Value of production (\$US)
North	Ajlune	Quarries	43,500	646,800
	Mafrq	Quarries	312,40	1,544,550
		Limestone	462,847	3,239,929
		Pozzolana	239,139	3,013,151
		Clay	232,218	2,187,536
		Volcanic Tuff	415,818	4,075,016
		Zeolite	12,318	120,716
	Irbid	Quarries	143,10	813,960
	Jerash	Quarries	31,500	198,450
				15,840,108
Central	Amman	Quarries	551,700	3,543,683
		Limestone	372,443	2,625,723
	Balqa	Quarries	386,550	1,876,560
		Gypsum	352,244	6,410,841
		Clay	32,884	322,263
		Limestone	74,439	521,073
	Zarqa	Quarries	347,250	8,738,940
		Limestone	21,232	148,624
		Clay	1,316,891	12,905,532
		Pozzolana	3,034	52,225
		Basalt	22,000	338,800
		Volcanic Tuff	63,205	594,209
	Madaba	Quarries	84,300	535,080
		Pozzolana	281,447	3,546,235
				42,159,788
	South	Karak	Quarries	155,700
Gypsum			127,142	2,313,984
Limestone			35,282	246,974
Basalt			12,000	184,800
Potash			1,090,000	806,600,000
Bromine			143,000	286,000,000
Tafila		Phosphate (Al-Abiad mine)	2,000,000	174,800,000
		Quarries	226,350	276,360
		Gypsum	149,204	2,734,918
		Limestone	3,496	24,644
		Pozzolana	103,91	1,319,646
		Clay	232,379	2,293,581
Ma'an		Phosphate (Al-Hasa mine)	1,000,000	100,000,000
		Quarries	3,486,000	58,644,720
		Kaolin	1,322,792	1,865,419
		Glass Sand	1,373,265	1,936,304
		Phosphate (Al-Shidiyah mine)	4,367,000	628,061,940
Aqaba		Quarries	31,200	955,134
		Kaolin	104,703	1,033,419
		Glass sand	716,222	504,938
			2,071,046,701	
Total			2,129,046,597	

Tafila area (Al-Hasa mine). The mine productions were valued at USD 628 million, USD 174.8 million and USD 100 million respectively.

Potash and its byproducts such as bromine occur in huge quantities dissolved in the Dead Sea water. The average salt content of the Dead Sea is about 31.5%. Approximately 45 billion tones of salts are dissolved in the Dead Sea water. In extensive pans, Dead Sea water is evaporated for increasing the salt concentration in the brine and for the selective precipitation of potash salts. Potash is only located in Karak area and it was valued at USD 806.6 million in 2013. Bromine, which is one of potash byproducts, was valued at USD 286 million in the same time period.

3. Mining and the impact on local communities

Mining companies are in the business of extracting valuable minerals for a profit. The technical, legal and commercial functions that are needed to support efficiencies in the extraction of minerals are understood as being at the core of this business. However, over the past two decades the industry has witnessed the emergence of

community relations and development (CRD) functions, essentially under the rubric of sustainable development (SD) and corporate social responsibility (CSR) as a core factor in extracting minerals.

Many corporations especially international ones are embracing Corporate Social Responsibility (Garriga and Mele, 2004) as a fundamental component of resource extraction operations, including mining. Exercising social responsibility in small, remote centers often means that international and transnational corporations must interact with rural or indigenous people who have strong emotional and historical links to the land. Meanwhile the same corporations are increasingly drawn to such remote areas due to growing technological capacity, liberalization of international markets, and new resource discoveries in previously 'unknown' places (Brohman, 1996; Madeley, 1999; Veiga et al., 2001). As a result, the mining sector, while sometimes strengthening the economy at the national scale, may present an entirely new set of problems at the scale of the local community.

An alternative perspective on socioeconomic impacts to small rural communities is that these impacts usually result in significant negative demographic changes, due to a large influx

of laborers from elsewhere seeking employment (Hilson, 2002). This causes major negative impacts such as disruption of the social balance in the community, the introduction of diseases, increased demand and prices for local resources, increased cost of living, stress on the local water supply, disturbance to traditional hunting and fishing, and increases in socially undesirable activities such as prostitution (see also Vanclay, 2002). Poorly managed mines may even worsen existing levels of poverty (Pegg, 2006). Furthermore, the extent of positive impacts arising from employment tends to diminish over time as mining becomes more technical and automated and this can reduce support for mining activity amongst local stakeholders (Warhurst and Mitchell, 2000).

In prescribing success in dealing with affected communities, Labonne (1999) has suggested that the mining company should view the local community as a source of valuable human, natural and physical assets that can be utilized when developing the mine, and that the community must be able to articulate its own development aspirations. Since the mid-1980s, thirty-two countries have adopted community development requirements into their mining laws, while nine countries are in the midst of doing so. Dupuy (2014) reported that new public regulation approach to addressing mining's impact goes beyond mitigating the negative effect of mining on local communities (such as through compensation arrangements and environmental laws), to requiring firms and/or states to ensure that mining translates into real, positive social and economic gains for mining-affected communities.

In a study on 71 local government areas in Australia, Hajkowicz et al. (2011) found that mining had a positive effect on incomes, house affordability, communication access, education and employment across regional and remote areas in Australia. However they commented that the benefits at a regional scale could mask negative localized inequalities and disadvantages. Gifford et al. (2010) reported that about 70% of gold mining is done in developing nations, where the consequences of environmental damage often are greater for the sustainability of local communities. The communities around mining operations not only tend to be poor and vulnerable, but also lack government protection, regulation and oversight. While recognizing some of the benefits brought by the mines, in a study done by Garvin et al. (2009), he reported that communities felt that the companies did not live up to their responsibility to support local development. Companies responded by denying, dismissing concerns, or shifting blame.

The next section of the paper will present how key socio-economic indicators (unemployment, Human Development Index, poverty, health indicators, education indicators, and environmental

indicators) vary across the governorates of Jordan, and how it correlates with the amount of mining activity in the individual governorates.

4. The development of Jordan by cities

4.1. Unemployment rate

Arguments for mining developments focus on the economic benefits that can be achieved to enhance the well being of the community in which they occur by providing employment to residents and other economic benefits. In the first years of the mining operations, local community members tend to fill the lower skilled jobs and provide unsophisticated services to the mine, especially if it is in a remote location. However, as the community matures, it is common for local residents to provide services such as vehicle repair, machine shop services, welding, sheet metal work, plumbing, and electrical work.

Jordan struggles with a growing youth populations who have limited job opportunities. The World Bank estimated that unemployment rates in Jordan in 2013 reached over 26% among young men and over 51% among young women. The unemployment rate is highest in the South (17.2%) compared to 13.9% and 14% in Northern and Central Regions respectively. Since 1995, many Jordanian's state companies have been privatized due to neoliberal economic reforms, and in many cases, this has resulted in a net loss of jobs. When mining companies were privatized² in the 2000s, workers especially those from the South lost their jobs, consequently the living standards of people there have been affected causing inequality and poverty to rise. In Tafila, for example, many people previously employed with the phosphate and potash companies lost their jobs following privatization. It is claimed that 40 buses used to depart from Tafila every morning to bring workers to the phosphate factory; however, following privatization, only one bus transported workers to the factory. In addition, staff that was involved in transportation and logistics were laid off affecting many people and their families.

Fig. 6 shows a cross sectional chart of the natural logarithm of mining value per capita on the x-axis and the unemployment rate on the y-axis for each Jordanian city. As mining value per capita increases across the X-axis, unemployment rates tend to increase. Though the mining activity is concentrated in the South, it is estimated that the Southern areas like Karak, Tafila, Ma'an, have the highest rates of unemployment of 17.3%, 18.5%, and 20.6% respectively compared to the current 14% nationwide average.

4.2. Human Development Index (HDI)

Jordan has made human development a national priority. The country continues to invest significant resources to ensure that all its citizens benefit from access to health and education services and enjoy a reasonable standard of living. One of the main drags on development is deep and chronic inequality, which restricts choices and erodes the social fabric.

In 2013, the average human development rate in the South reached 0.76 compared to 0.77 and 0.78 in the Northern and Central Regions respectively. The South gets less economic-development projects than the rest of Jordan and its local communities have been hard hit by stagnating wages and the

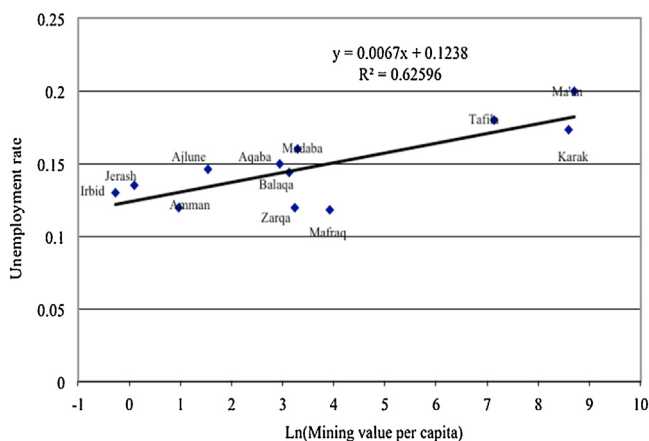


Fig. 6. Cross sectional chart of mining per capita and unemployment rate from 2010 to 2013.

² The Government of Jordan sold 28% of its stake in the APC to the Potash Corporation of Saskatchewan in 2003 and by 2013 the government owned only 27% of the APC shares. Also 37% of JPMC was sold to the Brunei Investment Agency (Kamil Holdings Limited) and the government owned only 26% of JPMC shares by 2013.

lifting of fuel subsidies since 2008. While the country’s basic industrial sector is a significant contributor to its total output, services still make up approximately 73% of GDP, providing low wages and unstable work (Central Bank of Jordan, 2014). Two-thirds of all industry is located in the capital city “Amman” and the Southern areas have only a small proportion of industry, less than 1% of the domestic total that consists mainly of raw material “mining”.

The Southern Regions in Jordan are characterized by a low population density, a shortage of resources (water, pastures, and livelihood options), lack of public transportation, and a high dependence on the public sector and armed forces for employment. In 2012 when the Arabic spring broke out in Arabic countries, the majority of protests and demonstrations calling for political and economic reforms in Jordan took place in the Southern Regions, Karak, Tafila, and Ma’an. Jordanian activists from the South emphasized social justice in the South in the form of more equitable state investments in economic development (to include the Southern cities and to be less Amman centric). In short, they sought greater economic development.

Regional human development disparity remains a challenge to the promotion of social equity. As can be noticed in Fig. 7, as mining value per capita increases the Human Development Index tends to decrease. The development status of Ma’an, Karak and Tafila remains relatively weak with HDI values of 0.740, 0.758 and 0.754 respectively.

4.3. Poverty line

In 2013, the poverty line reached USD 950 and the percentage of people living below the poverty line in the South reached 17.2% compared to 16.3% and 12.4% in the Northern and Central Regions respectively. Most individuals in the South have only one JD per month to spend on entertainment, a sum insufficient to purchase a book or see a movie. The private sector avoids investing in the remote Southern areas due to distance, lack of services, and inadequate labor supply. Around 85% of the poorest 30 districts in Jordan are situated in the South Regions and the Northeastern desert places. Income disparities are high whereas the richest 20% in Jordan controls around 43% of the country’s wealth and its poorest 20% has a share of just 7% (World Bank, 2014).

In line with the distribution of poverty in the kingdom, over 55% of households in Ma’an and Karak in the South spend the highest proportion of their income on food and drink. In contrast, families in Amman, of all income groups, spend the least of their income on these necessities. The annual average household spends on meat

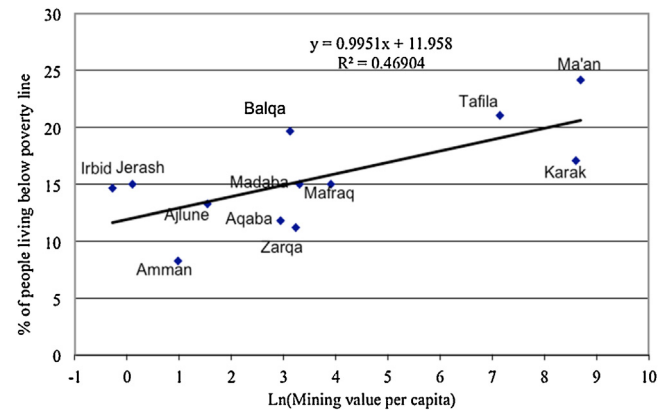


Fig. 8. Cross sectional chart of mining value per capita and % of people living below poverty line from 2010 to 2013.

and poultry in the South stands at \$850, one of the lowest in Jordan (Jordan Department of Statistics, 2014).

Fig. 8 shows that as mining value per capita increases across the x-axis, the percentage of populations living below the poverty line tends to increase especially in the Southern Regions. The inequality that exists between the affluent and the poor in a community can induce violence and because of that the violence rate and the crime rate per capita in the South is higher compared to the Northern and Central parts (Jordan Department of Statistics, 2014).

4.4. Health indicators

Jordanian people benefit from a relatively modern health system that is accessible by everyone. Different sources estimate total health expenditures in Jordan at or around 9% of GDP (World Bank, 2014) that is far higher than other low-middle income countries, and comparable with levels typically found in many developed countries.

The Southern mining communities have relatively low health indicators as compared with the rest of the country. Fig. 9 shows a cross sectional chart of the mining value per capita on the x-axis and the infant mortality rate on the y-axis for each Jordanian city. As mining value per capita increases across the x-axis, the infant mortality rate tends to rise.

By comparing health indicators in Southern mining communities with Northern and Central parts of the country, Table 4 shows that the Southern Regions have lower life expectancy for males and females, higher rates of children suffering malnutrition, higher

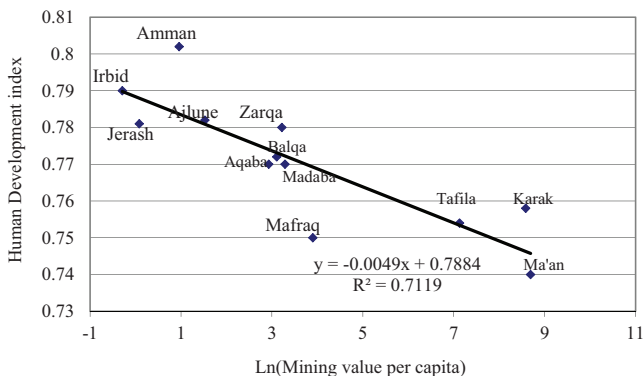


Fig. 7. Cross sectional chart of mining value per capita and Human Development Index from 2010 to 2013.

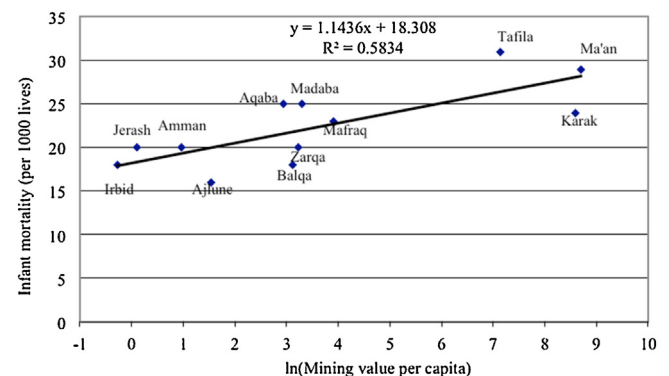


Fig. 9. Cross sectional chart of mining value per capital and infant mortality rate from 2010 to 2013.

Table 4

Major average annual health indicators of Northern, Central and Southern parts of Jordan from 2010 to 2013.

Indicator	South Region	Middle Region	North Region
Life Expectancy (Male)	68.9	71.3	69.9
Life Expectancy (Female)	71.7	73.6	72.9
Children suffering malnutrition (%)	2.7	1.2	1.6
Infant Mortality (%)	26.0	19.0	20.0
Percentage of children not receiving vaccines	2.4	0.1	0.1
People suffering from Asthma (%)	0.84	0.73	0.83
People suffering chronic diseases (%)	2.3	1.3	2.2
People suffering from heart diseases (%)	0.78	0.45	0.7

Source: Jordan Department of Statistics (2014).

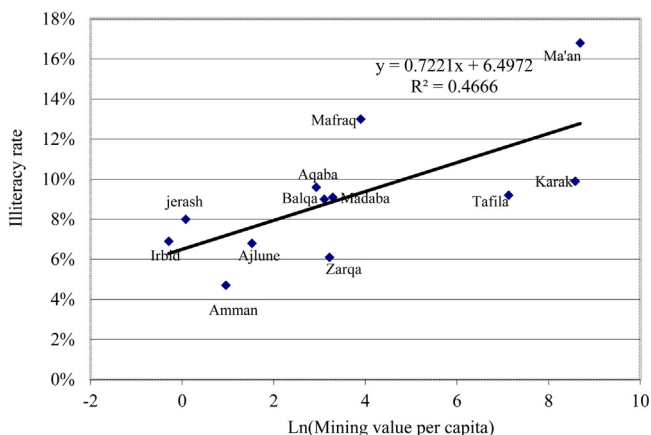
infant mortality rate and higher rates of children who don't receive vaccines. When taken as a group, the Southern communities with a greater the dependency on minerals, have a greater likelihood that children born there will die at birth, will have poorer health care and nutrition than their resource-poor counterparts, and will die sooner, if they survive at birth.

Also as can be seen from Table 4, Southern mining communities have been afflicted by higher percentage of people suffering from asthma, chronic and heart diseases. Most of these diseases indicate less health care availability in the South since most highly qualified doctors do not work there because of low quality of life style. Asthma is a wide spread disease in the South. Fertilizers plants use phosphate rock with ammonia in order to make Di-ammonium phosphate, and the exposure to ammonia is very highly related to asthma.

4.5. Education indicators

Given the available resources, education also performs worse than expected in the South, affecting future prospects for growth. Jordan, inadvertently or deliberately, neglected the development of Southern mining communities by devoting inadequate attention and expenditure to education. As Fig. 10 shows, there is a positive correlation between mining value per capita and illiteracy rate which means that as we move across the x-axis, mining per capita values tend to increase and the illiteracy rate tend to rise.

As Table 5 shows, in 2013, illiteracy rate in the South reached 11.3% compared to 8.7% and 7.2% in Northern and Central parts respectively. The net secondary school enrollments in the Southern mining Regions tend to be lower than in their non-resource-rich counterparts. In the Southern communities, for example, 83% of all children go to secondary school compared with 88% and 91% in the Central and Northern parts respectively. The adult literacy rate for

**Fig. 10.** Cross sectional chart of mining value per capita and illiteracy rate from 2010 to 2013.**Table 5**

Major average annual education indicators of Northern, Central and Southern parts of Jordan from 2010 to 2013.

Indicator	South Region	Central Region	North Region
Illiteracy (%)	11.3	7.2	8.7
Reading and writing (%)	3.3	2.9	2.8
Secondary enrolment rate (%)	83.0	88.0	91.0
Adult literacy (male)	0.93	0.96	0.94
Adult literacy (female)	0.83	0.89	0.84
Adult literacy (total)	0.89	0.92	0.89
Bachelor degree (%)	10.7	13.3	11.3
Master degree (%)	0.40	0.73	0.63
PhD degree (%)	0.15	0.23	0.20

Source: Jordan Department of Statistics (2014).

male and female and the percentage of students holding bachelor, master and PhD degrees in the South tends to be less than those in Central and Northern parts. Flooded with easy money from mining, the government has underestimated the need for strong educational policies in the Southern Regions that could have achieved long-term development benefit and social equity across the country.

In 2013, the Department of General Statistics conducted a statistical survey, where it was found that about 33,000 children were truant and working in Jordan, and interestingly, that 3,300 of them were aged 5–12 years and most of them were from the South. The main reason is poverty, which is leading these children to work in order to assist their families. Another reason is, which is no less important than the first, is insufficiency of the educational system in facing the education essentials of students with learning difficulties.

4.6. Environmental indicators

Air emissions, discharges of liquid effluents and large volumes of solid waste are responsible for the most important negative environmental impacts of the mining and minerals industry. There are several examples of these impacts in Jordan from the activities of the phosphate industry. After collecting dust samples from Southern and Northern Jordan, El-Hassan et al. (2002) found generally higher concentrations of arsenic, cadmium, sulphur and phosphates (PO₄) in the South of Jordan than in the North. They argued that this might be due to the phosphate handling activities of the port at Aqaba, –see Table 6.

Table 6

Arsenic, Cadmium and Sulphur concentrations (in parts per million) in dust sample taken from the South and Central areas of Jordan in 2002.

Element	South part of Jordan	Central part of Jordan
Arsenic	98	53
Cadmium	13	1.7
Sulphur	12,800	6331.1

Source: El-Hassan et al. (2002).

Table 7

Environmental impacts of phosphate in Southern Jordan.

Significant environmental & socio economic issues
Energy consumption
Consumption of limited water resources
Changing the local geomorphology
Effect on the local climate including air pollution
Effect on the biodiversity in the Aqaba gulf
Effect on the marine ecosystem in the Aqaba gulf
Effect on public health of workers and local communities

Source: Mosa et al. (2008).

Table 7 summarizes significant environmental and socio-economic issues of mining. Production and processing of phosphate has a negative effect on energy consumption, water usage and on local geomorphology of the surrounding areas. Processing of phosphate consumes high amount of water in a country like Jordan that has limited and scarce water resources and its impact may be high. Through the years, mining of phosphate has changed the landscapes and geomorphology due to the removal of mineral resources which had also caused a high visual impact on neighborhood areas.

Also as Table 7 shows, phosphate-mining activity can have a negative impact on the local climate of the area by causing what air pollution. Furthermore, it also has a negative impact on the area's biodiversity that include several rare species, such as the grey wolf and sand cat. It has also an impact on the marine ecosystem in the Aqaba gulf that is located south of the phosphate mines. Local air pollution resulted from overburden removal can also have a negative impact on the health of workers and local population due to incidental releases of particles and toxic substances.

5. Regional analysis (Ma'an area)

The development indicators show that the South Region of Jordan lags the averages of the country as a whole, and that there appears to be a correlation between mining activities in the country and lower-than-average performance measured in the development indicators. However, these results could be due to other factors at work, and the mining communities may be better off than they would have been otherwise. To look further at this possibility, the case study of Al-Shidiyah mine in Ma'an is considered.

Phosphate is produced from four mines in Jordan; Al-Rusaifa (located in Northern area), Al-Hasa (located in Tafila-South), Al-Abiad (located in Karak-South) and Al-Shidiyah mine (located in Ma'an-South). These mines began operation in 1953, 1962, 1978 and 1988 respectively. Phosphate is transported from these mines to company facilities to be exported by trains and trucks. In

Fig. 11, it is observed that of the four major mines, production from Al-Hasa mine and at Al-Abiad mine exceeded production at Al-Shidiyah until the year 2000, when production at Al-Shidiyah started to exceed the output of the other two mines and it has continued to increase. In 2013, Al-Shidiyah contributed around 67% of the total phosphate production in Jordan with production at Al-Hasa and Al-Abiad contributing 20% and 13%. Al-Rusaifa mine has declined to nil.

Fig. 11 shows that in 1990, 53% of total phosphate production came from Al-Hasa mine, 39% and 8% from Al-Abiad mine and Al-Shidiyah mine respectively. However, phosphate production during 2000–2013 declined by 55% at Al-Hasa and 41% at Al-Abiad and it increased to 150% at Al-Shidiyah mine during the same period time.

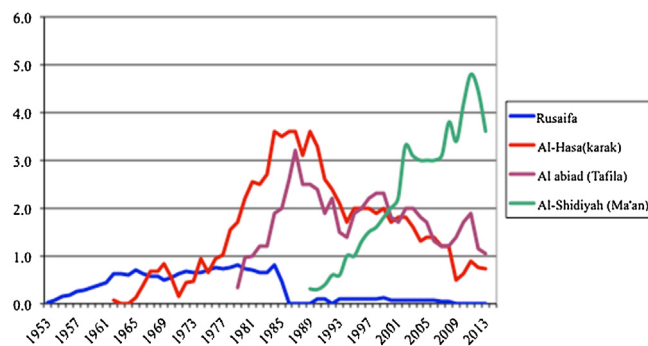
Jordan's total phosphate ore reserves at the beginning of 2014 were estimated to be 1.5 billion tonnes. Out of this, Al-Shidiyah mine alone contains around one billion tonnes of phosphate ore. With the better evaluation of existing mines and with new discoveries, the reserves could farther grow. Production from the Al-Shidiyah mine, which is located in Ma'an, started in 1988 and it has been developed by JPMC in two stages with the help of World Bank assistance. In the long run JPMC is going to concentrate its production on the vast low cost Al-Shidiyah mine.

Since regional data for development indicators are limited before the year 1990, the only data available to measure the impact of mining into the Southern regional development of Jordan is to look at the changes as the phosphate mine, Al-Shidiyah grew in production. One approach is to compare development indicators in the Ma'an area before and after the establishment of the mine with what occurred for the country as a whole.

As can be seen in Fig. 12, since the commencement of the operation of the mine, unemployment rate in Ma'an area has decreased from 27.9% in 1990 to around 17% in 2013.

Revenues received from mining can support community health, education, economic and other programs established by the community or by the community in partnership with the mining company. For example, educational standards have increased with mining production for the people living in Ma'an. As can be seen in Table 8, number of schools has increased from 133 schools in 1990 to around 221 schools in 2013; the illiteracy rate has decreased from 24% in 1990 to around 12.5% in 2013. Also primary and secondary enrolment increased from 84% and 70% respectively in 1990 to 91.1% and 81% respectively in 2013.

Strong correlation coefficients can be observed (Table 8) between mine production trends and number of schools (0.95), illiteracy rate (-0.70), secondary school enrolment (0.84), primary school enrolment (0.86), % of people with the bachelor degree (0.80), % of people with the masters degree (0.60) and % of people with the PhD (0.86).

**Fig. 11.** Main Phosphate mines production (in million tonnes) from 1953 to 2013.

Source: Jordan Phosphate Mines Company (2016).

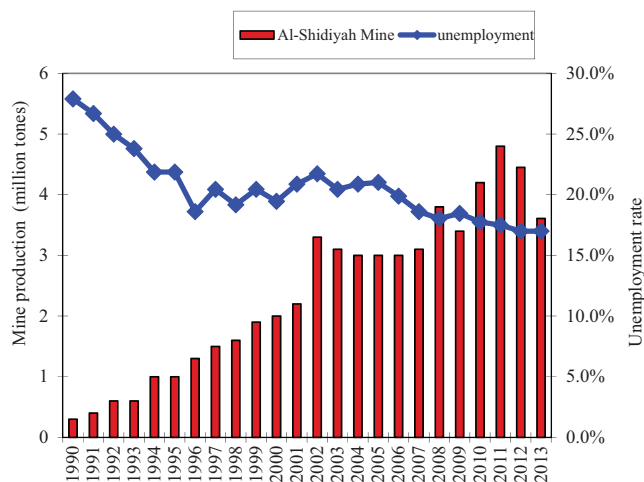


Fig. 12. Production and unemployment trends in Ma'an area from 1990 to 2013.

Source: Jordan Department of Statistics (2016) & Jordan Phosphate Mines Company(2016).

Table 8

Educational indicators and mining trends from 1989 to 2013.

Development indicators	Before Mining 1989	After mining					Correlation coefficient between mining and educational indicators from 1990 to 2013
		1995	2000	2005	2010	2013	
Mine production (Mt)	0.3	1.1	2.0	3.0	4.2	3.6	
Number of schools	133	153	180	220	236	221	0.95
Illiteracy rate (%)	24.0	22.0	19.6	15.6	13.5	12.5	-0.70
Secondary enrolment (%)	70.0	75.2	79.9	85.6	87.0	81.0	0.84
Primary enrolment (%)	84	87.8	89.0	89.3	91.4	91.1	0.86
Bachelor degree (% of total population)	1	2	4.4	6.1	8.7	8.6	0.80
Masters degree (% of total population)	0	0	0.2	0.4	0.3	0.3	0.60
PhD degree (% of total population)	0	0	0	0.1	0.2	0.2	0.86

Source: Jordan Department of Statistics (2016).

Table 9

Health, construction and economic indicators and mining trends from 1989 to 2013.

Development indicators	Before mining 1989	After mining					Correlation coefficient between mining and educational indicators from 1990 to 2013
		1995	2000	2005	2010	2014	
Mine production (Mt)	0.3	1.1	2.0	3.0	4.2	3.6	
Health indicators							
Life expectancy	68.9	69.6	70.7	71.6	72.4	72.7	0.91
Infant mortality (per 1000 lives)	34.0	32.0	28	25	23.0	22.0	-0.90
Malnutrition prevalence (%)	9.6	7.6	7.2	5.0	3.6	3.5	-0.93
Construction indicators							
No. of business shops	66.0	169	493	910	1300	1500	0.83
No. of real estates licenses	30	152	135	134	200	220	0.42
Economic indicators							
Human Development Index	0.61	0.65	0.69	0.72	0.73	0.74	0.92
Unemployment rate (%)	28.0	21.9	19.5	21.0	17.8	17.0	-0.78
Poverty rate (%)	24.5	-	-	-	12.7	12.7	-

Source: Jordan Department of Statistics (2016).

Within the context of the economic base view of the local economy, local economic health is determined by the health and profitability of those mining-oriented businesses with which the local community is blessed. In that context, any government regulations that might reduce that profitability can be depicted as threatening local economic health. For example, as Table 9 shows, life expectancy of the people of Ma'an increased from 68.9 in

1989 to 72.7 in 2013. Infant mortality (per 1000 lives) decreased from 34 to 22 and children malnutrition prevalence has decreased from 9.6% in 1989 to around 3.5% in 2013.

The correlation coefficients shows that higher levels of mining activity are associated with higher levels of life expectancy (0.91), lower infant mortality (-0.90) and lower malnutrition prevalence (-0.93). Also, the incomes that employees at the mine and their

households spend on goods and services in the local community or the adjacent region can result in the opening of more businesses and shops, as can be seen business shops increased from 66 shops in 1990 to around 1500 shops in 2013.

As also shown in Table 9 is that the Human Development Index increased from 0.61 in 1989 to 0.74 in 2013 and unemployment rate declined from 28% in 1989 to around 17% in 2013. The poverty rate has declined from 24.5% in 1989 to around 12.7% in 2013. While the poverty gap between overall Ma'an region and the rest of Jordan's regions has narrowed since 1990, rates still remain higher than the country's average.

When comparing the change in development indicators for the Ma'an region with the average for the country from 1989 until 2013, it provides some insight into the possible positive impact of mining for the region. Changes in the development indicators for the Ma'an region are similar to the changes for the country overall. Some indicators showed a little more improvement and others less. There is no strong evidence of any significant difference. Ma'an and the South Region in general still maintain their lagging performance in comparison with the rest of the country. This result does not suggest any significant development benefit from mining in the region to offset the negative impacts of mining on the local communities.

Table 10 shows the variation in unemployment and poverty rate from 2000 to 2014 in Jordan's twelve governorates. As can be seen from the table, the biggest improvements in these indicators since 2000 have occurred in the non mining regions particularly, the Northern and Central parts of the country. For example the percentage changes (decline) in unemployment rate in cities like Irbid, Mafraq, Jerash, Ajlune and Zarqa were -18.8% , -31.8% , -28.9% , -14.1% and -21.1% respectively which are greater than percentage changes in the major Southern mining governorates (Karak -3.4% , Tafila -5.3% and Ma'an -10.5%). Also percentage changes (decline) in poverty rate in major governorates in Northern and Central parts of Jordan were greater than mining governorates. For example, percentage changes in poverty rate in Irbid (-43.5%), Mafraq (-58.2%), Amman (-57.6%) and Madaba (-37.2%) were higher than Tafila (-13.2%) and Ma'an (-35.1%). On the other hand Karak governorate, where Al-Abiad and potash mines are located, suffers from a 31.5% rise in poverty rate.

6. The role of the mining companies

Mining companies can support local communities by addressing their needs in ways that raise local living standards and contribute to

improving services provided in different sectors with the aim of achieving social balance and sustainable development. In the area of social responsibility, investment in the development of local communities and protecting the environment, in 2013, the Arab Potash Company (APC) donated more than USD 14 million, which were spent according to priorities defined in consultation with the local authorities and civil society organizations. The number of beneficiaries from these grants exceeded 2000 organizations and more than 100,000 citizens. Donations and Grants given by APC included 23% on education, 21% on official bodies, 18% on social development, 13% on health, 12% on water and environment, 5% on sports, 4% on houses of worships and 3% on cultural activities (see Fig. 13).

Though they have been supportive, however, there is no specific law that obliges Jordan mining companies to spend a share of their profits on local communities' development. The amount of money to be spent to support local communities is solely determined by senior management and the board of directors. In 2005 JPMC profits reached USD 14.7 million, but it only distributed USD 2600 to local communities (Jordan Phosphate Mines Company, 2016), a very trivial number compared to the size of profits the company received.

Table 11 shows the total expenditures of mining companies on local communities' developments. The data shows that the total expenditures ranged from USD 1.26 million in 2005 to around USD 20.29 million in 2013 that represented 1.7% and 5.4% of total mining profits respectively. As can be seen in the table, major rises in oil prices have generated a high demand for bio-fuel, which in turn have caused a dramatic upturn in phosphate and potash prices in 2007 and 2008. This development suddenly made mining the fastest growing sector in the Jordanian economy and the net profits of the JPMC and the APC at that time were around USD 276.8 million and USD 775.5 million respectively.

Yet the percentage of mining expenditures on local communities over their total net revenues did not change during the phosphate and potash price booms, and remained around 1 to 1.5% from the year 2007 to 2009 that is less than the percentage the mining companies used to distribute in 2005 and 2006 which reached to around 1.7% and 5.8% respectively. It seems that there has not been a policy to raise local communities' expenditures when prices for mined resources rise.

In some countries, such as Canada and Australia, mining companies have begun to negotiate agreements with impacted aboriginal communities so that the latter receive a share of the benefits that are created from mining activity. These benefits can

Table 10
Variations in unemployment and poverty rates from 2000 to 2014.

City	Unemployment rate (2000)	Unemployment rate (2014)	(%) Change	Poverty rate	Poverty rate	(%) Change
North Region						
Irbid	16.0	13	-18.8	26.0	14.7	-43.5
Mafraq	17.3	11.8	-31.8	35.9	15.0	-58.2
Jerash	19.0	13.5	-28.9	19.2	15.0	-21.9
Ajlune	17.0	14.6	-14.1	17.3	13.3	-23.1
Central Region						
Amman	13.0	12.0	-7.70	19.6	8.3	-57.6
Balqa	15.0	14.0	-6.7	21.8	19.7	-9.6
Zarqa	15.2	12.0	-21.1	16.3	11.2	-31.2
Madaba	15.0	16.0	6.70	23.9	15.0	-37.2
South mining Region						
Karak	17.9	17.3	-3.40	13.0	17.1	31.5
Tafila	19.0	18.0	-5.30	24.3	21.1	-13.2
Ma'an	19.0	17	-10.5	37.3	24.2	-35.1
Aqaba	14.5	15.0	3.4	17.0	11.8	-30.6

Source: Jordan Department of Statistics (2016).

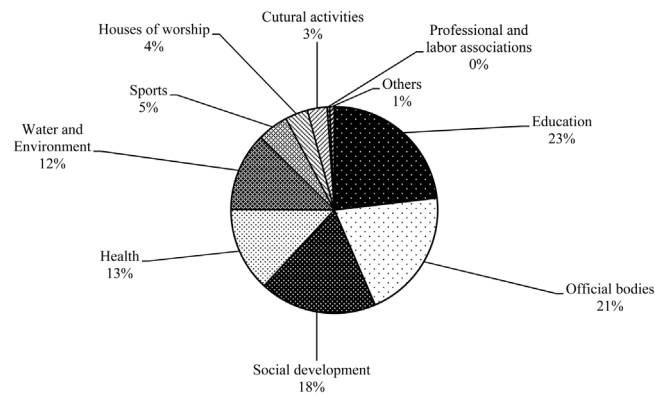


Fig. 13. Donations and Grants given by Arab Potash Company in 2013.

Source: Arab Potash Company (2014)

Table 11

Expenditures of Mining companies on local communities all over the country from 2005 to 2013.

Year	Total expenditures on local communities in USD (000)	Total mining profits in USD (000)	Percentage of local communities expenditures (%)
2005	1,263	75,326	1.7
2006	4,542	77,846	5.8
2007	3,104	276,797	1.1
2008	11,920	775,516	1.5
2009	4,086	316,787	1.3
2010	7,105	342,534	2.0
2011	10,083	627,386	1.6
2012	17,093	466,051	3.7
2013	20,288	369,933	5.4

Jordan Phosphate Mines Company (2014) & Arab Potash Company (2014).

take the form of employment opportunities, a share in mine profits, and investment in local development and infrastructure projects such as roads, schools, and clinics.

In Canada, the Reglan agreement, signed in 1995, has been used as a benchmark as the first national agreement in the mining industry. The profit sharing arrangement included a commitment to provide 4.5% of operating profit to community partners (Wall and Pelon, 2011). In Senegal, 20% of mining revenues (taxes and royalties) are used to create a national equalization fund. The local authorities in the mining region receive 60% of the fund, with the remaining 40% being shared by other local authorities in the country. The funds are shared between mining regions in amounts that are proportional to the revenues generated and the local population.

In the USA, mining companies have reached agreements to establish directly the economic and other benefits that a local community would get from the proposed mining activity. For example the pact reached by Kennecott (Rio-Tinto) and the local communities around the Ladysmith Mine (in Wisconsin) included cash payments, the development of recreation sites as part of the restoration process, and careful long-term monitoring of the environment (Campbell and Roberts, 2010). The discussion about the opening of the Eagle Mine (in Michigan) focused on the trade-off between the direct economic benefits to the local communities like primary and secondary jobs, local purchases, and a significant increase in the tax base versus the potential environmental and social costs of the mine (Campbell and Roberts, 2010).

Mineral activities in Jordan, as currently undertaken, appear to largely fail to benefit local communities beyond what is happening in the country as a whole. Policies and rules need to be developed for redistributing part of the Jordanian mining companies' wealth

to local communities better (e.g. part of mining fees, taxes and profits) and in order to offset the local cost of mining.

7. Conclusion

Mining operations routinely cause serious social, health, and environmental impacts. In virtually all cases, these are disproportionately borne by local communities. Development Indicators in the Southern mining territories of Jordan including, unemployment rate, Human Development Index, poverty line, health, education and environmental, have underperformed those in non-mining regions in the Northern and Central parts of the country. Improving standard of living, education, health and environmental standards of local communities would help to attract further investment and thereby sustain the community after mine closure.

The paper concludes that there has not been an internal company policy that obliges mining companies to contribute part of their profits for local communities' development especially during the price booms. In order to help local communities to generate positive impacts from large mines, the Government of Jordan should redistribute some of the tax revenue from mining to local governments and encourage the mining companies to contribute more to the welfare of the local communities.

Some developing countries established a Mineral Development Fund (MDF) that is used to fund public mining sector institutions and projects in mining communities. This could be recommended in Jordan's case, but since Jordan's mining companies are privatized, the government should promote social responsibility among mining companies toward the communities. Local communities should participate in decision-making and share the

benefits of mining and governments should also work as an intermediary between mining companies and local communities to insure their rights to gain part of the profits. This could be accomplished by playing the role of go-between that shows both the company and the community the fundamental nature and legitimate aspirations of each side.

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