The Challenges of Supply Chain in the Gold Mining Sector of Obuasi Municipality of Ghana

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ABSTRACT

Gold mining industry represents an important source of socio-economic development in most economies. Ghana has had its fair share of the benefits the mining sector brings by way of direct revenue generation and job creation. In spite of this significant contribution from gold mining, the sector appears to be facing various forms of challenges. This study aims at assessing the supply chain challenges facing the gold mining operations in Obuasi and its environs in the Ashanti region of Ghana. A combination of qualitative and quantitative methods with case study strategy was used in the study. Primary data was collected from field survey through questionnaires, semi-structured interviews and observation. The data was analysed using quantitative and qualitative approaches. The major supply chain challenges found to be facing the mining sector in Obuasi include supply of low quality products, unreliable or variable lead times, non-availability of local firms of international standard, fluctuation in Gold prices on the international market, high transportation cost and violence and sporadic attack from the communities. It is recommended that the mining firms should involve their key and strategic suppliers in product designs and development of specifications. Also, improving upon information sharing and building trust and transparency and developing the capacities of their key suppliers to improve the performances of the entire supply chain could also deal with delays and quality related supplies. Finally the Ministry of Energy, the Environmental Protection Agency and other institutions should collaborate with the mining firms to deal with issues of environmental pollution and matters of perceived inadequate compensation to community members whose farm lands get destroyed by the mining activities to address any unhealthy conflicts between the mining firms and the communities.

1. Introduction

Mining industry is an important sector for the development of economies of countries that have substantial gold deposits. The industries have attracted both large and small scale (artisanal mining) operations. Challenges in the mining supply chain have negatively affected the Gross Domestic Product (GDP), especially in recent times. Ghana is among African countries that have substantial gold deposits yet the country continually rely on donor countries to meet its annual budgetary target. It is reported that Ghana is the second largest producer of gold on the African continent and is also the tenth largest producer of gold in the world. Indeed the country accounted for 3.4% of the total world production in 2008 (Revenue Watch Institute, 2011; Kapstein and Kim, 2011; Hilson, 2004).The Federation of Ghanaian Jewelers Association has been complaining of non-availability of adequate raw materials needed to feed the jewelry industry. This gives course for concerns as the situation is threatening the sustainability of the jewelry industry in Ghana in spite of the fact that Ghana is the second gold producing country in Africa (Anane, 2011; Hilson , 2004). This gives an indication of possible challenges facing the mining supply chain in the country.

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Issues regarding the real economic benefits of the mining boom also arise because of the gold sector's limited capacity to generate local employment and its failure to build the kinds of inter-industry linkages (e.g., through the value-added domestic processing of minerals) that could contribute to the economic diversification and industrialization process (Aryee, 2001).

Ideally the mining supply chain, as part of its benefits to the society, is supposed to provide source of income for the indigenes of the various communities where the mining activities take place and to contribute to the national economy. However, it appears that this expectation has been almost be disappoing as a result of the seeming challenges the mining supply chain faces. Another issue that gives course for concern is threats or risks that mining activities pose to the livelihood of the rural communities. Hundreds of thousands of the rural poor, who are largely unexposed to the wage economy, derive their livelihoods directly from small-scale agriculture and the natural resources provided by the country's forests. The rapid expansion of surface gold mining operations by foreign Transnational and National Corporations (TNCs) in most part of the country represents a grave threat to rural livelihoods and indigenous survival (Amankwah and Buah, 1998;Tsikata, 2007;Hilson, 2004).

Again, the mining operations have wreaked heavy environmental and social havoc in the country. For example, the construction and operations of a surface mining involve clearing lands to make way for many new roads, buildings, stockpiles of ore and waste, resettlement of displaced communities, and the open-pit mining, to name some examples. These have led to clashes and violence related disputes between the mining communities and the mining firms, thus causing social and environmental insecurity (Akabzaa and Darimani, 2001; Anane, 2011; Zorrilla, 2009; Hilson, 2004).Furthermore, the mining industry seems to be facing various forms of challenges within the supply chain in Ghana such as poor road networks in the mining communities, strict government regulations and policies, variable lead times exchange rate volatilities, interest rate volatilities and other supply related issues (Anane, 2011; Hilson, 2004). These challenges together with clashes and violence related disputes between the mining communities and the mining firms that seemingly face the mining supply chain in Ghana, and in particular Obuasi and its environs, is adversely effecting not only national economy but also the lives of rural communities where mining operations take place.

This study, therefore, aims at assessing the supply chain challenges in the mining industries within the Obuasi and its environs of Ghana as well as the underlying factors that lead to violence related disputes that usually ensue between the mining communities and the mining firms within Obuasi Municipality.

2.0 Related Studies

2.1 The Role of Supply Chain in the Business Performance

The term supply chain (SC) has been defined in several ways from various perspectives. However, the concept that runs through various discussions of it is basically the same. Supply chain involves the network of organisations, which are involved through upstream and downstream linkages, in different processes and activities that create value in the form of products and services for final consumer (Christopher, 1998 cited in Peck, 2005; Christopher, Peck and Towill, 2006). Supply chain management (SCM) can be viewed as a business process that seeks to ensure efficient and effective flow of products, materials services, information from the supplier through to the customer (Chopra and Meindle, 2007; Coyle, Langley, Novack and Gibson, 2013).

It is clear from the above exposition that supply chain management seeks to enhance competitive performance by closely integrating the internal cross-functions within a company and effectively linking them with the external operations of suppliers, customers, and other channel members to be successful (Otchere Annan and Anin, 2013, Lambert, 2006). The basis of SCM is characterized by cooperation, collaboration, information sharing, trust, partnerships, shared technology, and a fundamental shift away from managing individual functional processes, to managing integrated chains of processes (Otchere*et al.* 2013,Tilamus, 1997; Tseng, Yue and Taylor,2005; Stock and Boyer, 2009).

The increasingly competitive nature of global business environment such as the mining industry has great influence on business activities. In the face of such fierce competition, supply chain then becomes a key business process model for organizations to be able to compete favorably in the business environment, both locally and internationally (Ou, Liu, Hung and Yen,2010; Baharanchi, 2009). The roles SC plays include, but

not limited to, coordination in the supply network, alignment with customer satisfaction and sustainability of the overall competency throughout the supply chain to ensure efficient and effective business performance (Faisal, Banwet and Shankar, 2006; Chopra and Sodhi 2004). To realize these objectives, the mining sector, just like other industries, requires close and seamless coordination among all the members of the supply chain.

2.2 Logistics system

Logistics as part of supply chain has to do with planning, implementing and controlling the efficient and effective forward and reverse flow and storage of goods, services and associated flow of information between the point of origin and point of consumption such that customer satisfaction can be met (Council of Supply Chain Management Professionals (CSCMP), cited in Jonsson, 2008). According to CSCMP, logistics activities include inbound and outbound transportation management, warehousing, material handling, inventory management, planning and management of third party logistics services, supply and demand planning, sourcing and procurement, production planning, customer service among others. These logistics activities are typical of that within the mining SC. They thus constitute essential part of mining operations. The purpose of logistics in organizational activities, including mining firms, is to ensure that efficiency and effectiveness are improved through effective management of material and information flows in order to enhance performance and competitive advantage. Logistics system has influence on customs service, cost, flexibility, time and environment (Jonsson, 2008; Tilamus, 1997; Tseng, Yue and Taylor,2005). Logistics service influences customer service by creating goods delivery, services and ensuring information flow. Effective handling, movement and storage of materials as well as management of inventory reduce tied-up capital and logistic cost. Similarly, effective logistics planning creates flexibility and reliable delivery time for the customer. Water pollution, land destruction, noise from transportation, emission, poor handling of waste from mining operations and high energy consumption which are examples of environmental impact of logistics and supply chain activities,(especially within the mining sector) can be minimized through a well planned logistics system. Jonsson (2008), outlines some logistics related measures aimed at minimizing environmental impact. They include the use of vehicles, engines and fuels which are environmentally friendly, paying environmental taxes to governments for the restoration of depleted environment and strict adherence to environmental protection requirements. He continues that effective logistics system should ensure that logistics activities conform to the environmental protection requirements to ensure sustainability of the environment. In Ghana, the mining firms pay royalties to the communities within which they operate for improving upon the social infrastructure and the environment of the communities.

2.3 Sourcing

Logistical and cross functional drives of supply chain play crucial role in the performance of supply chain activities in terms of efficiency and responsiveness. The logistical drives include facilities, inventory and transportation whilst that of functional includes flow of information, sourcing and pricing (Chopra and Meindl, 2007). Sourcing as a cross functional driver is key in the mining supply chain as it determines what function a firm performs in-house and what the firm outsources. Sourcing is concerned with the choice of who will perform particular supply chain activities such as production, storage, transportation or management of information. The effectiveness and efficiency of a particular supply chain is to a large extent dependent by sourcing activities (Chopra and Meindl, 2007;Stock, Stefanie, Boyer and Harmon, 2010; Van Weele, 2008, Jonsson, 2008).

2.4 Sourcing Strategies

Effective sourcing is one of the strategies that can overcome challenges of supply chain performance. Jonsson (2008) outlines two basic sourcing strategies as single sourcing and multiple sourcing. Single sourcing has to do with a company using one supplier for a particular item even when there are several other suppliers available on the market. The use of single sourcing approach is driven by cost effectiveness as small purchase volumes that do not make economic sense to use several supplies. Again the need to create collaborative and partnership relations with supplies may be compelling motivational consideration for single sourcing approach. Sadler (2003) delineates that partnership sourcing is developed and implemented with the intention to achieving competitive advantage. The assertion continues that partnership sourcing aims at, among other things, reducing stock times, shortening lead times, achieving a greater flexibility, improving the cash flow as well as lowering the administrative costs.

Multiple sourcing by contrast is concerned with the used of several alternative supplies for the performance of certain supply chain activities. The use of multiple sourcing is inspired by the fact that the sourcing

company can improve its negotiation leverage and reduce risk, that is one supplier can be used to compensate other in an event that one runs into delivery challenges although there is the notion that multiple sourcing approach reduces the chances of carrying out continuous improvement work (Coyle *et al.*, 2013; Jonsson, 2008; Van Weele, 2008; Lysons and Faerrington, 2006). Both single and multiple sourcing strategies are common practices of the mining supply chain. The use of a particular approach depends on certain factors such as the objectives to be achieved, the activities involved or the items to be supplied, availability of qualify suppliers, the prevailing circumstances and other strategic reasons.

2.5 Local and Global Sourcing

Local sourcing is concerned with selecting suppliers from the area where the organization's activities or project is being undertaken. In other words suppliers whose activities are closed to the sourcing organization are given priority over offshore suppliers. The use of local suppliers is informed primarily by its efficient exchange of information and personal contacts as well as the advantage of high delivery flexibility and frequent deliveries even upon short notices as against overseas sourcing which is characterize by some challenges such as logistics support for longer supply links, cultural and language differences among others (Birou and Fawcet cited Lysons and Farrington, 2006; Monckza and Trent, 2005;Jonsson, 2008).

In spite of numerous advantages derived from local sourcing such as delivery flexibilities and providing employment to the local people, there are other reasons that push for global sourcing. One reason being the limited chances of finding local suppliers of world class standard especially for the mining operations which is characterized by high technology. The difficulty in finding local suppliers who can perform to global standard drives most mining firms to source more from global market, (Jonsson, 2008). Thus, where local suppliers lack the required resources and competences to ensure quality performances, supply chain organizations within the mining sector resort to offshore/global sourcing; this limits employment opportunities for the local people.

2.6 Evaluating Supply Chain Performance

Supply Chain Performance is concerned with the extent to which the supply chain successfully achieves its desired objectives. Effective performance of supply chain should reflect on customer satisfaction and financial performance. Many organizations want to achieve effectiveness (doing the right thing) and efficiency (doing the things right) however, merely stating these objectives (effectiveness and efficiencies) is not enough unless there is specific measurable metrics in place to enable the organization evaluate the extent to which these objectives are achieved (Coyle *et al.*, 2013).

Logistics Management (2006) cited in Coyle *et al.* (2013) developed supplier Key Performance Indicators (KPI) that can be used to evaluate the stated supply chain objectives. These KPIs include on-time delivery, quality of goods and services, service capability and performance, price competitiveness, compliance with contract terms, response, lead time, technical capability, environmental and safety performance and innovation. Under achievement in any of these KPIs poses a challenge to the entire supply chain. For example, delay in delivery; unreliable lead time and inability to meet environmental requirements are factors that could pose a great deal of challenge to the mining supply chain. Another method which is based on four key categories has been developed to provide a useful basis for evaluating logistics and supply chain performance. These categories were time, quality, cost and what is termed as supporting metrics. Elements of time include on-time delivery, order cycle time variability and forecasting and planning time. Quality factors include overall customer satisfaction, processing accuracy, perfect order fulfillment, forecast and planning accuracy. Variables under cost include transportation cost, inventory carrying cost, material handling cost, and cost of goods among others whilst the other supporting category includes minimum order quality, change order time and availability of information (Keebler, Durtche, Manrodt and Ledyard, 1999, cited Coyle *et al.*, 2013).

Perhaps one particular model that has increasingly become popular is the Supply Chain Operations and Reference (SCOR) developed by the Supply Chain Council. The model identifies five major factors of metrics useful for measuring supply chain performance. These include reliability, responsiveness, flexibility, cost and asset. Reliability has to do with delivering the correct product to the correct place, at the correct time, in the correct condition, in the correct quantity with the correct documentation to the correct customer. Responsiveness is concerned with the rate or speed at which products are provided to the customer. Flexibility refers to how agile the SC is in responding to changes in the market place to gain and maintain competitive advantage. Cost is concerned with expenses incurred with operating the supply chain whilst

asset management factor is about how effective an organization manages assets to support demand satisfaction (Coyle et al, 2013, Jonsson 2008; Supply Chain Council, 2007 cited Chopra and Meindl, 2007). Effective and efficient mining operations is, to a large extent, dependent on reliability, responsiveness, flexibility of the various partners and parties of the entire SC. Again, effective management of assets and supply of components and service support services at the right cost, which do not compromise quality, is key in meeting the desired objectives of supply chain. Under Performance in any of these KPI could be source of challenge to achieving supply chain objectives.

2.7 Supply Chain Challenges in the Mining Industry

Supply chain in the mining sector is becoming increasingly complex. This complexity has increased the vulnerability and exposures of mining operations to many internal and external challenges that have the potential to cause huge distraction to the operations of SC activities. As a result, most businesses have realized the need for mechanisms to identify these challenges and risks in early stages and then manage them in the most effective way to survive the adverse consequences that may come about. Also, the large number of links that need to be created between members of the SC in the mining operations have increased the challenges facing the sector such that even small incident in one distant area can lead into adverse consequences for other associates within the SC (Christopher *et al*., 2006, Otchere *et al*., 2013; Faisal, Banwet and Shankar, 2006; Chopra and Sodhi, 2004). SC challenges varies with type of industry and the level of complexity of the SC network, however, it could be seen that most of the SC associated challenges are common in most industries including mining. The mining SC, for example, is characterized with frequent occurrence of natural disasters, labour disputes, and uncertainty in supply and demand, supplier bankruptcy, political changes, and terrorism among others (Anane, 2011; Akabzaa and Darimani, 2001; Tsikata, 2007). In Ghana, violence and disputes as well as accident related deaths are common challenges that characterize mining operations in most communities, and the need to deal with these challenges is imperative.

The World Bank (2012), reporting on SC risks in the cocoa industry in Ghana asserts that supply chain challenges can be grouped into three main categories. These are production, commercial or market and environmental. Even though these SC challenges, as described by the World Bank report, are more related to cocoa production, they are also prevalent in other business sectors including mining. The report describes market or commercial challenges within the supply chain in Ghana to include, but not limited to, products price volatility, exchange rate volatility, input price volatility, and interest rate volatility. Elements or factors of environmental challenges captured by the report, among others, were depletion of agricultural lands, government regulations and policies as well as logistics related issues. Logistics related issues include, inter alia, variable lead times, transportation challenges arising from poor road networks and limited capacity of local suppliers (World Bank, 2012).The rapid growth in surface gold mining operations in Tarkwa and other communities in Ghana have had negative social impacts on local communities. These include but not limited to:

- Forced Dislocation,
- Degradation and Loss of Agricultural Lands,
- Family Disorganization
- High Costs of Living (Akabzaa and Darimani, 2001)

2.8 Violence in the Gold Belt

Over the last two decades, communities on the fringes of large-scale mining projects have been subjected to increasing use of intimidation, abuse, violence, and violations of human rights by mining companies and state security agencies, including forceful evictions, arbitrary arrests, illegal detention, the demolition or burning of villages, beatings, shootings, dog attacks, rape, and murder among others. Indeed there have been several instances of human rights violations occasioned by the mining activities in almost all mining communities (Anane, 2011;Zorrilla, 2009).Moreover, tens of thousands of Ghana's rural poor reside in small farming and indigenous communities located in or around mining project areas. Many of these communities are sometimes displaced due to the gold-mining operations. These usually lead to violence between the communities and the mining firms resulting in clashes and blood sheds in some instances(Anane, 2011;Zorrilla, 2009;Hilson, 2004). For example, in June 21st, 2005 a man from Sanso, (a village within Obuasi community) was wounded by gun shot on suspicion of illegal gold mining (galamsey) activities on a concession of a mining firm. Also in June 6, 2006 three farmers were shot dead following youth protestation at Ntotroso in the Asutifi District of the Brong-Ahafo Region of Ghana against one of the mining firms for failing to keep the promises it had made to the community about jobs and development (Zorrilla, 2009;

Anane, 2011). There are several other instances of conflicts between various communities and mining firms. Thus the negative socio-environmental externalities associated with surface gold mining in Ghana (e.g., dispossession of lands, forced dislocation, loss of livelihoods, unemployment, higher costs of living, land degradation, contamination and depletion of the water supply, deforestation, violence and human rights abuses) are making life difficult for people living in these communities. Again, poor rural peasant and indigenous communities are being robbed of the very assets they depend on for their survival—land and water resources (Zorrilla, 2009; Anane, 2011;Hilson, 2004). According to them, mining-induced erosion of rural livelihoods is undermining the food security of peasant and indigenous communities living in the Ghana's gold belt. This obviously, is a clear violation of Minerals and Mining Act 2006 (Act 703) of Ghana (Ghana Chamber of Mines, 2010)

This unhealthy situation could be addressed by implementing proper supply chain management through integration and coordination of all stakeholders of the mining supply chain. This can provide job opportunities for the people of the communities in which the firms operate and reduce clashes among the stakeholders. For instance mining companies can organize short training and development programs for the local people to pick up downstream employment at, for example, malaria control department, safety department and also provide apprenticeship training to cover, among other areas, mechanical, electrical and auto electrical for the local people to create employment opportunities in these mining companies (Zorrilla, 2009; Anane, 2011;Hilson, 2004).

3. Methodology

This study adopted both quantitative and qualitative methods with case study strategy to assess the challenges of supply chain within the gold mining sector in Obuasi and its environs in the Ashanti Region of Ghana. Although the focus was more on quantitative approach, using mixed method made it possible for us to get a deeper insight on supply chain challenges in the Ghanaian mining industry, particularly in Obuasi. The case study approach was adopted to help the researchers make direct observations and collect data in natural settings (Yin, 2003).The study population consisted of senior and junior managers from five mining organizations and opinion leaders from fifty-three(53) communities in Obuasi and its environs. The opinion leaders targeted included Chiefs, Elders and Assembly members from the various communities in Obuasi. These groups of people were targeted because of their in-depth knowledge and diverse experience in mining related issues as pertained on the ground and their capacity to provide information relevant to the research objective.

One hundred and twenty- five (125) mining officers comprising fifty (50) senior managers and seventy-five (75) junior officers (10 senior managers and 15 junior officers each of the firms) were purposively selected from the five mining organizations within Obuasi mining area. Some of the key managers selected included the Community Relations Manager, Procurement and Supply Chain Manager, Contract Manager, the chief Finance Officer, Human Resource Manager, Production Manager, Environmental Protection Manager, and the Safety manager.

In addition, one hundred (100) opinion leaders, ten (10) each from ten (10) different communities within the mining areas in Obuasi were also sampled purposively. These comprised the chief, the queen mother, the assembly member for the area and seven elders from each selected community making for a total sample size of 225. Table 3.1 shows the categories of respondents. The adoption of purposive sampling method for the study was informed by the need to obtain key and relevant information that could meet the objective of the study. Primary data was collected through field generated survey using questionnaire, semi-structured interview and observation data collection instruments.

The interview sessions were held in two phases. The first stage was conducted to solicit information from the 50 senior managers of the five mining firms in respect of the supply chain challenges facing the mining sector, particularly in Obuasi area based on the SCOR model and other related challenges prevailing on the ground. The second phase was also held to collect responses from both the 50 senior managers and 20-member key informants, comprising the chief and the assembly member of each community from the selected communities, on the sources of clashes/ dispute between the miners and the communities. Closed ended type of questionnaires with five point likert scale, ranging from 5= Strongly Agree, 4=Agree, 3= Neutral, 2=Disagree and 1= Strongly Disagree and 5= Very High, 4=High, 3= Neutral, 2=Low and 1= Very Low, was also used to collect quantitative date. In each case, the interview session preceded the

questionnaire administration. The questionnaires used were also in two different sets. The first set was used to solicit information on supply chain challenges in the mining sector from the perspective of the mining organisations only.

The second set was used to collect information from both the selected individuals(opinion leaders and the assembly members) from the selected communities and the officers from the mining organisations. Both self-administered and interviewer-administered questionnaires were used for the study. Out of 225 questionnaires sent out, 196 were returned representing a response rate of about 87%. Furthermore, field observation was made alongside the administration of the questionnaire to afford the researchers the first hand information regarding the challenges prevailing within the study area. In the process of the observation, the researchers played the observer- participant role where relevant information regarding the research objectives was noted. The quantitative data was analyzed using descriptive statistics with the aid of Statistical Package for Social Sciences (SPSS) and Microsoft Excel software whilst deduction and inferences were used to analyse the qualitative data.

Table 3.1 Categories of respondents

Respondents	Questionnaires Sent Out	Questionnaires Returned
Senior managers	50	44(88%)
Junior Officers	75	63(84%)
Opinion Leaders from 10 Communities	90	79(87.8%)
District Assembly Officers 10 Communities	10	10(100%)
Total	**225**	**196(87%)**

Source: Authors 'Field Survey, (2013)

3.1 The Research Setting

The study was undertaken in Obuasi and its environs of the Ashanti Region of Ghana. The choice of Obuasi was inspired by the fact that it is one of the biggest mining communities in Ghana and therefore findings from a study conducted in the area may provide a good basis to inform policy direction and further studies. Obuasi Municipal Assembly was carved out of the erstwhile Adansi West District Assembly on the strength of executive instruments (E. I.) 15 of December, 2003 and Legislative Instrument L.I. 1995 of the 17th march, 2007. The Municipality is located between latitude 5.35N and 5.65N and longitude 6.35N and 6.90N. It covers a land area of 162.4sqkm.With 53 communities and 30 electoral areas, Obuasi Municipality is located in the southern part of the Ashanti Region and has a rather undulating topography. The climate is of the semi-equatorial type with a double rainfall regime. Mean annual rainfall ranges between 125mm and 175mm. Mean average annual temperature is 25.5 0C and relative humidity is 75% - 80% in the wet season. The population of the Municipality is estimated at 205,000 using the 2000 Housing and Population Census as a base and applying a 4% annual growth rate. The vegetation is predominantly a degraded and semi-deciduous forest. The forest consists of limited species of hard wood which are harvested as lumber (Obuasi Municipal Assembly Medium Term Development Plan (OMAMTDP), 2006).Mining and its related activities is the mainstay of the Municipal Economy. Mining operations started in the Municipality in the 1890s. Gold had long been panned and mined by local gold seekers until the end of the 19th century where orderly commercial approach to gold mining gathered momentum in the country. Gold mining had over the years passed through a lot of stages with the advent of technology (OMAMTDP, 2006).

4. Results and Discussions

In the interview session held during the study, the mining officers selected were asked to; based on their experience, identify the key factors negatively affecting the supply chain performance in the mining sector. The interview guide was based on the SCOR model and other challenges facing the sector as prevailed on the ground. It was deduced from the interview that the major factors challenging the mining sector in Obuasi communities include;

- high cost of transportation arising from poor road network,
- limited availability of local suppliers of international standard
- unreliable lead times (mostly due to delays at port)
- Violence and dispute from the communities
- Restricted Government Regulations
- High input price from Original Equipment Manufacturers (OEMs)
- Gold price fluctuation
- interest rate volatility
- unreliable/inaccurate order fulfillment

These were the major challenges perceived to be facing the supply chain in the mining sector in Ghana, particularly within Obuasi Municipality. These factors, subsequently, were quantitatively assessed to find out the extent to which they affect the mining operations (their relative impact). Table 4.1 gives the results below.

4.1 The Effect of Supply Chain Challenges in the Mining Sector- Ghana
Table 4.1

Factor Attribute	Very high	High	Fairly high	Low
Violence/Attack From Community	57(53%)	44(41%)	6(6%)	0.00
Supply of Low quality products	35(33.1%)	18(16.9%)	35(33.1%)	29(16.9%)
Unreliable Lead times	54(50.0%)	18(16.9%)	17(16.3%)	18(16.9%)
Non-availability of Local Firms	43(40%)	29(27%)	18(17%)	17(16%)
Restricted Government Regulations	32(30%)	37 (35%)	25(23%)	13(12%)
Transportation Cost	18 (17%)	54(50%)	35(33%)	0.00
Interest Rate Volatility	25 (23%)	52 (49%)	19(18%)	11(10%)
High Input price From (OEMs)	54(50.0%)	36(34%)	17(16.3%)	0.00
Gold Price Fluctuations	57 (53%)	48 (45%)	2 (2%)	0.00
unreliable/inaccurate order fulfillment	0.00	18(16.9%)	35(33.1%)	54(50.0%)

Frequency = 107
Source: Authors' Field Survey, (2013)

The respondents were asked to rate a list of challenges facing mining supply chain. It is evident from the results in table 4.1 that Violence and Clashes from the Community appeared a major challenge facing the supply chain. 53%(n=57) of the respondents rated Violence and clashes from the Community very high, 41%(n=44) also rated it high whilst 6%(n=6) considered it fairly high. Unreliable Delivery Times among local suppliers factor was also found to be a great challenge facing the mining supply chain. From the results, 50%(n=54) of the respondents rated Unreliable Delivery Times among local suppliers as very high, 17%(n=18) responded high whilst 16%(n=17 of the respondents perceived that Unreliable Delivery Times is fairly high. Restricted Government Policies and Regulations on mining concession and environmental protection issues and their associated bureaucracies also appeared a major challenge facing the sector. From the results, 30%(n=32) and 35%(n=37) of respondents rated this factor very high and high respectively whilst 12%(n=13) considered it low.

On cost of Transportation factor, about 17%(n=18) and50%(n=54) of the respondents rated it very high and high respectively, indicating that high cost of transportation is a challenge facing the mining supply chain. Also, Non availability of Local Firms appeared another challenge. It can be seen from the results that about 27%(n=29) and 40%(n=43.) of respondent this factor very high and high respectively whilst 17%(n=18) of the respondents perceived Availability of Local Firms fairly high. In terms of Low Quality of Input Supplies, about 33%(n=35) of the respondents indicated very high whilst 17%(n=18) of the respondents rated high, indicating that Supply of Low Quality Products is another challenge the mining

supply chain face.Input Price Volatility factor(from OEMs) was also seen as a major challenge facing the mining supply chain as the results show that about 50%(n=54) and 34%(n=36) perceivedInput Price Volatility as very high and high challenge respectively. For that of Fluctuation in Gold Price as a challenge, 53%(n=57) and 45%(n=48) of the respondents rated it very high and high respectively in terms of its impact on mining supply chain.However, the respondents did not view the unreliable/inaccurate order fulfillment as a major challenge as 50%(n=54) rated it low as indicated in table 4.1.

4.2 Sources of Community Dispute

The respondents from both the mining companies and the communities were further asked to identify the sources of community disputes plaguing the mining companies. The following were perceived as the major factors that emerged from the interview session as the source of community clashes or disputes between the mining firms and the community:

- Environmental pollution,
- Issues on Resettlement,
- Compensation Related Issues
- Employment Related issues,

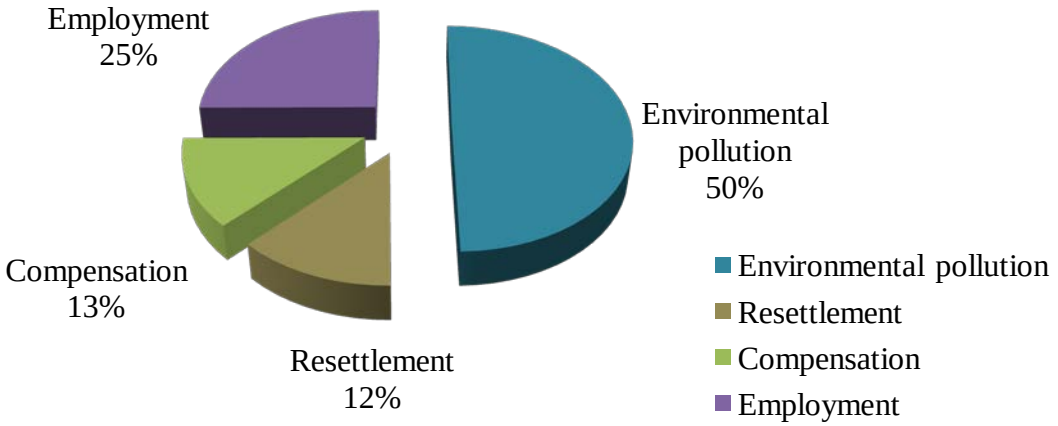
The respondents were further asked to rank these factors in terms of the extent to which they each contributes to clashes and disputes between the mining firms and the communities. This is shown in table 4.2 and figure 4.1.

Table 4. 2 Factors Leading to Disputes the Mining Firms and the Community

Factor Attribute	Frequency(N)	Percentage(%)	Rank
Environmental pollution	98	50	1st
Issues on Resettlement	24	12	4th
Compensation Related Issues	25	13	3rd
Employment Related issues	49	25	2nd
Total	**196**	**100**	

Source: Author's field survey (2013)

Fig.4.1 Sources of Community Dispute



Source: Authors' Field Survey, (2013)

From table 4.2 and figure 4.1, respondents were further asked to rank the factors perceived to be the causes of Violence and community disputes between the mining groups and the communities within the Obuasi and its environs. It can be discerned from the results that 50%(n=98) of the respondents ranked environmental pollution as the major source of the community dispute followed by employment related issues which recorded 25%(n=45). Compensation related issue on destroyed lands and crops, and issues

related to resettlement recorded 13%(n=24) and 12%(n=25) responses respectively as sources of disputes between the mining organizations and the communities.

The observations made during the study confirmed the views and perceptions of the respondents regarding various sources of disputes and sporadic clashes between the communities and the mining organizations. For example water pollution and destruction of farm lands and crops were evident in almost all the mining communities visited. Also the issue of unemployment appeared evident as most youth were seen moving about on the street of the various communities without any sign of being engaged in productive ventures. Uncovered excavated pits on some of the mine sites in some of the communities were also observed.

5. Conclusion

The study was set out to assess the challenges of supply chain in the mining industry in the Obuasi and its environs. The challenges faced by the indigenes of Obuasi and its surrounding communities as results of the mining operations were also explored. From the mining supply chain perspective, it was revealed from the study that violence and sporadic attack from the communities, supply of low quality products, unreliable or variable lead times, non-availability of local firms of international standard and fluctuation in Gold prices on the international market were the key challenges facing the mining sector.

Again, restricted government regulations and high cost of transportation could not go unnoticed as other challenges the industry face, especially within Obuasi mining area. The study also sought to investigate the sources of sporadic clashes between the mining firms and the communities. It was found that environmental pollution, employment related issues, inadequate compensation paid to owners of land destroyed by the mining activities and issues on resettlement were identified as the major sources of disputes that occasionally ensue between the mining organization and the communities.

6. Recommendations

Based on the above findings, it is recommended that the mining firms should further strengthen the relationships between their suppliers, perhaps through partnerships and collaborative approach to ensure consistent supplies. It is also recommended that the mining firms should involve their key and strategic suppliers in product design and development of specifications. Also, improving upon information sharing and building trust and transparency could also deal with delays and quality related supplies. Again the mining firms should, if possible, endeavor to develop the capacities of their key suppliers by way of training and development to improve the performances of the entire supply chain.

Finally, the Ministry of Energy, the Environmental Protection Agency and other institutions should collaborate with the mining firms to deal with issues of environmental pollution, unemployment situation in the mining communities and issues of perceived inadequate compensation to community members whose farm lands get destroyed by the mining activities to address any unhealthy conflicts between the mining firms and the communities.

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