

Sustainable Decommissioning and Integrated Closure Planning of Selected Mine Sites in the Bicol Region, Philippines

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Abstract. The study assessed the status of the Rapu-Rapu Minerals Incorporated (RRMI) and the Filminera Resources Corporation (FRC) which are the polymetallic and mineral mining sites, respectively in the Bicol Region, Philippines regarding their mine closure and decommissioning procedures in relation to the impact communities that they engaged. It is in this context that the study was implemented to set a management direction in the inevitable event of mine closure and decommissioning. The study utilized the qualitative and quantitative methods of research. Respondents consisted of the key officials of government agencies and municipal and barangay officials as well as households of the host and impact communities covering the two mining sites of Rapu-Rapu and Aroroy as well as community organizations and mining company representatives. Findings showed that both mining sites extract similar resources and have been paying taxes to the Philippine government. Although the RRMI has initiated its mine closure process, decommissioning is underway and still needs to undergo its standard procedure with various stakeholders, while FRC has its operations ongoing. It is recommended that mine closure planning must be integrated within the overall mine operations plan, and should be integral to the operational life cycle of the mine sites.

Keywords: sustainable decommissioning, integrated closure planning

1. Introduction

Mining industries in the Philippines is one of the biggest contributors in government's taxes yet it also causes long term environmental alteration and modification as well as social impact visible once mine site operations have ceased (Limpitlaw, 2004). This could be the result of mining legislation which failed to prevent or minimize the possible long term effects on the environment on account of the mining operations and mine closure (Dalupan, 2001). Hence, the importance of mine closure planning,

which is a practice but is neither complete nor formalized for a large majority of companies (Peck, 2005). On this premise, the study was designed to assess the Rapu-Rapu Minerals, Incorporated (RRMI) and the Filminera Resources Corporation (FRC) mining sites in the Bicol Region with the hope of recommending policies for the sustainable decommissioning and integrated closure of mineral and polymetallic mining operations. Specifically, the study sought answers to the following objectives: (1) to determine

the status of mineral and polymetallic mines in the Bicol Region in terms of operational, economic and social aspects; (2) determine the views of stakeholder and community involvements in the decommissioning and planning phase towards mine closure; (3) identify closure legislation and policies to regulate the implementation of sustainable mine decommissioning and closure practices; and (4) determine mining policies that may be recommended to ensure a sustainable decommissioning and closure of mineral and polymetallic mining operations in the Bicol Region.

2. Materials and Methods

The study made use of desk reviews, field observations and qualitative and quantitative approaches in data collection. Key informant interview of key officials of RRMI and FRC was undertaken to generate relevant technical information about the mining operations. Information from the direct and indirect impact barangays hosting the mining areas were also collected from key leaders of the barangays and LGU officials. A household survey was also employed to gain more insights and a deeper understanding of the culture of the residents in the mining areas.

Secondary data and information from the Department of Environment and Natural Resources (DENR) Regional Office No. V attached agencies such as the Environmental Management Bureau (EMB) and the Mines and Geosciences Bureau (MGB) and the Office of the Municipal Planning and Development (MPDO) in the Municipalities of Aroroy, Masbate and Rapu-Rapu, Albay was carried out to augment and validate datasets collected from primary sources. Descriptive statistics such as frequency count and arithmetic mean were employed to analyze the relevant datasets.

3. Results and Discussions

Findings showed that both mining companies extract similar minerals resources such as copper, silver and gold that employs the same methods of extraction, which is the open pit mining to extract the ore at a maximum annual rate of one million tons and contributed greatly to the employment and economic well-being of the people. However, in terms of mine life, RRMI is at the closures stage while FRC is still on its commercial operations. The

Table 1. Mining Project During Operation Phase

Basic Description	Rapu-Rapu Polymetallic	Filminera Resources
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s	Mining	Corporation
Location	Rapu-Rapu, Albay	Aroroy, Masbate
Geographic Coordinates	13°10'27"N 121°12'27"E	12°28'4"N 123°23'46"E
Tenement	Mineral Sharing Production Agreement and Mining Patents approved in 1998, 2000 and in 2004 with an area of 4,663 has.	Mineral Production Sharing Agreement - 289,9466 hectares; Mining Lease Contract - 108 has. and Patented Mining Claims - 236 has. in 1997
Tenement Holder	Rapu-Rapu Minerals, Incorporated	Filminera Resources Corporation
Permits Approval/Secured	Partial declaration of Mining Project Feasibility study	Declaration of Mining Feasibility in 2005
Major Stockholder	Lafayette NL represented by Roderick Watt – Country Manager	Thistle Mining Corp. Canada/South Africa Gerri Maritz Kennedy/Andreas Johannes Graetz
Foreign Partners	Lafayette NL Australia, LG Collins and KORES of South Korea	B2Gold Corporation of Canada
Commodity	Copper, Gold, Silver and Zinc	Chromite, Copper, Gold, Nickel and Silver
Geology and Mineralization	Project area is underlain by schist that contain massive polymetallic sulphides consisting mainly of pyrite, with lesser amounts of chalcopyrite and sphalerite	Gold deposits are centred on a northwest-to-south east mineralized volcanic belt, 5-7 km. wide, bounded by two northwest-trending fault zones
Reserves	Project has a reserve of about 5.9 Million MT @ 1.2% Cu; 2.5 g/t Ag & 2.1% Zn	48,000,000 MT @ 1.30g/t Au with a Gross Value of US\$738 Million
Production Rate	Annual production rate is placed at 10,000 MT for Cu; 50,000 oz. for Au; 14,000 MT for Zn and 60,000 oz. for Ag	Daily Production of 17,123t milled. Mine produced 155,000 oz. Au in 2012 and to produce 200,000 oz. Au in 2013
Mine Life	Estimated at 7 years	Estimated at 12 years

Financial Details	Estimated to have a Potential Investment of US\$42 Million and Potential Gross Sales of US\$41 Million/year. Potential Excise Tax due to the Philippine Government estimated at US\$0.80 Million/year (without incentives) and Potential Income Tax of US\$5.7 Million/year (without incentives)	Potential Investment US\$ 45 Million and Potential Gross Sales US\$ 62 Million per year. Potential Excise Tax due to the Philippine Government US\$ 1.2 Million per year (without incentives) and Potential Income Tax US\$ 7 Million per year (without incentives)
Potential Employment	1,000 during construction and 274 during operation	2,500 during construction and 300 during operation

information as to the status of the mine sites in terms of operation is shown in the preceding table.

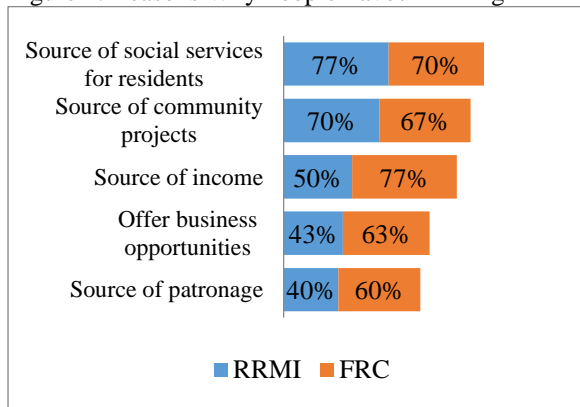
Huge amount of taxes were contributed by both mining companies. For instance, from 2012 to 2014, RRMI contributed to the Philippine government a total of Php 1,003,084,002.45, both in the national and local taxes, while FRC contributed a total amount of Php 2,403,093,440.08 from both national and local taxes for the past three-year duration. However, despite the huge amount of taxes in the government, it appears that the general economic condition in the host communities are still low. In terms of employment for RRMI, it has generated more less only 21.5% from its total population of 3,413 in 2010, while FRC has also generated employment of about 8.13% from its population of around 14,927 in the same year. In RRMI impact barangays for instance, one in ten persons finished grade school and three out of ten are elementary undergraduates. Seven out of 100 graduated from high school and three out of 100 have graduated and earned academic degrees from college. The drop-out rate from elementary to high school is estimated to be at 90%. These were attributed to the high incidence of poverty and the absence of an accessible secondary school in the area. In FRC host barangays, on the other hand, nearly half or 48% have attended or completed elementary education. The high school undergraduates constitute 20%; those who completed secondary education is 10%; college undergraduates constitute around 4% and those with academic degrees, is 3%. More females finished college than their male counterparts. It is also interesting to note that in RRMI areas, people put much priority on livelihood benefits, while in FRC areas, health services is given much priority (Kearns and Barnett, 1998).

In the aspect of stakeholder views and community involvements relative to mine decommissioning and closure planning, various consultations were undertaken in the formulation and preparation of the Social Development and

Management Program (SDMP) for the two mining sites. A chi-square test ($\chi^2 = 32.42, p < 0.001$) indicated that the respondents' perception on the current mining operations differ in the two locations. Respondents from FRC barangay more likely to show that the current mining operations provide family's income source while the RRMI respondents perceive it to be the source of community projects. This further validates the situation with RRMI areas as the company has commenced in closing mining operations, where only the social projects on account of the SDMP are the ones benefiting the communities, while income from mining operations are the ones obtained by the residents of FRC barangays.

In RRMI impact barangays, the communities were involved in the formulation of the plans for livelihood and employment as a result of the closure of the mining project. Under the SDMP scheme, fishing implements (banca, nets and fishing gears) were provided; funding opportunities to implement piggery, poultry and goat raising projects; provision of agricultural inputs for coconut, abaca and vegetable production; organization of cooperatives

Figure 1. Reasons Why People Favour Mining*



* Multiple Response

and the recovery of scrap materials for community projects were also included in the package. It also made possible the provision of water system such as storage tanks and water distribution lines, educational assistance in the form of scholarships for pupils and students, provision of electricity, health services and the conduct of medical missions. The maintenance of road networks, environmental conservation and preservations measures were also part of the major provisions of the SDMP for the impact barangays. These are the social services which people source out on account of the mining operations, which is why for them these things are very favourable as reflected in Figure 1.

Comparatively, the SDMP provisions for the FRC impact barangays consists of allocation for environmental safety features with conservation and preservation measures along tailings impounding areas; establishment of community mangrove reforestation and aquaculture projects; establishment of cacao plantation; conversion of the current airstrip into a municipal airport; development of ecotourism in the municipality; conversion of the building facilities inside the FRC compound to a residential area; development of causeway for commercial operation to accommodate cargo of large vessels; development of an agro-forestry site out of the tailings storage and mill facilities; conversion of the mine

power plant into an independent power provider; turnover of the management of the division dam to a local cooperative; maintenance of access roads; and the relocation of the church into a new site.

Mine closure legislation and policies which regulates the implementation of sustainable mine decommissioning and closure practices adopted and implemented by mining companies are clearly stipulated and embedded in the final mine rehabilitation and decommissioning plan (FMRDP). Such plan is in accordance with Republic Act No. 7942 otherwise known as the "Act Instituting a New System of Mineral Resources Exploration, Development, Utilization and Conservation"; Administrative Order No. 2010-21, which provides for a Consolidated Department of Environment and Natural Resources (DENR) Administrative Order for the Implementing Rules and Regulations of Republic Act No. 7942, otherwise known as the "Philippine Mining Act of 1995"; DENR Administrative Order 2005-07, which are the "Amendments to Chapter XVIII of DENR Administrative Order 96-40, as amended, providing for the establishment of the Final Mine and Decommissioning Fund"; Administrative Order No. 2010-21, which provides for a Consolidated Department of Environment and Natural Resources Administrative Order for the Implementing Rules and Regulations of Republic Act No. 7942, otherwise known as the "Philippine Mining Act of 1995"; DENR Administrative Order 36, Series of 2004, which revises the DENR Administrative Order No. 29, Series of 1992, to further strengthen the implementation of Republic Act 6969 (Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990) and Prescribing the Use of Procedural Manual; DENR Administrative Order No. 1996-40, as amended, which specifically provides the guidelines on the determination of a post-mining land use.

Table 2. Suggested Use of Facilities after Closure*

Responses	RRMI Barangays		FRC Barangays	
	Frequency*	%	Frequency*	%
School complex	19	63.3	20	66.7
Sports complex	16	53.3	15	50.0
Camp site	21	70.0	23	76.7
Housing complex	18	60.0	19	63.3
Tourist destination/attraction	22	73.3	24	80.0

* Multiple Response

The development of a sustainable mining industry is dependent on the development of a regulated and controlled responsible mining industry. However, appropriate legislation and policies should be developed to effectively control and regulate mine closure process within the initial mine assessment and approval process (Clark *et al*, 1998). Based on the findings of the study, it can be construed that the contribution of mining to the overall economy of the two municipalities is relatively small. Hence, an equitable sharing mechanism should be developed so that the host communities may have the highest share, a reverse of the present sharing scheme. Citing data from the Mines and Geosciences Bureau (MGB), the mining sector currently has a 0.7 percent contribution to the country's gross domestic

product (GDP) and comprises 5.6 percent of the total exports of the Philippines. One critical use of

4. Conclusions and Recommendations

Assessment result showed that in both Rapu-Rapu and Aroroy mining sites are compliant with the provisions of the Philippine Mining Act 1995, however, much has to be desired in terms of stakeholder participation and community engagements for sustainability at the start of planning for operations to have a proactive perspective for the future mine decommissioning and closure. In the case of RRMI, while it has complied with the minimum requirements cited in the legal provisions, such are not sustainable in terms of economic and social continuity. This is because, what has been laid down at the outset, prior to the closure phase primarily focused on the SDMP project planning and implementation and not much on the decommissioning aspects. This features how the structures and facilities will be able to serve in favour of the impact communities directly and indirectly affected by mining. Facilities and infrastructures built to support the mining operations is worth millions of pesos, yet lesser community interventions were undertaken to pave way to their involvement, participation and decisions.

It is therefore recommended that the following mining policies to achieve a sustainable decommissioning and closure be made: 1) The development programs as an output of the consultations and legal processes implemented to establish the SDMP of the impact barangays should be integrated as a development roadmap subject of the LGUs for regular review, monitoring and evaluation; 2) Mine closure planning must be integrated within the overall mine operations plan, and should be integral to the operational life cycle of a mine to include: (a) Mine Closure Planning at the feasibility phase of mine operations, which allows mining operations to identify future constraints and costs of mine closure; (b) Financial provisions and assurances; (c) stakeholder engagement and community consultation needs to be integrated within the overall mine operations and closure processes; (d) clear and measurable indicators are needed to track compliance; 3) The organizational transformation of the DENR, specifically the MGB and the EMB of the DENR, where a regulatory structure should be rationalized. Currently, the MGB is under the DENR, as well as the EMB. The research strongly recommends for the creation of another government agency like the Environmental Protection Agency (EPA), where the function of which should focus on the Regulatory, Monitoring and Evaluation of mining and other industries' operations and activities, and for which the EMB should be a part. A specialized Bureau, like a Mining Regulatory Authority, that will regulate mining practices, policies and procedures compliant to the Mining Act of 1995 and other legislative policies and protocols. Consequently, the regulatory body should also employ the services of soil scientists as part of the regulatory functions on hazardous wastes brought about by mining operations, or in close collaboration with, but not limited to, the Bureau of Soils and Water Management and with the Department of Agriculture to help ensure sustainability of resources; and 4) Finally, there is a need to thoroughly study the equitable distribution of taxes paid by the industry to ensure the greatest possible benefit for the host community who in most case suffer from the consequences of environmental alteration and modifications from mining industry.

Table 3. Suggestions for a Sustainable Mine Closure and Decommissioning Program*

Responses	RRMI Barangays		FRC Barangays	
	Frequency*	%	Frequency*	%
More participation in meetings and discussions	20	66.7	27	90.0
Clear cut policies are provided for the program	25	83.3	26	86.7
Transparency should be observed in all aspects	24	80.0	25	83.3
Facilitate release of funds for social projects	28	93.3	29	96.7
Participatory planning and implementation of program	27	90.0	24	80.0

* Multiple Response

the mineral accounts is in the analysis for an appropriate fiscal policy considering its small contribution to the economy and the contentious debate on mining and its links with issues on land-use, environment and social acceptability. In terms of the proposed use of mine facilities and equipment's after mine closure and the suggestions for a sustainable mine closure and decommissioning program in the mining sites, Table 2 and Table 3 reflects the respondent's views, respectively.

Table 4. Expectations from LGU to Achieve the Sustainable Mine Closure/Decommissioning*

Responses	RRMI Barangays		FRC Barangays	
	Frequency	%	Frequency	%
Assist and support the planning process	15	50.0	20	66.7
Asserts that mine company follows the law	9	30.0	12	40.0
Prioritize SDMP projects from mining company	18	60.0	15	50.0
Participates in the process	17	56.7	19	63.3
Coordinates with various stakeholders	20	66.7	23	76.7

* Multiple Response

The expectations from the Local Government Unit (LGU) to achieve a sustainable mine closure and decommissioning plan or mechanism was also asked and majority of the answers of the respondents covering the two mining sites focused on the coordination with various stakeholders, to assist and support the closure planning process and the prioritization of the SDMP projects as reflected in Table 4. Although these were emphasized prior to the FMRDP, some respondents however, may not be familiar of the rightful process for the sustainable closure and decommissioning but are aware of how things can be properly managed.

Bibliography

- Limpitlaw, D., "Mine Closure as a Framework for Sustainable Development Practices on Mine Sites", University of the Witwatersrand, 2004.
- Peck, P., "Mining for Closure; Policies and Guidelines for Sustainable Mining Practice and Closure of Mines", The Environment Security (ENVSEC), 2005.
- Dalupan, C., "Mining and Sustainable Development: Insights from International Law", Claredon, 2001.
- Kearns, R.A. and Barnett, J.R. (1998) Consumerist ideology and the symbolic landscapes of private medicine. *Health and Place* 3: 171-180 (Journal Articles).
- Clark, J. C., Clark, Allen L. and Naito, K, 1998, 'Emerging Mineral Policy and Legislation in the Economic Development of the Central Asian Republics', *Resources Policy*, vi. 24, No. 2, pp. 115-123, 1998.