FINAL DRAFT

VISION 2030 JAMAICA

MINING AND QUARRYING

SECTOR PLAN 2009 - 2030

Mining and Quarrying Task Force

September 2009

Table of Contents

1. Introduction

1.1 Vision 2030 Jamaica – National Development Plan

In 2006, the Government of Jamaica (GOJ) mandated the Planning Institute of Jamaica (PIOJ) to lead the preparation of a comprehensive long-term National Development Plan (NDP) which would place Jamaica in a position to achieve developed country status by 2030. Development of the Plan began in January 2007 and thirty-one Task Forces (TFs) including the Mining and Quarrying Task Force were established thereafter. The TFs represent sectors and areas critical to the achievement of the national goals and have been charged with responsibility for developing the relevant long-term sector plans.

The Mining and Quarrying Task Force commenced the plan preparation exercise in June 2007, as a part of the Real Sector Task Force, leading to the completion and submission of a 1st draft report for the long-term development of the Mining and Quarrying Sector in Jamaica. Following review and stakeholder consultation, and preparation of an action plan for the sector, the Mining and Quarrying Sector Plan for Vision 2030 Jamaica was completed in 2009.

This Sector Plan for Mining and Quarrying is one of the strategic priority areas of the ***Vision 2030 Jamaica - National Development Plan***. It is one of thirty-one sector plans that form the foundation for Vision 2030 Jamaica – a 21-year plan based on a fundamental vision to make *'Jamaica the place of choice to live, work, raise families, and do business,'* and on guiding principles which put the Jamaican people at the centre of the nation's transformation.

The Mining and Quarrying Sector Plan provides for the development of a world-class minerals sector that: increases the value of the nation's mineral resources by developing higher value production; is guided by responsible environmental stewardship with minimal harmful environmental impacts; contributes to the sustainable development of mining communities; and ensures the health and safety of workers. Vision 2030 Jamaica provides a path for Jamaica to regain its competitiveness in the bauxite and alumina industry, while taking greater advantage of its other mineral resources, particularly through development of value-added products based on limestone.

The preparation of the Plan was supported by a quantitative systems dynamics computer model – Threshold 21 Jamaica (T21 Jamaica) – which supports comprehensive, integrated planning that enables the consideration of a broad range of interconnected economic, social and environmental factors. The T21 Jamaica model is used to project future consequences of different strategies across a wide range of indicators, and enables planners to trace causes of changes in any variable or indicator back to the relevant assumptions and policy choices.

This sector plan was developed using the following processes:

- Participation of Task Force Members[1] through Task Force Meetings[2] that were used to solicit ideas and views on Mining and Quarrying issues and challenges facing Jamaica as well as identifying a vision for Mining and Quarrying in Jamaica, and determining key goals, objectives and strategies for the sector
- Research on international best practices in Mining and Quarrying that could be adapted to the Jamaican context
- Review of relevant documentation on the Mining and Quarrying Sector
- Development of a detailed Action Plan with responsible agencies and time-frames for implementation.

This Sector Plan for Mining and Quarrying is structured in the following main chapters:

- Situational Analysis
- SWOT Analysis
- Strategic Vision and Planning Framework
- Implementation, Monitoring & Evaluation Framework
- Action Plan

1.2 Mining and Quarrying and National Development

The mining and quarrying sector represents a critical component in the national development of those countries such as Jamaica that are endowed with exploitable mineral resources.

Mineral exploitation, including mining and quarrying, and its related activities are important direct and indirect contributors to the development of modern economies. Commercially exploitable mineral deposits are valuable natural resources which provide metals, fuels, construction aggregates and various other raw materials for many industries and play a central role in the development of modern economies. Minerals in various forms are used in the construction of aircraft, vehicles, sea-going vessels, civil infrastructure, appliances, tools, and equipment. They also are used in food preservation, animal feed, medicines, water treatment, the manufacturing of toothpaste, paper, paint, glue, ink, glass, jewellery, cosmetics, and other personal items. Other applications occur in soil stabilization, public sanitation, pollution control, and the removal of impurities in numerous industrial processes.[3]

The Mining and Quarrying Sector Plan also will have implications for other areas of national development including transport, urban and regional planning, agriculture, tourism, environmental management and housing. During the period 2004-2008 Mining and Quarrying represented on average 3.8% of Jamaica's Gross Domestic Product (GDP)[4].

[1] See Appendix 1 for List of Members of the Mining and Quarrying Task Force.
[2] See Appendix 2 for Listing of Task Force Meetings.

[3] Minerals Policy and Development Division, Ministry of Agriculture and Lands.
[4] Based on Contribution to Total Goods and Services Production in Basic Values at constant (2003) prices, Economic and Social Survey of Jamaica, 2008.

The planning for Vision 2030 Jamaica and the mining and quarrying sector has taken place within the context of a global economic recession which commenced in US credit markets in 2007, and spread in 2008-2009 to affect the economies of developed and developing countries alike. The consequences for Jamaica are likely to include: reduced flows of direct investment; greater difficulty in sourcing financing from global capital markets; reduction in demand for Jamaica's exports; and a downturn in tourism earnings. The impact will limit the prospects for growth in our economy in the initial years of implementation of the National Development Plan, until recovery takes place. The mining and quarrying sector has been particularly affected, as the downturn in the global economy has reduced the demand alumina, leading to plant closures and contraction in production and employment in the domestic bauxite and alumina industry. These circumstances have increased the importance of strategic planning for the future of this industry as a national priority.

2. Situational Analysis – Jamaica's Mining and Quarrying Sector

The mining and quarrying sector has been a part of the Jamaican economy for centuries. The quarrying of limestone and construction materials dates back to the earliest days of colonization while sporadic exploration and extraction of metallic minerals such as lead and copper has taken place on a small scale since the eighteenth century. However the modern era of the sector may be considered to have developed since the discovery of high grade bauxite in 1938 and the establishment of bauxite mining and refining operations by major North American aluminium companies, including Alcan, Reynolds and Kaiser, beginning in 1952.

2.1 Sector Definitions

2.1.1 Scope of Mining and Quarrying Sector

It is useful to define the scope of the Mining and Quarrying Sector as addressed in this Sector Plan, which is based on the definition of the scope of the Minerals Industry contained in the Draft National Minerals Policy (2006) as provided below:

"The Minerals Industry is a conglomeration of activities geared at exploiting the country's mineral resources, and producing raw minerals and value-added mineral products consumed by various sectors of the economy. The scope of the industry includes:

- Mineral exploration and exploitation (namely mining and quarrying)
- Mineral processing, beneficiation and the manufacturing of mineral based products, including: alumina, construction blocks, lime, skid resistant aggregates, etc.
- Mineralogical, mining and metallurgical research and development
- Trading and professional services
- Transportation and machinery
- Mineral waste management and recycling
- Land management, including land rehabilitation and managing mineral resources."[5]

It should be noted that the scope of the sector as defined above does not coincide precisely with the definition of the Mining and Quarrying Sector in the National Accounts for the Gross Domestic Product (GDP), as some activities may be classified in other sectors (e.g. production of lime is classified within the manufacturing sector and building blocks within the construction sector).

[5] Minerals Policy and Development Division (2006). *The National Minerals Policy: Ensuring a Sustainable Minerals Industry (3rd Draft)* p. 1.

The following definitions also are relevant in defining the scope of the sector:

Mineral Exploitation: The systems, processes and techniques through which mineral deposits are transformed into usable mineral commodities. As such, it includes mineral extraction, processing (raw mineral or high value value-added product), transportation and sale for commercial purposes. It also includes recycling and rehabilitation of mined areas.
Mining: The extraction of valuable minerals or other geological materials from the earth, usually, but not always, from an ore body, vein, or seam. In a wider sense, mining can also include the extraction of petroleum, natural gas and water.
Quarrying: A form of mining that is generally centred on the extraction of rocks or minerals at the Earth's surface. Quarries are generally used for extracting building materials, including sand and gravel, limestone and dimension stone and other relatively cheap and bulky minerals such as salt. They are usually shallower than other types of open-pit mines. However, there are instances in which a part of a quarry or an entire quarry is located underground.[6]

2.1.2 Metallic and Non-Metallic Minerals

According to conventional National Accounting classifications, minerals are classified as metallic and non-metallic. Metallic minerals contain ferrous and non-ferrous metal ore deposits. The main metallic mineral resources discovered in Jamaica are bauxite, cobalt, copper, gold iron, lead, manganese, silver, titanium and zinc. Jamaica's non-metallic mineral resources consist of limestone, sand and gravel, dolomite, marble, gypsum, shale, pozollan, silica sand and skid resistant aggregates. Non-metallic minerals include industrial minerals, which may be defined as commercially valuable non-metallic, non-fuel rocks and minerals used in their natural and processed state in the construction, chemical, manufacturing and other industries.[7] While fossil fuels (e.g. peat, coal and petroleum) are minerals, their exploitation is usually considered under the energy sector.

2.1.3 Mineral Resources and Reserves

It is also relevant to distinguish between mineral resources and mineral reserves as explained below[8]:

i) Resource: A concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible. Identified mineral resources are resources whose location, grade, quality, and quantity are known or estimated from specific geologic evidence. Identified resources include measured, indicated, and inferred resources.

[6] Ibid. *Appendix II.*
[7] Minerals Policy and Development Division, Ministry of Mining and Energy.
[8] Definitions for mineral resources and reserves taken from U.S. Department of the Interior, U.S. Geological Survey, Mineral Commodity Summaries 2001 (Washington, D.C.: GPO, 2001), Appendix C.

ii) Reserve Base: That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently sub-economic (sub-economic resources).

iii) Reserves: That part of the reserve base which could be economically extracted or produced at the time of determination. The term reserves need not signify that extraction facilities are in place and operative.

2.2 Global Context

2.2.1 Bauxite and Alumina

The most important metallic mineral for the Jamaican mining and quarrying sector is bauxite, the ore from which alumina and aluminium are derived. The world alumina market has been experiencing steady growth in production and consumption. In 2004 world production was 58,080.0 kilo tonnes and grew on average by 8.0 % each year to reach 79,151.0 kilo tonnes in 2008. World consumption of alumina grew on average by 7.6 % to reach 78,102.0 kilo tonnes in 2008. In 2008 there was a surplus of global metallurgical grade alumina amounting to 1 016.0 kilo tonnes. Most of the growth in world alumina production over the time period was due to increased production from China, which accounted for the largest share (28.3%) of world alumina production in 2008. The largest consumers of alumina are aluminium producing countries such as China, Western Europe, the United States and Canada. The average spot price of alumina has been trending up moving from US$290 per metric tonne in 2003 to $354 in 2008.

Developments in the aluminium market dictate the posture of the alumina market as alumina is a primary component in the production of aluminium. From a global perspective aluminium consumption has been increasing on an average by approximately 6.7 % per annum since 2002. Total world production of aluminium has been growing steadily since 2002 albeit in 2004 and 2006 annual production was lower than consumption. Total world consumption has largely been influenced by activities in the construction, automotive and power industries. China has been a growing force, as its production level in 2008 was 34.1 % of global production compared with 16.9 % in 2002. Its consumption level was 33.4 % of global demand in 2008 compared with 16.5 % in 2002. The average annual London Metal Exchange (LME) price of aluminium has increased by 50.0 % between 2004 and 2008. This rise in price may be attributable to strong demand and rising input/operating costs overtime.

However, the deepening of the financial and economic crisis in 2008, which has negatively impacted the construction and transport industries[9], has resulted in a fall in the price and consumption of aluminium on the world market by 2.5 % and 0.5 % in 2008 relative to 2007. The price of alumina collapsed by 51.5 % in December 2008 compared with July 2008.

[9] Transport, Packing and Construction industries are the three largest consumers of aluminium.

In response to the fall in demand and price of aluminium, major producers of aluminium and alumina implemented comprehensive plans to address cost and rationalization of the production process. The strategies include cutting production at the most inefficient plants and a reduction in the labour force. Aluminium capacity cutback announced as at February 2009 amounted to approximately 5.8 million tonnes per year or 11.8 % of world capacity. China accounted for 56.6 % of the announced cutback (see Table 1). The planned restriction in output in Europe and North America, which are Jamaica's main alumina export markets, accounted for the second and third largest expected reduction in aluminium production.

Table 1: Projected Curtailment in Aluminium Production in 2009

Region	Aluminium Announced Curtailments, TPY(a)	Regional to Total Curtailments Ratio	Regional Curtailments To Total Regional Capacity Ratio
North America	1,074,000	18.7%	16.0%
Europe	1,280,000	22.2%	12.5%
South America	57,000	1.0%	2.1%
China	3,256,000	56.6%	17.8%
Rest of the World	90,000	1.6%	0.9%
World/Total	5,757,000	100.0%	11.8%

a: Tonnes per year

Source: Compiled from data supplied by the CRU Metal Monitor

Alcoa, which is a major owner (55.0%) in JAMALCO, has announced that it will cut 15.8 % of its 2009 aluminium capacity (Table 2). UC Rusal, the major owner in Alpart (65.0%) and WINDALCO (93.0%), has stated that it will cut 10.5 % of its 2009 aluminium capacity. Hydro, which owns the remaining 35.0 % of Alpart, announced that it will cut 12.0 % of its total world aluminium capacity (see Table 2).

Table 2: Announced Curtailment by Major Aluminium Producers

Producers	% of Total Curtailment	% of Producers Capacity
Alcoa	13.1	15.8
UC Rusal	8.7	10.5
Chalco	7.8	14.3
Rio Tinto Alcan	4.8	6.6
Hydro	3.7	12.0

Source: Compiled from data supplied by the CRU Metal Monitor

The cutback in production at UC Rusal has led to the temporary closure of Windalco and Alpart in 2009, with consequent loss of employment and production.

2.2.2 Non-Metallic Minerals

Jamaica's limestone resources are by far the largest mineral resources possessed by the country. Limestone and its derivative lime are among the most basic materials used by mankind. Lime is the most commonly used alkali with the most diverse end use structure of any industrial material, and its level of use is second only to sulphuric acid as an indicator of the level of industrialization of a country. Total world production of lime is approximately 130 million tonnes, with China, USA and Russia as the largest producers.[10] Gypsum also is a raw material with a wide range of uses including in drywall manufacture and as a plaster ingredient and fertilizer and soil conditioner. Sand and aggregate are widely used construction materials, which occur in economic quantities in many countries. Jamaica faces opportunities to export construction-grade aggregate to regional markets in the Caribbean and the South-Eastern and Gulf regions of the United States which lack adequate indigenous supplies of aggregate to meet the demands of their construction sectors.

2.3 Overview of Sector

The mining and quarrying sector represents an important component of the Jamaican economy. In 2008 the sector's contribution to GDP stood at 3.8%, almost entirely attributable to the bauxite and alumina industry. The full scope of the sector includes metallic minerals (including bauxite and gold), non-metallic minerals (clay, dolomite, gypsum, limestone, marble, sand and gravel, silica sand, volcanic rocks and shale), and semi-precious minerals.[11]

The main mineral resources of Jamaica are outlined in Table 3 below.

[10] http://indexmundi.com/en/commodities/minerals/lime/lime_t9.html.

[11] While fossil fuels (e.g. peat and petroleum) are minerals, their exploitation is usually considered under the energy sector.

Table 3: Jamaica – Summary of Mineral Resources

Mineral	Resources and Reserves	Life (1)
Bauxite	2.0 billion metric tonnes (Reserve)	50-150 years (proven and probable)
Clay	Over 160 million metric tonnes (Estimated Reserve)	
Gypsum (including 90%, 80%, 70% gypsum and anhydrite)	29.0 million metric tonnes (Total Reserve)	33-38 years (including anhydrite)
Black Sand (including sand, iron and titanium oxide)	19.0 million metric tonnes (Estimated Deposits)	
Aggregate (skid-resistant)	162 million metric tonnes (Known Reserve)	
Alluvial sand and gravel	Over 95 million metric tonnes (2)	
Limestone (calcareaous/dolomitic)	Over 2.7 billion metric tonnes (Estimated Reserve)	
Limestone (whiting grade)	11.15 billion metric tonnes (3)	
Limestone (chemical, industrial, metallurgical grade)	57.5 billion metric tonnes (3)	
Silica Sand	To be determined (TBD)	TBD

Source: US Geological Survey, Draft National Minerals Policy
(1) Based on current rates of exploitation
(2) Estimated ten-year replenishment rate
(3) Inferred Resource Estimate

It is important to note that while Jamaica possesses large resources of high-quality limestone, the levels of economic reserves of chemical, industrial, metallurgical and whiting grade limestone in Jamaica have not yet been quantified.

2.4 Sector Performance

The relative contribution of the mining and quarrying sector to the Jamaican economy has shown a long-term decline over the period since Independence, falling from 10.3% of Gross Domestic Product (GDP) in 1962 to 5.9% of GDP in 1982 and to 3.7% in 2001. However the sector has shown growth in recent years, rising slightly to 3.8% of GDP in 2008.

2.4.1 Metallic Minerals

The main minerals industry in Jamaica consists of bauxite mining and refining of bauxite into alumina, the intermediate raw material for aluminium. Total production of bauxite in 2008 was 14.6 million tonnes. Whereas in 1974, 47 % of total bauxite production consisted of alumina, in 2008 the share was 69.6 %, clearly indicating a progression up the value chain. Exports of bauxite and alumina were valued at US$1.4 billion in 2008, and represented 50.4 % of earnings from export of goods in 2008. The sector also has the highest labour productivity in the Jamaican

economy, due to its capital intensity and efficiency, advanced technology and the high quality of its human capital.

Total alumina capacity has increased steadily from 3,850 kilo tonnes in 2002 to 4,550.0 kilo tonnes in 2008. Increased capacity was attributed to expansion projects primarily at the ALPART and JAMALCO refinery. Within the five year period 2004-2008 average capacity utilization at the alumina refineries ranged between 87.1 % in 2007 to 95.8 % in 2004. The capacity at the sole crude bauxite plant has been stable at 4,500 kilo tonnes between 2002 and 2005, however, in 2006 capacity rose to 5,000 kilo tonnes. Capacity utilization at the bauxite plant was 91.0 % in 2006, the highest within the five year period. The lowest capacity utilization was 74.1 % in 2004 when Hurricane Ivan ravaged the island.

Jamaica's international competitiveness in the bauxite and alumina industry is affected by its relative position against its main global competitors. The competitors in terms of metal grade alumina are: China, Australia, USA and Brazil. For bauxite, competition emanates from Guinea, Australia and Brazil. Thus while Jamaica benefits from shallow deposits of relatively high-grade ore which may be strip-mined at relatively low cost, its overall competitiveness is affected by the relatively high cost structure in the energy-intensive alumina refining stage. Australia in particular also benefits from significant economies of scale in its bauxite mining and refining plants. However, Jamaica also enjoys a transport cost advantage to its major market in the North American markets over its main competitors. Canada is Jamaica's major purchaser of metal grade alumina, accounting for 757.3 kilo tonnes (or 18.8% of total shipments) in 2008. In contrast, the US purchased 465.6 kilo tonnes, or 11.5 % of total shipments in the same year.

The following table compares the cost of production of alumina in a number of countries, and indicates that Jamaica's costs of production are higher than in Australia and Brazil but lower than Western Europe. It is also worth noting that energy is the main cost element at most plants including in Jamaica, where energy costs accounted for 35% of production cost in 2006.

Table 4: Comparative Alumina Industry Cost Structure of Production (US$ per metric tonne)

		Cost Elements							
Year	**Refinery**	**Bauxite**	**Caustic Soda**	**Energy**	**Labour**	**Other**	**Total Cash**	**Depreciation**	**Operating Cost**
2004	Pinjarra, Australia	17	14	26	20	34	111	7	118
	Wagerup, Australia	21	14	23	25	36	119	18	137
	Alunorte, Brazil	58	16	38	4	16	132	12	144
	Aughinish, Ireland	68	13	69	23	33	206	8	214
	Eurallumina, Italy	112	14	95	20	38	279	9	288
	JAMAICA	26	15	53	21	46	161	14	175
2005	Pinjarra, Australia	19	24	32	21	36	132	7	139
	Wagerup, Australia	23	23	28	26	39	139	18	157
	Alunorte, Brazil	67	29	57	5	19	177	13	190
	Aughinish, Ireland	76	23	79	23	34	235	10	245
	Eurallumina, Italy	115	24	139	20	39	337	9	346
	JAMAICA	29	24	75	23	47	198	14	212

Source: Brook Hunt; JBI.

More recent data shows that the fuel/energy cost in Jamaica's bauxite/alumina industry has increased from an average of US$51.90 per metric tonne in 2004 to US$170.70 per metric tonne in 2008, an increase of 229% in four years.[12] In 2008, fuel/energy costs represented 48% of the total operating cost of production in Jamaica's bauxite/alumina industry, making it clear that reduction in energy cost is the key to the future competitiveness of the industry.

2.4.2 Non-Metallic Minerals

Production of most non-metallic minerals has been increasing since 2002, including limestone, gypsum, and sand & gravel (see Table 5). The growth rates of production for Silica Sand, Sand and Gravel and limestone over the five year period (2004-2008) are 32.1%, 26.4% and 1.1% respectively. In 2008 production for industrial minerals were as follows: silica sand 14.8 kilo tonnes, limestone 2.5 million tonnes, gypsum 0.2 million tonnes, Marble 120 tonnes, Sand and Gravel 3.0 million tonnes, Marl and Fill 2.7 million tonnes. Since 2005 pozollan, a volcanic material used in the production of Portland cement, has been added to the list of industrial minerals that are mined in Jamaica. Export earnings from gypsum were US$1.5 million in 2006 while limestone was US$1.8 million for that same year.

Table 5: Jamaica – Production of Non-Metallic Minerals 2004 - 2008

PRODUCTION OF INDUSTRIAL MINERALS 2004-2008 ('000 tonnes)						
						% Change (1)
	2004	2005	2006	2007	2008	2004-2008
Silica Sand	11.2	14.3	9.6	14.5	14.8	32.1
Limestone	2500	2610	2801	2950	2527.5	1.1
Gypsum	283	302.1	364.4	227.7	238.3	-15.8
Marble	0.12	0.12	0.12	0.12	0.12	0.0
Sand and Gravel	2362	2392	2760	3611	2985	26.4
Marl & Fill	5900	5310	3011	3228	2740	-53.6
Pozzolan	0	79	149.3	114.5	124.3	n.a.
Shale	185	164.3	180	168.4	200.3	8.3
Clay	525	45	102.6	663.8	101.2	-80.7

(1) Change in total production in 2006 compared to 2002
Source: Mines and Geology Division

2.5 Policy and Institutional Framework

The Ministry of Energy and Mining has overall policy responsibility for guiding the development of the mining and quarrying sector. The Mines and Geology Division (MGD) has the statutory responsibility under the Mining Act and the Quarries Control Act to supervise over all prospecting, mining and quarrying operations throughout the island. The Division also

[12] ESSJ 2008.

manages the investigation, characterization, documentation and release of information on all aspects of the geology of Jamaica. The Minerals Policy and Development Division (MPDD) of the Ministry of Energy and Mining (MEM) is responsible for policy development with a specific focus on promoting sustainable development and contributing to the ongoing modernization of the minerals industry, including proposing amendments to minerals-related legislation, introducing new minerals-related legislation, and developing programmes and projects to facilitate the industry's continued development and the efficient management of mineral-bearing lands.

The Jamaica Bauxite Institute (JBI) was established in 1976 to deal mainly with the sovereign aspects of the Government's participation in the bauxite and alumina industry. Its main functions include: monitoring and studying the alumina and aluminium industry; providing technical advice; undertaking research and development activities; assessing and ensuing rationalization in the use of Jamaica's bauxite reserves and bauxite land; and monitoring and making recommendations on pollution control and other environmental concerns in the industry. In conjunction with other agencies such as the MGD and the National Environmental Planning Agency (NEPA), the JBI is also involved in environmental monitoring and interfacing with communities hosting bauxite and alumina operations.

The Jamaica Bauxite Mining Limited (JBM) and the Bauxite and Alumina Trading Company of Jamaica Limited (BATCO) are involved in the marketing of the Government's share of bauxite resources and sale of alumina.

The main pieces of legislation governing the minerals industry are the Mining Act, the Quarries Control Act and their Regulations, the Minerals (Vesting) Act and incentive legislation for the Bauxite and Alumina Industries. A National Minerals Policy is being prepared to guide the sustainable development of the minerals industry.

2.6 Structure of Minerals Sector

2.6.1 Structure of Metallic Minerals Sub-Sector

The ownership structure of the bauxite and alumina industry has evolved over time. The industry was initially driven by foreign direct investment by North American companies, then saw government acquisition of assets in the industry in the 1980s when several foreign companies divested their interests. This has been followed by new foreign direct investment in recent years. However the government continues to have shareholdings in the industry. Currently the main players in the bauxite industry are:

- The West Indies Alumina Company (WINDALCO) - partnership between Jamaica Bauxite Mining and United Company RUSAL
- Jamaica Alumina Company (JAMALCO) – partnership between Clarendon Alumina Production (CAP) and Alcoa
- Alumina Partners of Jamaica (ALPART) – partnership between Norske Hydro and United Company RUSAL
- St. Ann Jamaica Bauxite Partners (produces crude bauxite for export)

The industry also benefits from port facilities for the export of bauxite and alumina including Port Rhoades (Discovery Bay, St. Ann), Port Esquivel (St. Catherine), Port Kaiser (St. Elizabeth), Rocky Point (Clarendon) and the Reynolds Pier in Ocho Rios (St. Ann).

2.6.2 Structure of Non-Metallic Minerals Sub-Sector

The Survey of Local Quarry Operations completed by the MPDD in 2006 reports that there are a total of 218 licenced quarries on record in the country as at December 2005. Of this total, 173 quarries reported some activity during the year with 42 being active year round. Over 1 500 persons were directly employed by quarries with over 90 % being males.

Quarries are located in all parishes with a concentration of river-based sand and stone quarries along the Rio Minho in Clarendon. A large number of quarries are also located in St. Catherine. River based sand quarries are located mainly in eastern parishes while most limestone quarries are in the western parishes. Over 75 % of entities within the sector are located in rural and semi-rural areas. As shown in Table 6 below, the main output of the sub-sector consists of crushed stone, marl and fill, and sand and gravel.

Table 6: Number of Quarries by Material Produced

Quarry Material		Number	Quantity (metric tonnes)
Gypsum/Anhydrite		1	302,066
Igneous Rock		2	0
Limestone	Crushed Stone	29	2,610,000
	Marl & Fill	113	5,310,000
Sand & Gravel		72	2,392,000
Shale		1	72,362

Source: Minerals Policy and Development Division

The non-metallic minerals industry in Jamaica consists mainly of micro to medium-sized local companies, of which some have made significant steps to improve their technological and human capability in recent years. The vast majority of limestone, marl, gypsum, shale and igneous rock quarries are very small, producing under 125,000 tonnes of material per annum. Only 57 quarries or 26% of the total number of licenced quarries possess crushing facilities, of which 36, in most cases the larger entities, may be considered as fully mechanized. Approximately 80 % of the equipment in the sector is over 10 years old.

The non-metallic minerals sub-sector in Jamaica can be classified as follows:
1. Raw material extraction
2. Primary processing (crushing, screening, etc)
3. Value added (mineral based manufacturing)
4. Stonecraft, concrete fabrication and installation
5. Services (professional, maintenance, etc.)[13]

[13] Mining and Quarrying Association of Jamaica.

However at present the sub-sector is largely confined to the extraction and primary processing stages. The majority of the output is used in the local construction industry while local use of gypsum and shale is almost exclusively for the manufacture of cement. Limestone is also used to manufacture calcined and hydrated lime for various applications such as bauxite refinement, flocculants, fillers and agriculture purposes. Over 90 % of the gypsum produced is exported and the majority (99%) of the high purity grade limestone (whiting) is exported, while only 8.5 % of the sand and gravel produced was exported.

Over 90% of the entities within the sub-sector are locally owned with direct foreign ownership represented primarily by the Caribbean Cement Company through its subsidiary Jamaica Gypsum and Quarries Limited, Rugby Jamaica Lime & Minerals Limited, and Chemical Lime. Entities within the sub-sector are privately owned and primarily family-owned, with the exceptions being the largest entities. By world standards, entities within the sub-sector are generally micro to small,[14] and less than 15% are regarded as medium (500,000 – 1,000,000 tonnes annually) and large (over 1,000,000 tonnes annually). Currently there are no entities of a world-class size with annual production of over 4 million tonnes. However major multinational companies, including Rinker, which could produce these volumes, have been considering establishing operations in Jamaica.[15]

The sub-sector possesses only a few entities which may be considered advanced companies with modernized operations and management systems, and existing value-added and export activities or the potential to undertake such activities. There are also a second tier of companies which serve national markets and, while not as well-equipped as the most advanced companies, also possess capacity for value-added and export production. There is a relatively broader range of companies which may account for 25%-35% of the total number of licenced entities and serve smaller domestic markets often focused on specific parishes or regions. These entities may not currently possess the ability to undertake production for export markets. The majority of quarries may be considered as community-based operations which are very small, often located at significant distances inland, and are primarily dependent on the surrounding communities for their market.

Operations in the 'regional' and 'community-based' groups broadly typify the local quarrying sector. They are generally individual- or family-owned, produce small volumes of material, lack effective management and expertise, maintain poor records, have old and poor quality mining equipment, and are staffed by individuals with low levels of education. Finally, there are a number of seasonal and special purpose operations, which generally focus on the removal of marl, and to a lesser extent sand and the crushing of limestone for public sector infrastructure projects.[16]

The differences in characteristics of these entities are relevant in planning for the long-term development of the sub-sector. The more advanced companies will be able to respond faster to

[14] Annual production of less than 250,000 tonnes and between 250,000 – 499,000 tonnes, respectively.
[15] Analysis is based on MPDD (2006) *Proposed Classification of Entities within Jamaica's Industrial Minerals Sector.*
[16] MPDD (2006) *Proposed Classification of Entities within Jamaica's Industrial Minerals Sector.*

initiatives aimed at encouraging the production of value-added mineral products and increasing exports, while specific strategies may be required to develop the capacity of smaller operations.

2.6.3 Linkages with Other Sectors

The mining and quarrying sector has significant linkages with other important sectors of the Jamaican economy such as construction, transportation, energy, manufacturing and professional services. The sector produces important inputs for the construction sector including aggregate, sand and the raw materials for cement, and also depends on an efficient transport system for the movement of mineral products to domestic and export markets. The mining and quarrying sector is the second largest consumer of energy in the Jamaican economy, particularly in the conversion of bauxite to alumina, and uses a range of local professional services in its development and operation, including engineering and environmental services. The mining and quarrying sector also requires careful spatial and environmental planning to reconcile its development with competing land use for other sectors including tourism, agriculture and housing.

2.7 Sector Development

The development of the mining and quarrying sector in Jamaica shares comparisons both to leading mineral producing countries such as South Africa, Australia and Canada and to well-established non-metallic mineral producers such as Spain, Italy, Ireland, Greece and Israel. One of the close similarities with Jamaica and these countries is that most of them have a vibrant tourism industry coexisting with mineral exploitation. In most cases, these countries like Jamaica also are dependent on imported fossil fuels. There also are several physiographic similarities in topography and surface mining activities. The ownership structure in Jamaica is similar to the leading mineral producing countries in the case of bauxite, but for other minerals our ownership structure is more similar to countries like Italy.

In looking at the growth of these countries, even industry leaders such as Canada have had serious environmental disasters as a result of either poorly executed reclamation efforts or chemical spillages. Their movement towards best practice has been aided by enactment of legislation and establishment of strong environmental, regulatory and research institutions together with voluntary compliance by larger entities. There also has been the development of high levels of environmental awareness within their industries.

2.7.1 Metallic Minerals

The Jamaican bauxite and alumina industry has entered a mature stage and its long-term development will require addressing a range of issues as stated below.

i) Change in quality and size of mix of reserves: As the relative percentage of alumina trihydrate in the mineable reserves of bauxite decreases and the percentage of the more difficult- to-process alumina monohydrate increases the industry will have to adopt

alternative methods in alumina plants, including ore blending and use of high-temperature extraction and dual-feed digester systems.

ii) Increasing distance of mineable reserves from plants: The Jamaican bauxite industry is in its mature stage, and the reserves closest to processing plants are being steadily depleted. As the industry shifts over the medium term to exploitation of reserves that are more distant from existing bauxite plants, the cost of transport will increase, requiring adequate responses from the industry to remain competitive.

iii) Proximity to population centres: The main bauxite reserves are located in proximity to population centres within their respective parishes, which will require increasingly sensitive mining methods to maintain long-term sustainability of the industry.

iv) Tolling bauxite: Over the long term, it will be necessary to consider options for supplementing Jamaica's indigenous bauxite supplies by tolling bauxite or importing bauxite from other sources such as Guyana to be refined at Jamaican plants. This option, which is already practiced by other countries, would allow the substantial investment made by Jamaica in developing its alumina refining plant capacity and skilled workforce to extend its productive life despite declining reserves.

v) Energy: As indicated above, energy costs represent the largest component of the cost of production at Jamaica's refineries. It will be important for these plants to reduce their energy costs to remain competitive, which will involve switching from their current reliance on Bunker C fuel oil as their main energy source to lower cost options such as coal, petcoke or liquefied natural gas (LNG). However these options involve development of additional infrastructure for importation, storage and distribution of fuel supplies (e.g. port facilities and pipelines), in addition to investment in fuel conversion facilities at the plants themselves. The improvement in energy cost-efficiency within the bauxite and alumina industry therefore is dependent on the overall energy policy of the country, as the diversification of fuel choice at a national level would allow the infrastructural costs associated with alternative fuel supplies to be shared with the public electricity generation system.

2.7.2 Non-Metallic Minerals

By contrast with the Jamaican bauxite and alumina industry which is in its mature stage, the non-metallic minerals sub-sector is still in the early stages of its economic development, and is anticipated to become relatively more important in the mining and quarrying sector over time. Its long-term development will require addressing the following issues:

i) Size and Economies of Scale: As described above, the vast majority of quarrying operations are small and under-equipped, and lack the economies of scale to compete with large, capital-intensive operations. This renders the sub-sector generally unable to take full advantage of export opportunities to markets in the Caribbean and United States, and highly vulnerable to the imminent establishment of large-scale operations in Jamaica by new, global competitors such as Rinker. While the main motivation of these foreign companies is to use Jamaica as an export base, their scale of operation is such that they would also have the potential to dominate the local market for non-metallic minerals such as crushed stone, marl and fill, to the detriment of local producers. It will be necessary therefore to consider the mechanisms

for enabling existing local operators to improve their capacity and competitiveness over time while allowing foreign direct investment to play a role in expanding the sub-sector.

ii) Supporting infrastructure and regulatory environment: The existing constraints to the growth of the sub-sector also will have to be addressed, including the lack of key supporting infrastructure such as ports for bulk exports of non-metallic minerals, and a regulatory environment that generally gives the non-metallic minerals sector greater parity with the metallic minerals sub-sector.

iii) Value-Added Production: As with the aim to add value in the metallic minerals sub-sector by increasing the percentage of bauxite converted to alumina, it will be important to develop the non-metallic minerals sub-sector on the basis of value-added production. For example the economic value of limestone increases by several orders of magnitude as the raw material progresses up the value chain by crushing, washing, calcination, and precipitation to create precipitated calcium carbonate (PCC). By contrast the country will derive relatively low levels of benefit from its limestone resources if they are extracted and exported as a primary raw material.

2.8 Best Practices in Minerals Development

The international minerals industry has designed basic guiding principles that are to be modified by individual countries according to the prevailing local conditions. These fundamental best practice principles have been agreed by major minerals-related companies, governments of major minerals-based economies and other stakeholders in the international minerals industry. These best practices will be important for the long-term sustainable development of Jamaica's mining and quarrying sector.

2.8.1 Fundamental Principles for the Mining Sector

According to the Berlin Guidelines 1991 (revised 2000)[17] on Fundamental Principles for the Mining Sector, governments, mining companies and the minerals industry should, as a minimum, adhere to the following:

1. Recognize environmental management as a high priority, notably during the licensing process and through the development and implementation of environmental management systems. These should include early and comprehensive environmental impact assessments, pollution control and other preventive and mitigation measures, monitoring and auditing activities, and emergency response procedures.
2. Recognize the importance of socio-economic impact assessments and social planning in mining operations. Social-economic impacts should be taken into account at the earliest stages of project development. Gender issues should also be considered at a policy and project level.

[17] Environment Australia (2005). Overview of Best Practice Environmental Management in Mining. http://www.industry.gov.au/assets/documents/itrinternet/overview_Best_Practice_Environmental_Management_in_Mining20051123111536.pdf. Accessed 08/08/07.

3. Establish environmental accountability in industry and government at the highest management and policy-making levels.
4. Encourage employees at all levels to recognize their responsibility for environmental management and ensure that adequate resources, staff and requisite training are available to implement environmental plans.
5. Ensure the participation of and dialogue with the affected community and other directly interested parties on the environmental and social aspects of all phases of mining activities and include the full participation of women and other marginalized groups.
6. Adopt best practices to minimize environmental degradation, notably in the absence of specific environmental regulations.
7. Adopt environmentally sound technologies in all phases of mining activities and increase the emphasis on the transfer of appropriate technologies that mitigate environmental impacts including those from small-scale mining operations.
8. Seek to provide additional funds and innovative financial arrangements to improve environmental performance of existing mining operations.
9. Adopt risk analysis and risk management in the development of regulation and in the design, operation, and decommissioning of mining activities, including the handling and disposal of hazardous mining and other wastes.
10. Reinforce the infrastructure, information systems service, training and skills in environmental management in relation to mining activities.
11. Avoid the use of such environmental regulations that act as unnecessary barriers to trade and investment.
12. Recognize the linkages between ecology, socio-cultural conditions and human health and safety, the local community and the natural environment. In effect, synergies provided within the sustainable development construct.
13. Evaluate and adopt, wherever appropriate, economic and administrative instruments such as tax incentives and other policies to encourage the reduction of pollutant emissions and the introduction of innovative technology.
14. Explore the feasibility of reciprocal agreements to reduce trans-boundary pollution.
15. Encourage long term mining investment by having clear environmental standards with stable and predictable environmental criteria and procedures.

2.8.2 Voluntary Initiatives for the Minerals Industry

Voluntary initiatives represent a broad range of industry activities, potentially covering all actions not required by legislation. At the 2001 Mining, Minerals and Sustainable Development (MMSD) Workshop on Voluntary Initiatives for the Minerals Sector,[18] it was concluded that:

1. Objectives of voluntary initiatives should go beyond legal requirements: voluntary initiatives should be designed to improve industry/sector performance over and above

[18] Walker, J. & Howard, S. (2002). Finding the Way Forward. How Could Voluntary Action Move Mining Towards Sustainable Development. Environmental Resources Management (ERM) in collaboration with the International Institute for Environment and Development. http://www.iied.org/mmsd/mmsd_pdfs/finding_the_way.pdf. Accessed 09/08/07.

requirements set by international agreements and by national law and regulation. They should strive for continual improvement and provide incentives for participation.

2. Voluntary initiatives should be flexible in their application: flexibility should be allowed in the way companies achieve sustainable development objectives, although common norms are required for guidance.
3. Consistent principles are important: consistency in approach across the sector is needed to improve performance. This could be achieved through sustainable development principles and a code of conduct setting out process, management, and performance norms. A wide range of local economic, social, and environmental conditions, the diversity of company size, and the issue of impingement on the right to development for developing countries need to be balanced against this, however.
4. The scale of application should be appropriate: voluntary initiatives also need to be designed at the appropriate level, from global down to local.
5. Voluntary initiatives should complement other instruments: voluntary initiatives can form only part of the picture for improving performance in the sector. International cooperation, national policy, law and regulatory instruments, and other approaches are necessary to complement or parallel voluntary initiatives.
6. Voluntary third-party verification should be used: a key element of voluntary initiatives, including an industry code, will be the design and application of some form of third-party verification and possibly certification of adherence to the norms and process provisions of the code. This is essential to gain the widest possible acceptance of the programme by both companies and stakeholders, and to provide public legitimacy to its implementation.

Voluntary initiatives for the minerals industry may be accommodated within the best principles guidelines for the industry. These also have relevance for the long-term development of Jamaica's mining and quarrying sector.

2.8.3 Sustainable Mining

The concept of sustainable development has been applied to the mining and quarrying sector through the elaboration of the principles and practice of sustainable mining. For example the Mining Association of Canada has expressed its guiding principles as including: sustainable natural resource use; minimizing the impact of mining operations on the environment and biodiversity; supporting the sustainability of mining communities; acting in a transparent and ethical manner; protecting the health and safety of employees, contractors and communities; and practicing continuous improvement through the application of new technology, innovation and best practices in all facets of our operations. The performance indicators for sustainable mining include targets for tailings management, energy use and greenhouse gas emissions management, external outreach and crisis management planning.[19]

[19] The Mining Association of Canada. 2007. Towards Sustainable Mining. http://www.mining.ca/www/Towards_Sustaining_Mining/index.php

2.9 Issues and Challenges

2.9.1 Competitiveness

Jamaica's minerals sector faces a number of challenges to its long-term competitiveness. While the bauxite and alumina industry is part of a vertically integrated global industry, the non-metallic minerals sector has been relatively less exposed to global economic competition due to:

i) the typically low value-to-bulk ratio of industrial minerals;
ii) the infant stage of development for non-bauxite resources; and
iii) Jamaica's geographic location.

Jamaica's bauxite and alumina industry is now facing a very serious challenge to its global competitiveness, particularly in the context of the global economic downturn of 2008-2009. Jamaica's share of total global alumina production has steadily declined over the past nine (9) years, from 7.3 % of total global alumina production in 2001 to 5.0 % in 2008. Its share declined by a further 1.1 percentage point in the first quarter of 2009 to 3.9 %, as the percentage cutback in local production consequent on production cutbacks and plant closures outweighed the percentage cutback in global production. This occurred as some of Jamaica's alumina plants operate near the top end of the global cost curve and suffer from relatively higher energy cost. Addressing the high energy costs in Jamaica's bauxite and alumina industry therefore represents a high priority in restoring its global competitiveness.

Additionally, in order to develop value-added industries based on processing of mineral resources, the minerals extraction stages have to provide competitive sources of raw materials. A critical part of this process will be to increase the scale and scope of operations within the industry and to increase the levels of exports from the sector significantly. While productive enterprises in the minerals sector, along with other sectors, will benefit from improvements in the overall macro-economic and business environment, there are sector-specific measures which can improve the competitiveness of the sector, including:

- Facilitation of retooling and upgrading of mines and plants with a view to improving their position on the global cost curve
- Rationalization of legislation to provide similar benefits to all segments of the minerals industry
- Expansion and improved utilization of port facilities employing the principle of coexistence and development of multi-use facilities
- Substantial skills upgrading

2.9.2 Land Management

As with agriculture, the mining sector involves the exploitation of resources that are intrinsic to the land, and planning for the sector therefore requires long-term planning for land use and management, in which the following issues will be important:

- Confinement of exploitation of mineral resources to mineral development zones wherever feasible and sustainable

- Improvement of inventory of mineral resources islandwide to incorporate exclusion of mined out and sterilized resources and addition of new discoveries
- Introduction of Global Positioning Radar (GPR) and related technologies
- Investigation of marine mineral resources
- Provide adequate resources to shorten the turn around time for processing applications
- Facilitating greater community consultation

With regard to land management in the bauxite sector it is worth highlighting that between 1952 and the end of 2006, a total of 7,473 hectares of land has been mined, representing 0.8% of Jamaica's total land area of roughly 1 million hectares. To date, approximately 4,803 hectares, or just over 64% of the total area mined, have been certified by the Commissioner of Mines as being satisfactorily reclaimed.

2.9.3 Supporting Framework

The supporting framework for the sector also can add to its competitiveness and long-term development, including through:

- Strengthening the capacity, business-friendly orientation and coordination among agencies in the sector, including rationalization and consolidation to increase efficiency and reduce administrative costs
- Strengthening research and development capacity including collaboration and partnership between local and international institutions and development of world-class testing facilities
- Development of systems for market information and quality standards
- Strengthening of monitoring and evaluation framework for sector
- Development of continuous and comprehensive training programmes for sector
- Access to adequate and competitive financing

2.9.4 Optimal Long-Term Extraction Rates

While Jamaica may seek to increase its production levels of bauxite in the short or medium term, the optimization of the value of the island's bauxite reserves (including low-grade ores) as a non-renewable resource will depend on the rates of extraction and the market prices over the lifetime of the reserves. Given the general outlook for world commodity prices it is likely that the real prices of bauxite, alumina and aluminium will increase over the long run, driven in part by increased demand from developing countries such as China. It is relevant for planning over a 20-year horizon therefore to consider the rates of extraction of Jamaican bauxite that will maximize its present value given likely scenarios for world demand and prices. It has been and will continue to be imperative to sustain the industry's march up the value chain, thereby converting a progressively larger share of total bauxite production into higher value alumina. For example, in 2008 we exported 4.4 million dry metric tons of crude bauxite to the U.S.; there is the need to make a concerted effort to have that material refined locally.

For the rest of the industry (the non-bauxite component), given its infant stage, optimal extraction rates are yet to be determined, however, increased emphasis needs to be placed on achieving higher rates of value-added and a diversification in output.

2.9.5 Environmental Issues

The mining and quarrying sector has very significant impacts on the environment, including dust and noise pollution, red mud residues, loss of biodiversity, reduction of forest cover, degraded watersheds, sediment loads to surface waters, coastal waters and the marine environment and loss of habitats and relocation of communities.

The Ambient Air Quality Regulations and Guidelines were gazetted in August 2006, requiring continuous monitoring, assessment and verification of emissions and the development and application of dispersion modeling for each major facility. The mineral and non-mineral processing sectors also are required to comply with environmental legislation such as the Natural Resources Conservation Authority Act, the Wild Life Protection Act and the Beaches Control Act where port facilities would be of significance in the value chain.

The operators within the sector are expected to: comply with codes of practice, guidelines, standards and regulations for the maintenance and improvement of the environment, including the controlled release of substances into the environment and the trans-boundary movement of hazardous wastes; dispose of ship-generated wastes in an environmentally sound manner; and engage conservation, management practices in their activities to reduce the risk to disasters and the negative impacts of climate change. The long-term sustainability of the mining industry will require use of best practices in the rehabilitation of mining sites.

Development projects for the exploitation of mineral and non-mineral resources are subject to having environmental permits that may require an Environmental Impact Assessment Report and a Health Impact Assessment Report. In addition the new minerals policy proposes that ‘mineral exploitation in areas protected under different pieces of legislation and equivalent to the World Conservation Union’s (IUCN) categories I and II, as outlined in the Policy for the National System of Protected Areas, will not be undertaken’. It will be important however to ensure that the impact assessment of any such decisions fully reflect the economic cost of the natural resources and eco-systems of the protected areas that might be affected. The Government also should ensure that the costs of environmental impacts are not passed on to the community.

3. SWOT Analysis

Minerals development provides a valuable opportunity for industrialization and sustainable development of nations that possess exploitable mineral resources. A standard tool of strategic analysis is SWOT analysis, which seeks to identify the main strengths, weaknesses, opportunities and threats for a given entity, ranging from a nation to a sector to an individual enterprise. For the Mining and Quarrying Sector in Jamaica the identification of strengths and weaknesses represents the internal assessment of the sector while the consideration of opportunities and threats represents the analysis of the external environment for the sector.

The SWOT analysis, along with the Situational Analysis, form the basis for identifying goals, objectives and strategies that may be employed to apply the strengths and address the weaknesses of the sector, and capitalize on the opportunities and mitigate the threats to the long-term development of the sector.

The SWOT analysis for Jamaica's Mining and Quarrying Sector is presented in Table 7 below.

Table 7: SWOT Analysis – Mining and Quarrying Sector

Internal Analysis	
Strengths	**Weaknesses**
• The chemical and geomorphological properties of Jamaican minerals including bauxite (where notably the percentage of available alumina and reactive silica, rank among the best in the world) and limestone (where the exceptional purity and amorphous, non-crystalline characteristics are highly regarded) • Jamaican mineral deposits including bauxite and limestone deposits in general lie close to the surface making them easier and less expensive to mine • Location of limestone deposits in proximity to port facilities • Substantial proven reserves of high-quality non-metallic minerals, particularly limestone (approximately 150 billion tonnes) and volcanic materials • High quality lime being produced competitively	• High level of dependence of bauxite/alumina industry and non-metallic minerals sector on imported, and increasingly expensive, energy (bauxite/alumina requiring the amount of approximately 10 million barrels of oil equivalent per annum at current levels of production) • Local refineries are – for the most part – designed to process bauxite at low temperature.[21] At the current mature stage of the industry, this could undermine its international competitiveness • Unavailability of bulk-handling port and loading facilities to accommodate non-metallic minerals exports together with the high capital intensity associated with making the improvements needed • Inadequate local transportation system (roads, rail and inland water)

• Several successful quarry operators, as well as local and foreign investors with strong interest in expanding operations and targeting niche markets overseas • Favorable geographical location with close proximity and timely logistical access with respect to the markets of the Caribbean, USA and South America • Existence of in some cases, heavily under-utilized bulk shipment ports in Jamaica[20] • Existence of several large-scale end-users of Jamaican minerals, seeking additional quantities (i.e. an available and proven market) • Existence of favourable conditions for new entrants whether individually or through joint ventures with local firms	leading to an overwhelming reliance on road transport for cross-country movement of construction aggregates • Insufficient focus on the rehabilitation of mined-out non-metallic minerals bearing lands • Absence of institutions for human resources development and research for opportunity areas other than bauxite. • Difficulty in accessing financing on competitive terms • Poor practices (quality, environment, safety and management) on the part of some firms that have not had access to industry supported training • Lack of transparency in the procurement of aggregates for public sector projects • Illegal and illicit quarrying • Difficulty in accessing mineral bearing land at reasonable costs • Limited size and existing layout of plants reduces economies of scale • Limited local content of goods and services used in industry <u>The Non-Metallic Minerals Sector:</u> • Large fleet of old and inefficient equipment and plants • Dominance of undercapitalized and small-scale operations with high production costs • Concentration on the production of primary products • Poorly developed human resources: low levels of mining engineering, mineral processing and related skills • Poor marketing strategies, low levels of exports and low ratio of exports to total annual production • Very small expenditure on mineral exploration and research: less than 10% of the operators can provide satisfactory data on the quantities and categories of reserves • Over-reliance on Government as the major consumer • Limited amount of product research and

	development • Limited penetration of environmental management and sustainable development practices • Lengthy processing times for licences (new and renewals). • Short duration of quarry licences. • Difficulties in sourcing affordable financing for business development and expansion. • High interest rates, import duty, and taxes • Lack of dedicated bulk-handling port facilities for the quarrying sector • High costs associated with using existing ports for the export of quarry materials • Quarry tax on materials for export and value-added products • Imposition of G.C.T. on quarry materials which has led to reduced sales • High cost of inputs including electricity, fuel and lubricants, plant and equipment • Informal residential settlements in some quarry areas • High restoration bond cost • Illegal activity in the industry • Time limitations (7:00am – 6:00pm) imposed on operation of sand quarries • Difficulties collecting outstanding payments from state agencies
External Analysis	
<u>Opportunities</u> • Use of each company's annual productivity plan as the principal driver of its global cost positioning • Existence of large local, regional (CSME) and export markets (target exports to be set at US$400M by 2030) • Existing capabilities within the Hope Analytical Laboratories Network (HALN) with potential to deliver more efficient analytical support to the mining and quarrying sector • Existence of co-generation power	**<u>Threats</u>** • Global economic downturn which may reduce the demand for bauxite and alumina exports from Jamaica and lead to contraction in the local industry • The price volatility of critical imported inputs such as fuel and caustic soda • Patterns of severe weather – due in some measure to global climate change – that from time to time disrupt production and damage facilities • Growing competition for investment from low-cost advantaged bauxite and alumina

systems based on cheaper and cleaner-burning sources of energy • Revamped railway system to accommodate increased use of rail as a cost-effective means of inland transportation for industrial minerals • Potential use of the levy-free fiscal incentive to encourage all the refineries to invest in dual-feed digestion systems • Existing technology to transport bauxite by pipeline in the form of a treated-slurry from the mine to the refinery, thus minimizing dust pollution • Development of integrated minerals industrial park focusing on lime and limestone at Tarentum, Clarendon in order to maximize scale and scope advantages associated with large-scale port development at Salt River • Growing demand for titanium oxide – as a value-added by-product – from red mud residue • Conditional on successful substitution of renewable energy sources for fossil fuel based sources, there is the potential for generating additional revenue in the form of carbon credits traded through the recently established Emissions Trading Scheme (ETS) under the Clean Development Mechanism of the Kyoto Protocol • Aligning the 1998 Manley Accord with the prerequisites of attaining developed country status by 2030 • Brazilian, Caribbean and Venezuelan markets for metallurgical limestone and dolomite • Growing Caribbean/North American markets for construction aggregates • Production of value-added import substitutes such as calcium citrate and calcium propionate derived from calcium oxide (lime) as well as export products such as GCC/PCC • Export market expansion through new trade agreements	producing countries such as Australia, Brazil and Guinea • Sterilization of bauxite reserves due to the unplanned development of bauxite bearing lands • Possible erosion of support for bauxite mining and processing due to the perception that industry wealth creation is not benefiting communities adequately • Potential harmful implications of high concentrations of beryllium in Jamaican bauxite/alumina • Continued (historical) reduction in the real price for raw mineral exports. It is necessary to focus on the production of value-added, and where possible high-end value-added products • Continued liberalization of the local economy and our inability to compete with cheap imports: cheap marble from India, etc. • Failure of local capital to make large investment in the sector: profits are repatriated by foreign-based investors • Aging, small and inefficient alumina plants cannot compete with newer, larger efficient plants in the competing markets • Poor condition of some public roads • Extortion and general criminality

• Possibility of access to cheaper energy (e.g. LNG, petcoke and coal) • Potential for development of new products (skid resistant aggregates) and new resources (off-shore minerals) • Demand for technologies for small scale mineral operations, rehabilitation, stone craft design, etc. • Opportunity for greater linkages of mining sector to local economy	

4. Strategic Vision and Planning Framework

The long-term process of planning for the Mining and Quarrying Sector is guided by a Vision that describes a future for the sector that is desirable for its stakeholders and that can be achieved through their own efforts within a realistic time frame. The Sector Plan contains an overall Vision for the Mining and Quarrying Sector that reflects the contributions made to date by the stakeholders represented on the Mining and Quarrying Task Force during the Vision 2030 Jamaica planning process.

4.1 Vision Statement

The Vision Statement for the Mining and Quarrying Sector for Vision 2030 Jamaica is:

> **"A World-Leading Minerals Sector, Efficiently Leveraging all Endowments And Capabilities to deliver Sustained Economic Viability based on Value-Added Products, Disciplined and Responsible Environmental Stewardship, and Enlightened Community Engagement, reinforced by an Overriding Commitment to Health and Safety"**

4.1.1 Strategic Vision

The long-term strategic vision for the Mining and Quarrying Sector in Jamaica is built on a number of fundamental elements, including the following:

i) A Mining and Quarrying Sector that uses the mineral resources of Jamaica sustainably to contribute to the long-term economic and social development of the nation;

ii) A Mining and Quarrying Sector that is driven by private sector investment within a policy and regulatory framework that fosters competition and transparency;

iii) A Mining and Quarrying Sector that is developed in harmony with other uses of land resources;

iv) A Mining and Quarrying Sector that is environmentally sustainable with minimal harmful environmental impacts;

v) A Mining and Quarrying Sector that increases the value of the nation's mineral resources by developing higher value production;

vi) A Mining and Quarrying Sector that ensures the health and safety of communities and workers.

This strategic vision is expressed in the strategic framework for the Mining and Quarrying Sector for Vision 2030 Jamaica presented below.

4.2 Strategic Planning Framework

4.2.1 Strategic Approach

The strategic planning for Jamaica's Mining and Quarrying sector broadly seeks to address the main issues and challenges facing the sector by:

i) Strengthening the supporting framework for the overall development of the sector;
ii) Restoring the international competitiveness of the island's bauxite and alumina industry as the component of the mining and quarrying sector that is currently the most mature, well-developed and economically important;
iii) Fostering the growth of the non-metallic minerals/industrial minerals sub-sector over the medium and long term;
iv) Enhancing the social responsibility and environmental stewardship of the sector.

To strengthen the supporting framework for the overall development of the sector, Vision 2030 Jamaica includes a range of strategies, including to: ensure an appropriate policy and regulatory framework for long-term development of the minerals industry; integrate development of mineral resources with overall land use planning and zoning; strengthen partnerships and linkages between the minerals sector and research and academic institutions locally and internationally; facilitate industry specific training and accreditation for the minerals sector; and enhance labour relations and productivity in the minerals industry.

To restore the international competitiveness of the island's bauxite and alumina industry, the strategies include to: develop cost efficient energy solutions bauxite and alumina industry as a priority; encourage investment in capacity expansion and dual-feed digester systems in alumina plants; allocate sufficient bauxite mineral reserves to sustain production at the targeted level; and intensify research and reconfigure technical capabilities to mitigate a declining trihydrate-to-monohydrate reserves ratio.

The approach to foster the growth of the non-metallic minerals/industrial minerals sub-sector includes strategies to: establish a national entity to lead the development of the non-metallic minerals sub-sector, particularly limestone; develop major integrated non-metallic minerals complexes; promote marketing of non-metallic minerals; and ensure access to and development of port facilities for shipping of non-metallic minerals.

Finally, the approach toward enhancing the social responsibility and environmental stewardship of the sector includes strategies to: assist in building viable mining communities; participate in development and enforcement of occupational safety and health legislation and regulations for

the mining and quarrying sector; promote compliance with relevant environmental standards and legislation; mine mineral resources with appropriate planning for the end use of land; and improve monitoring and enforcement of rehabilitation of mined-out mineral bearing lands.

4.2.2 Goals and Outcomes

The three (3) main goals and associated outcomes of the Mining and Quarrying Sector Plan are presented below. The Sector Goals represent the ultimate desired state of the Mining and Quarrying sector through which we realize the Sector Vision. The Sector Outcomes represent the desired results which we seek to achieve under each goal. A range of indicators and targets aligned to the Sector Outcomes provide quantitative milestones against which progress in implementing the Mining and Quarrying Sector Plan over time may be measured.

Table 8: Mining and Quarrying Sector Goals and Outcomes

GOALS	OUTCOMES
1:- An economically viable and globally competitive sector based on value-added products	**1.1:- An enabling policy and regulatory environment**
	1.2:- Long-term development of minerals sector integrated into the overall land use planning and management objectives of the country
	1.3:- Increased value of bauxite extraction and processing
	1.4:- A developed and economically feasible non-metallic mineral sub-sector
	1.5:- Provision of competitive infrastructure and technology
	1.6:- Adequate supply of human resources with internationally competitive levels of labour productivity
	1.7:- Increased exploitation of other mineral resources
	1.8:- Strengthened hazard mitigation mechanisms in the sector
2:0:- A socially responsible sector	**2.1:- Sustainable mining communities**
	2.2:- Harmonious relationships between communities and mining and quarrying entities
	2.3:- Adoption of a holistic approach to the wellness of sector employees
3:- Minimum negative environmental consequence from mining and quarrying	**3.1:- Effective control of negative environmental occurrences**
	3.2:- Adequately rehabilitated mined-out mineral bearing lands

4.2.3 Integration with the National Development Plan

Under Vision 2030 Jamaica, each Sector Plan is integrated with the strategic framework of the National Development Plan. The Mining and Quarrying Sector Plan is aligned with the National Development Plan under the following National Goal and National Outcome:

National Goal #3: Jamaica's Economy is Prosperous
National Outcome #12: Internationally Competitive Industry Structures

Consequently the implementation of the Mining and Quarrying Sector Plan will contribute primarily to the achievement of National Goal #3 and National Outcome #12 of the National Development Plan.

4.3 Sector Indicators and Targets

The proposed indicators and targets for the Mining and Quarrying Sector Plan over the period 2009 -2030 are presented in Table 9 below.

Table 9: Mining and Quarrying Sector Plan – Proposed Indicators and Targets

Mining & Quarrying Sector Plan					
PROPOSED OUTCOME INDICATORS	**BASELINE**	**PROPOSED TARGETS**			**COMMENTS**
	2007 or Most current	**2012**	**2015**	**2030**	
% change in exports earning from the bauxite industry	14.2%	2-4%			JBI notes that it is not able at this time to set a target for this indicator beyond 2012.
Average % change in value added outputs of non-metallic minerals (lime, cement, whiting)	290 tonnes	50%			Locally set by Ministry of Energy and Mining
% change in US$ foreign exchange inflows of exports earnings from bauxite industry (%)	14.2%	2-4%			
Average % change in value-	290 tonnes	Increase by 50%			

Mining & Quarrying Sector Plan					
PROPOSED OUTCOME INDICATORS	**BASELINE**	**PROPOSED TARGETS**			**COMMENTS**
	2007 or Most current	**2012**	**2015**	**2030**	
added outputs on non-metallic minerals - lime, cement & whiting (%)					
Share of Total Bauxite that is used in the production of Alumina - Bauxite Value Added Index (%)	70.0%	≥ 80%	≥ 85%	≥ 95%	
Total Operating cost of production per ton of alumina (US$)	US$350.00				
% of mined and quarried lands that is rehabilitated (%)	66.00%				

5. Implementation, Monitoring & Evaluation Framework for the Mining and Quarrying Sector

5.1 Implementation Framework

The implementation of the Mining and Quarrying Sector Plan is an essential component of the implementation, monitoring and evaluation framework for the Vision 2030 Jamaica – National Development Plan. The Plan is implemented at the sectoral level by ministries, departments and agencies (MDAs) of Government as well as non-state stakeholders including the private sector, NGOs and CBOs. The involvement of stakeholders is fundamental to the successful implementation of the National Development Plan and the Mining and Quarrying Sector Plan.

Components of Vision 2030 Jamaica

The Vision 2030 Jamaica - National Development Plan has three (3) components:

1. **Integrated National Development Plan:**
   The integrated National Development Plan presents the overall plan for Vision 2030 Jamaica, integrating all 31 sector plans into a single comprehensive plan for long-term national development. The integrated National Development Plan presents the National Vision, the four National Goals and fifteen National Outcomes, and the National Strategies required to achieve the national goals and outcomes.
2. **Medium Term Socio-Economic Policy Framework (MTF):**
   The Medium Term Socio-Economic Policy Framework (MTF) is a 3-yearly plan which summarizes the national priorities and targets for the country and identifies the key actions to achieve those targets over each 3-year period from FY2009/2010 to FY2029/2030.
3. **Thirty-one (31) Sector Plans:**
   At the sectoral level Vision 2030 Jamaica will be implemented through the strategic frameworks and action plans for each sector as contained in the respective sector plans. Vision 2030 Jamaica includes a total of thirty-one (31) sector plans covering the main economic, social, environmental and governance sectors relevant to national development.

5.1.1 Accountability for Implementation and Coordination

The Cabinet, as the principal body with responsibility for policy and the direction of the Government, has ultimate responsibility for implementation of the National Development Plan. Each ministry and agency will be accountable for implementing the National Development Plan

(NDP) through various policies, programmes and interventions that are aligned with the strategies and actions of the NDP and the sector plans. A robust results-based monitoring and evaluation system will be established to ensure that goals and outcomes of the Plan are achieved. This system will build on existing national and sectoral monitoring and evaluation frameworks and will be highly participatory.

5.1.2 Resource Allocation for Implementation

Vision 2030 Jamaica places great emphasis on ensuring that resource allocation mechanisms are successfully aligned and integrated with the implementation phase of the National Development Plan and sector plans. The requirements to ensure resource allocation for implementation will include alignment of organizational plans in the public sector, private sector and civil society with the National Development Plan, MTF and sector plans; coherence between the various agency plans with the National Budget; rationalization of the prioritization process for public sector expenditure; and increased coordination between corporate planners, project managers and financial officers across ministries and agencies.

5.2 Monitoring and Evaluation Framework

5.2.1 Institutional Arrangements

A number of institutions and agencies, including the following, will be involved in the monitoring and evaluation framework for the National Development Plan and the Mining and Quarrying Sector Plan:

1. **Parliament**: The Vision 2030 Jamaica Annual Progress Report will be presented to the Parliament for deliberations and discussion.

2. The **Economic Development Committee (EDC)** is a committee of Cabinet chaired by the Prime Minister. The EDC will review progress and emerging policy implications on the implementation of Vision 2030 Jamaica and the relevant sector plans.

3. The **Vision 2030 Jamaica Technical Monitoring Committee (TMC)**, or Steering Committee, is to be chaired by the Office of the Prime Minister and will provide oversight for the technical coordination and monitoring of the Plan and reporting on the progress of implementation.

4. The **Vision 2030 Jamaica Technical Secretariat** to be institutionalized within the PIOJ will play a leading role in coordinating implementation, analyzing social and economic data and information, consolidating sectoral information into comprehensive reports on Vision 2030 Jamaica's achievements and results, maintaining liaisons with sectoral focal points in MDAs, and supporting the establishment and operation of Thematic Working Groups.

5. **Ministries, Departments and Agencies (MDAs)** represent very important bodies within the implementation, monitoring and evaluation system. They are the Sectoral Focal Points that will provide data/information on a timely basis on the selected sector indicators and action plans, and be responsible for the timely preparation of sector reports that will feed into the Vision 2030 Jamaica Annual Progress Report. For the Mining and Quarrying Sector Plan, the main MDAs comprising the relevant Sectoral Focal Point will include the Ministry of Energy and Mining, the Jamaica Bauxite Institute and the Mines and Geology Division.

6. **Thematic Working Groups (TWGs)** are consultative bodies aimed at providing multi-stakeholder participation in improving the coordination, planning, implementation and monitoring of programmes and projects relevant to the NDP and sector plans, including the Mining and Quarrying Sector Plan. TWGs will be chaired by Permanent Secretaries or senior Government officials and shall comprise technical representatives of MDAs, National Focal Points, the private sector, Civil Society Organizations and International Development Partners. TWGs will meet a minimum of twice annually.

5.2.2 Indicator Framework and Data Sources

Appropriate indicators are the basic building blocks of monitoring and evaluation systems. A series of results-based monitoring policy matrices will be used to monitor and track progress towards achieving the targets for the NDP and sector plans, including the Mining and Quarrying Sector Plan. The performance monitoring and evaluation framework will be heavily dependent on line/sector ministries for quality and timely sectoral data and monitoring progress.

The results-based performance matrices at the national and sector levels comprise:

- At the national level, 60 proposed indicators aligned to the 15 National Outcomes
- At the sector level, a range of proposed indicators aligned to the sector goals and outcomes
- Baseline values for 2007 or the most recent past year
- Targets which outline the proposed values for the national and sector indicators for the years 2012, 2015 and 2030
- Data sources which identify the MDAs or institutions that are primarily responsible for the collection of data to measure and report on national and sector indicators
- Sources of targets
- Links to existing local and international monitoring frameworks such as the MDGs

Some gaps still exist within the performance matrix and a process of review to validate the proposed indicators and targets is being undertaken. This process is very technical and time consuming and requires significant cooperation and support from stakeholders and partners. The performance monitoring and evaluation framework will be heavily dependent on ministries for quality and timely sectoral data and monitoring progress. The system will benefit from our existing and relatively large and reliable statistical databases within the Statistical Institute of Jamaica (STATIN) and the PIOJ.

5.2.3 Reporting

The timely preparation and submission of progress reports and other monitoring and evaluation outputs form an integral part of the monitoring process.

The main reports/outputs of the performance monitoring system are listed below.

1. **The Vision 2030 Jamaica Annual Progress Report** will be the main output of the performance monitoring and evaluation system.

2. **The annual sectoral reports** compiled by the Sectoral Focal Points for submission to the Vision 2030 Jamaica Technical Monitoring Committee. These will be integrated into the Annual Progress Report.

3. **Other products** of the performance monitoring system include issues/sector briefs and research reports.

5.2.4 Capacity Development

There is recognition that building and strengthening technical and institutional capacity for the effective implementation, monitoring and evaluation of the NDP and the Mining and Quarrying Sector Plan is critical for success. This calls for substantial resources, partnership and long-term commitment to training MDA staff. Training needs will have to be identified at all levels of the system; a reorientation of work processes, instruments, procedures and systems development will have to be undertaken; and staffing and institutional arrangements will need to be put in place. Partnership with the Management Institute for National Development (MIND) and other institutions also will be required to provide training to public sector staff and others in critical areas such as results-based project management and analysis, monitoring and evaluation, and data management.

5.3 The Way Forward

The Mining and Quarrying Sector Plan will represent the basis for implementation of the Vision 2030 Jamaica – National Development Plan in the Mining and Quarrying sector. Some key steps in the implementation process for the Mining and Quarrying Sector Plan include:

1. Undertake consultations with stakeholders in the sector to present and review the Mining and Quarrying Sector Plan for Vision 2030 Jamaica;

2. Engage with key stakeholders including relevant Ministries, Departments and Agencies (MDAs) to finalize sector-level indicators and targets for the Mining and Quarrying Sector Plan for 2012, 2015 and 2030;

3. Mainstream the Mining and Quarrying Sector Strategic Framework and Action Plan into the Corporate/Business and Operational Plans of the relevant MDAs as the mechanism for implementation in the public sector;

4. Ensure participation by key Mining and Quarrying sector stakeholders in the establishment and ongoing operation of the implementation, monitoring and evaluation framework for Vision 2030 Jamaica, including the Sectoral Focal Point and Thematic Working Group for the Mining and Quarrying Sector Plan.

6. Action Plan for the Mining and Quarrying Sector

The Action Plan represents the main framework for the implementation of the Mining and Quarrying Sector Plan for Vision 2030 Jamaica. The tracking of implementation of the Mining and Quarrying Sector Plan will take place through the Action Plan as well as the framework of sector indicators and targets.

The Action Plan contains the elements listed below.

i. Sector Goals
ii. Sector Outcomes
iii. Sector Strategies
iv. Sector Actions
v. Responsible Agencies
vi. Time-Frame

VISION 2030 JAMAICA
MINING AND QUARRYING SECTOR PLAN
REVISED STRATEGIC FRAMEWORK

Outcomes	Strategies	Actions	Responsible Agencies and Stakeholders	Time-Frame
Goal # 1:- An economically viable and globally competitive sector based on value-added products				
1.1: An enabling policy and regulatory environment	**1.1.1:** - Ensure appropriate policy and regulatory framework for long-term development of minerals industry	1.1.1.1 Complete and promulgate the National Minerals Policy, including provisions for development of non-metallic minerals sub-sector	**MEM**, JBI	
		1.1.1.2 Simplify licensing process for metallic and non-metallic minerals	**MGD,** JBI, MEM	
		1.1.1.3 Extend the period of licences for non-metallic minerals quarries	QAC, MEM	
		1.1.1.4 Rationalize procedures for granting of blasting licences and regulating importation, handling, storage and transportation of explosive materials	**MTW, MGD**, MNS, MEM	
		1.1.1.5 Promote public awareness of importance of minerals sector	**MEM, JTI**, MQAJ, MGD, Private sector	
		1.1.1.6 Modernize minerals-related legislation	**MEM**, MGD	
		1.1.1.7 Recognize exploration in minerals legislation	**MEM**, MGD	
		1.1.1.8 Introduce certification for mineral operations and materials/products	**BSJ, MGD**	
		1.1.1.9 Review fiscal regime for bauxite/alumina industry	**MEM, MFPS**, JBI, OPM, JBM, CAP	

	1.1.2:- Revise and improve mechanisms for encouraging investment in the non-metallic minerals sub-sector	1.1.2.1 Revise and improve access to incentives encouraging investment in the non-metallic minerals sub-sector	**MFPS, JTI,** MEM	
		1.1.2.2 Rationalize treatment of metallic and non-metallic minerals under mining and quarrying legislation and incentives (exploration; transferability of licences)	**MEM, MGD**, JBI	
	1.1.3:- Strengthen enforcement of mineral licenses and regulations	1.1.3.1 Carry out education of stakeholders on licensing and regulatory requirements and breaches and international best practices	**MEM, MGD**, JBI	
		1.1.3.2 Promote improved industry self-regulation	**JBI, MQAJ, MGD,** MEM	
		1.1.3.3 Strengthen institutional capacity of regulatory agencies	**MEM, MGD,** JBI, NEPA, NWA	
		1.1.3.4 Review and revise penalties for breaches including discrete notices and penalties for operators and individuals	**JBI, MGD,** MLSS, NEPA	
		1.1.3.5 Develop modes of enforcement of penalties for specific breaches on operators and individuals	**JBI, MGD,** MLSS, NEPA	
		1.1.3.6 Create public database of status of operators in breach of licenses and regulations	**JBI, MGD**, MLSS, MNS	
		1.1.3.7 Become ISO Certified and Compliant in all mission-critical operational areas	**BSJ, Private Sector, MQAJ**	
	1.1.4:- Strengthen monitoring and evaluation mechanisms for the sector	1.1.4.1 Strengthen collection and use of data on minerals sector	**JBI, MGD, STATIN,** MEM, PIOJ	
		1.1.4.2 Develop monitoring and evaluation framework for development of minerals sector	**MEM, JBI, MGD,** JTI, PIOJ, NEPA, WRA	
		1.1.4.3 Develop accountability framework and mechanisms for evaluating and monitoring effectiveness of sector agencies	**MEM, CO,** OPM, PIOJ	

	1.1.5:- Develop and implement mechanisms to reduce informality and illegal activities	1.1.5.1 Create public database of status of licensed and certified operators	**MGD, MEM**	
		1.1.5.2 Ensure adequate penalties for operating and /or purchasing from unlicensed operators	**MEM, MGD**, MQAJ	
		1.1.5.3 Carry out public education on purchasing only from licensed and certified operators	**MEM, MGD**, MQAJ	
1.2:- Long-term development of minerals sector integrated into the overall land use planning and management objectives of the country	**1.2.1:-** Prevent the sterilization of mineral reserves hypothecated for future production	1.2.1.1 Carry out a comparative assessment on the economic extraction potential of reserve base	**JBI, MGD**, MEM	
		1.2.1.2 Classify reserve base based on economic potential	**JBI, MGD,** MEM, PIOJ	
		1.2.1.3 Provide priority planning approval for mineral development of mineral reserves	**NEPA, LAs,** CoL, NLA, JBI, MGD	
	1.2.2:- Implement sequential land-use planning for lands containing valuable mineral deposits	1.2.2.1 Introduce framework for use of mineral-bearing lands including sequential land-use	**MEM, OPM**, MGD, RADA, NEPA, LAs, MQAJ, Private sector	
		1.2.2.2 Prevent conflicting land use at pre-mining stage and during mining on lands with priority planning approval for mineral development	**MEM, OPM, NEPA, LAs,** MGD, RADA,	
		1.2.2.3 Support strengthening of capacity of planning agencies and authorities	**OPM, NEPA, LAs, MEM,** MOE (PetroCaribe Fund)	
		1.2.2.4 Ensure productive use of unmined lands including through tenant farming	**MOAF, RADA**, Private Sector	
		1.2.2.5 Ensure compliance with end use of land as per terms of approval and rehabilitation plan	**JBI (BCDP), MGD**	
		1.2.2.6 Integrate rehabilitation plans with regional land use plans	**OPM, NEPA, LAs,** MEM, JBI,	

			MGD	
	1.2.3:- Integrate development of mineral resources with overall land use planning and zoning	1.2.3.1 Identify all mineral-bearing lands including through non-invasive technological approaches e.g. Ground Penetrating Radar (GPR), infrared satellite imaging and hand drilling	**Private sector, MGD**, JBI	
		1.2.3.2 Prepare updated geological maps of entire island including location of mineral resources	**MGD, MGI, NLA**	
		1.2.3.3 Register mineral resources and reserves with Land Management Bank	**MEM, NLA, JBI, MGD**	
		1.2.3.4 Integrate mineral resource maps into planning information systems including GIS	**MGD, MGI, OPM, NEPA**, LAs, JBI, PIOJ	
		1.2.3.5 Ensure zoning of lands containing valuable mineral resources (including metallic minerals, dolomite, gypsum, whiting, marble, chemical-grade limestone)	**OPM, NEPA, LAs, MGD,** MEM, JBI	
		1.2.3.6 Update zoning (and provide flexibility in mining outside of zones)	OPM, NEPA, LAs, MGD, MEM, JBI	
		1.2.3.7 Establish and enforce no go areas for mineral exploitation	**MEM, OPM, NEPA, LAs, MGD,** WRA	
	1.2.4:- Integrate infrastructural development of mineral bearing lands in line with planning and management objectives	1.2.4.1 Integrate infrastructural development of mineral bearing lands in parish development and regional plans	**MEM, OPM, NEPA, LAs, MGD,** JBI, MTW, NWA, WRA, NWC	
		1.2.4.2 Integrate infrastructure built by mining projects into national and regional plans where possible after mining	**MEM, OPM, NEPA, LAs, MGD,** JBI, MTW, NWA, WRA, NWC	

		1.2.4.3 Develop mechanisms for joint development of infrastructure between government and private investors (e.g. roads, ports)	**MEM, MTW, JTI, PAJ, Private sector**, MOE (PetroCaribe Fund)	
		1.2.4.4 Rationalize location of quarries to be consistent with development and maintenance of transport network	**QAC, MQAJ, MTW, MGD**	
		1.2.4.5 Identify/rationalize island-wide road network for the transportation of bulk minerals	**MTW, NWA, MEM, MGD**	
	1.2.5:- Develop institutional mechanisms for long-term management of mineral resources	1.2.5.1 Establish a National Mineral-Bearing Lands Management Committee	**MEM,** JBI, MGD	
		1.2.5.2 Establish a National Mineral-Bearing Land Management Bank	**MEM**, JBI, MGD	
1.3:- Increased value of bauxite extraction and processing	**1.3.1:-** Encourage investment in capacity expansion and dual-feed digester systems in alumina plants, to engender continuous cost reduction, progression up the value chain and rise in net retained earnings	1.3.1.1 Provide Accelerated Depreciation Allowance for investment in capacity expansion and dual-feed digester systems	**MFPS,** JBI, JTI, TAAD	
		1.3.1.2 Undertake conversion of energy sources at bauxite / alumina plants to graduate to high-temperature processing format in coordination with national decisions on diversification of fuel supply between coal and natural gas and underlying economics in energy markets	**MFPS,** JBI, JTI, TAAD, MOE	
	1.3.2:- Allocate sufficient bauxite mineral reserves to sustain production at the targeted level, underpinned by an efficient exploration and reserves management	1.3.2.1 Allocate bauxite reserves adequate to sustain production for at least 25 years in the case of new plants	**JBI,** OPM, MEM, MGD	
		1.3.2.2 Improve monitoring of rate of depletion of allocated reserves and quality of remaining unallocated reserves	**JBI**	
		1.3.2.3 Provide additional reserves to existing companies as needed to sustain planned levels of production	**JBI,** OPM, MEM, MGD	

	programme			
	1.3.3:- Establish mechanisms for bauxite tolling to supplement indigenous reserves	1.3.3.1 Identify primary locations for sourcing bauxite based on logistics and material specifications (with particular reference to Haiti and Guyana)	JBI, Private sector, JBM, CAP, BATCO	
		1.3.3.2 Develop procurement, transportation and storage policy and arrangements	**JBI, Private sector,** PAJ, BATCO	
		1.3.3.3 Initiate/conduct negotiations to secure stable supplies on a long-term strategic basis	**JBI, Private sector,** PAJ, MFAFT, BATCO	
1.4:- A developed and economically feasible non-metallic mineral sub-sector	**1.4.1:-** Establish a national entity to lead the development of the non-metallic minerals sub-sector, particularly limestone	1.4.1.1 Establish National Minerals Institute (NMI) with Jamaica Limestone Institute (JLI) to spearhead development of limestone and its derivatives and other non-metallic mineral resources	**MEM,** MGD, JBI	
		1.4.1.2 Develop long-term strategic plan for integrated non-metallic minerals sub-sector with emphasis on value-added production	**MEM,** MGD, JTI, MQAJ	
	1.4.2:- Develop major integrated non-metallic minerals complexes	1.4.2.1 Develop and implement long-term plans for: • Tarentum • Cane River • Lydford • Port Esquivel • Rio Bueno • Bowden	**Private sector, JTI, MEM**, MGD, PAJ	
	1.4.3:- Strengthen the capacity of non-metallic minerals enterprises	1.4.3.1 Develop technical assistance programmes to expose industry operations to best practice in: • Management • Resource/reserve management	**MGD, JBI, MQAJ, JTI**, Tertiary institutions	

		• Drilling and blasting • Extraction • Environmental management and rehabilitation • R&D • Product development		
		1.4.3.2 Encourage consolidation of smaller enterprises	**MEM, MQAJ**, JTI	
		1.4.3.3 Encourage development of strategic alliances with internal and external partners who bring value	**JTI, Private sector,** MEM	
	1.4.4: **-** Promote development of diversified value-added non-metallic minerals products	1.4.4.1 Develop and promote quality assurance standards for non-metallic minerals enterprises	**MQAJ, BSJ, JLI,** MEM	
		1.4.4.2 Encourage substitution of local value-added products	**MQAJ, JTI, Private sector**, MEM, MGD	
		1.4.4.3 Promote awareness of range of products, end-uses and profitability of non-metallic minerals	**MQAJ, JTI, Private sector**, MEM, MGD	
	1.4.5:- Promote and encourage investments and financing in non-metallic minerals ventures	1.4.5.1 Establish and maintain non-metallic minerals as a priority sub-sector for investment promotion	**JTI,** MEM, MGD	
		1.4.5.2 Promote investment opportunities in non-metallic minerals in domestic and international markets	**JTI, MEM, MGD**	
		1.4.5.3 Develop financing mechanisms for exploration and R&D	**JLI, MQAJ, DBJ, Private sector,** MFPS	
	1.4.6: **-** Promote marketing of non-metallic minerals	1.4.6.1 Establish National Minerals Week as an annual event	**MEM**, MQAJ, MGD, Private sector	
		1.4.6.2 Develop online and hard copy catalogues of	**Private sector,**	

		available products	**MEM, JTI,** MQAJ, JEA	
		1.4.6.3 Develop market intelligence through networking alliances and conducting market studies	**Private sector, JTI,** MQAJ, JEA	
	1.4.7:- Develop linkages with other sectors	1.4.7.1 Strengthen relationships with other sector associations	**MQAJ, JMA, IMBJ**	
		1.4.7.2 Establish appropriate marketing and information systems to bring together producers and purchasers in the mining and quarrying sector and linkage sectors	**MEM, MQAJ, JMA, IMBJ**	
	1.4.8:- Allocate sufficient mineral reserves to sustain production at the targeted level, underpinned by an efficient exploration and reserves management programme	1.4.8.1 Manage allocation of valuable high-quality non-metallic mineral resources	**MEM, MGD**, MQAJ, Private sector	
1.5:- Provision of competitive infrastructure and technology	**1.5.1:-** Develop cost efficient energy solutions for metallic and non-metallic minerals sub-sectors	1.5.1.1 Use the annual productivity plan to drive a progressive reduction in the share of energy in the overall bauxite and alumina industry cost structure by increasing energy efficiency and promoting co-generation	**Private sector, JBI, Unions**	
		1.5.1.2 Coordinate conversion of energy sources at bauxite / alumina plants with national decisions on diversification of fuel supply between coal and natural gas and underlying economics in energy markets	**MEM, PCJ,** JBI, JPSCo, Private sector	
		1.5.1.3 Promote retooling of non-metallic minerals operations to introduce energy-efficient equipment including variable speed motors	**MEM**, JTI, MQAJ	

		1.5.1.4 Promote use of renewable energy sources including wind, solar and hydro-power	**PCJ, MEM,** JTI, MQAJ	
		1.5.1.5 Encourage more energy-efficient methods of drilling, blasting, loading, crushing and transport	**MEM, MGD, MQAJ**	
	1.5.2:- Ensure access to and development of port facilities for shipping of non-metallic minerals	1.5.2.1 Undertake comprehensive port study to identify existing ports including sufferance wharves and develop recommendations for expansion and rationalization of port infrastructure	**PAJ**, MTW, MEM	
		1.5.2.2 Explore potential for consolidation of alumina exports through Port Esquivel and establish Rocky Point as a port for export of non-metallic minerals from South-Central Jamaica	**MEM, MTW, PAJ, Private sector**	
		1.5.2.3 Expand and upgrade gypsum port to accommodate non-metallic minerals exports from South-Eastern Jamaica	**CCC, PAJ**, MEM	
		1.5.2.4 Develop suitable port facility for non-metallic minerals exports on North Coast	**Private sector, PAJ, MEM**	
		1.5.2.5 Require multi-use access to new port facilities for non-metallic minerals	**MEM, MTW, PAJ, Private sector**	
		1.5.2.6 Develop facilities to allow compatible multi-use of existing bauxite ports	**Private sector, PAJ, MEM**	
	1.5.3:- Develop coastal barge system as a transport solution for minerals sector	1.5.3.1 Include identification of coastal barge system in port study	**PAJ**, MTW, MEM	
		1.5.3.2 Undertake dredging and development of port facilities for barge transport as alternate means of transport	**PAJ**, MTW, Private sector	
		1.5.3.3 Undertake study of economics of coastal shipping	**PAJ**, MTW, MEM	
	1.5.4:- Extend rail network and	1.5.4.1 Develop point-to-point rail network with	**JRC, Private**	

	capacity to meet minerals sector needs	adequate load-bearing capacity from major new and existing mining and quarrying operations to ports and land-based customers	**sector,** MTW, MEM	
	1.5.5:- Introduce appropriate vehicles for transport of minerals	1.5.5.1 Ensure that vehicles used for transporting minerals on public roadways conform with load-carrying and combined weight-bearing restrictions and other regulations of the Road Traffic Act	**MTW**, MEM, MGD, JCF, ISCF	
		1.5.5.2 Require inclusion of weigh bridges and scales in quarry operations	**MTW**, MEM, MGD	
		1.5.5.3 Encourage introduction of vehicles with higher capacity on an OEM basis	**MTW**, MEM, MGD, MQAJ	
	1.5.6:- Develop conveyor and cable belt and pipeline systems where feasible	1.5.6.1 Encourage use of conveyor and cable belt and pipeline systems as means of transportation from plant to port (e.g. Ocho Rios)	**JBI,** MEM, MGD, Private sector	
	1.5.7:- Increase use of appropriate research and technology in mineral sector operations	1.5.7.1 Leverage the capabilities within the Hope Analytical Laboratories Network (HALN) as a critical underpinning of sector development	**JBI,** SRC, MGD, MOAF, WRA	
		1.5.7.2 Research the mineralogy and processing of bauxite reserves with a high concentration of goethite and associated phosphates	**Universities, SRC, JBI**, Private sector	
		1.5.7.3 Support research into the potentially hazardous effects of beryllium found in alumina	**JBI**, Private sector	
	1.5.8:- Intensify research and reconfigure technical capabilities to mitigate a declining trihydrate-to-monohydrate reserves ratio	1.5.8.1 Explore alternatives to double-digester for processing high monohydrate bauxite, including pre-treatment and sintering approaches	**JBI, Private sector**	
		1.5.8.2 Strengthen reserves definition and mine planning to allow appropriate blending of trihydrate and monohydrate bauxite	**JBI, Private sector**	
	1.5.9:- Develop research into value-added mineral	1.5.9.1 Investigate the mineralogy and commercial feasibility of isolating and extracting	**JBI,** SRC, Universities,	

	products including limestone derivatives and machine-assisted craft	titanium oxide and other materials from red mud residue	Private sector	
		1.5.9.2 Investigate the mineralogy, identification and commercial feasibility of: • Dolomitic, calcitic and hydrated lime • GCC (packaged to lab-specs) • PCC (packaged) • Specialty lime chemicals (e.g. calcium citrate, calcium propionate) • Stone craft and decorative stone products (including from agates and marble) • Manufactured sand • Clays and ceramics • Construction finishes and plasters (e.g. gypsum ceilings, decorative finishes such as stucco and plasters) • Mineral springs	**MEM, National Minerals Institute, JBI, Private sector**	
	1.5.11:- Encourage applications of limestone in reducing global GHG emissions	1.5.11.1 Encourage use of local limestone in desulphurization operations locally and overseas (with by-product of gypsum)	**MEM, MQAJ**, Private sector	
	1.5.12:- Research and develop seabed mineral exploitation	1.5.12.1 Explore potential for dredging beach sand and aggregate offshore	**Private sector, MGD**	
		1.5.12.2 Explore application of seabed mineral exploitation best practice to Jamaica's Exclusive Economic Zone (EEZ)	**MEM**, MGD, NEPA, Private sector	
	1.5.13:- Strengthen partnerships and linkages between the minerals sector and research and academic institutions locally and	1.5.13.1 Develop internship programmes and project assignments for engineering students related to the Bayer process	**UTech, UWI (St. Augustine), JBI, Private sector**	
		1.5.13.2 Develop capacity and opportunities for academic institutions to apply knowledge to industry problems and challenges	**Universities, MEM, JBI, MGD, Private**	

	internationally		**sector**, NMI	
		1.5.13.3Develop relationships with alumni and industry experts through discussion fora, seminars and presentations on topics of mutual interest	**Universities, Private sector**,	
		1.5.13.4Develop strategic alliances and research partnerships between JBI and UC Rusal-affiliated VAMI and CSIRO in Australia among others	**JBI, UC Rusal**	
	1.5.14:- Strengthen capacity of local research, academic, science and technology institutions and bodies	1.5.14.1Strengthen research capacity of JBI	**JBI**, Universities, SRC	
		1.5.14.2Upgrade JBI pilot plant for practical training and research	**JBI**	
		1.5.14.3Strengthen research and development capacities of mining institutions and enterprises	**Private sector**	
1.6:- Adequate supply of human resources with internationally competitive levels of labour productivity	**1.6.1**:- Facilitate industry specific training and accreditation for the minerals sector	1.6.1.1 Leverage the skills upgrade model piloted at the Breadnut Valley Training Institute and the Alpart/HEART Apprenticeship programme to boost productivity and enhance international competitiveness	**HEART**	
		1.6.1.2 Establish certification programmes for mining and quarrying operatives	**HEART**	
	1.6.2:- Institute necessary minerals education programmes at the universities and other levels to provide professionals for the minerals sector	1.6.2.1 Develop tertiary-level training programmes in the Bayer process using the JBI pilot plant	**JBI, Universities**, SRC	
		1.6.2.2 Introduce applied electives on bauxite and limestone in tertiary geology curricula	**Universities**, JBI, MQAJ, JLI, SRC	
	1.6.3:- Enhance labour relations and productivity in the	1.6.3.1 Review and enhance existing 1998 Industry MOU for bauxite industry	**MEM, MFPS, JBI, Private sector, Trade**	

	minerals industry		**unions**	
	1.6.4:- Improve measurement and compensation of labour productivity in the minerals sector	1.6.4.1 Establish benchmarks for internationally competitive levels of labour productivity	**JBI, MQAJ**, JLI, Private sector, Trade unions	
		1.6.4.2 Encourage application of performance-based compensation schemes	**Private sector, JEF, Trade unions, MLSS**, JBI, MQAJ, JLI	
1.7:- Increased exploitation of other mineral resources	**1.7.1:-** Encourage exploration for and exploitation of other metallic minerals resources including gold and copper	1.7.1.1 Package and provide baseline data from existing studies on potential of other metallic minerals resources in Jamaica	**JTI,** PCJ, MGD, JBI, JLI, UWI	
		1.7.1.2 Promote exploration for other metallic minerals	**JTI**, PCJ, MGD, JBI, JLI	
	1.7.2:- Encourage exploration for and exploitation of marine minerals resources	1.7.2.1 Review international programmes and models for exploitation of marine minerals resources to determine suitable model and approach for Jamaica	**MEM, UWI, JBI, PCJ,** JLI, NEPA, PAJ, MGD, ISA	
		1.7.2.2 Develop zoning and commercial blocks for exploration (see PCJ model)	**MEM**, PCJ UWI, JBI, JLI, NEPA, PAJ, MGD,	
		1.7.2.3 Package and provide baseline data from existing studies on potential of marine minerals resources	**JTI, PCJ**, MGD, JBI, JLI, UWI	
		1.7.2.4 Promote exploration for marine minerals resources	**JTI**, PCJ, MGD, JBI, JLI	
1.8:- Strengthened hazard mitigation mechanisms in the sector	**1.8.1:-** Institutionalize Enterprise Risk Assessment and Management as an effective means of reducing hazard-related losses	1.8.1.1 Design and retrofit operational, transportation and storage facilities to meet standards appropriate to natural hazard profile of Jamaica including tropical storms, hurricanes, earthquakes and floods	**Private sector, ODPEM, MGD,** JBI, MQAJ, PAJ, JLI, NEPA, JIE, LAs	
		1.8.1.2 Ensure hazard preparedness and response plans	**Private sector, ODPEM, MGD,** JBI, MQAJ, PAJ,	

			JLI, NEPA, JIE, LAs	
		1.8.1.3 Ensure maintenance and related training programmes incorporate hazard mitigation system checks	**Private sector, ODPEM, MGD**, JBI, MQAJ, PAJ, JLI, NEPA, JIE, LAs	
	1.8.2:- Strengthen relationship with national disaster preparedness and emergency management system	1.8.2.1 Strengthen linkages between umbrella organization and national disaster preparedness and emergency management system, including throughout the prevention, preparation, response and recovery phases	**Private sector, ODPEM, MGD**, JBI, MQAJ, PAJ, JLI, NEPA, LAs	
		1.8.2.2 Encourage collaboration between mining and quarrying enterprises and community-level disaster committees	**Private sector, ODPEM, MGD**, JBI, MQAJ, JLI, NEPA, LAs	
		1.8.2.3 Implement periodic on-site monitoring programmes of mining and quarrying enterprises	**ODPEM**, NEPA, MGD, JBI, private sector, MQAJ, PAJ, JLI, LAs	
Goal # 2:- A socially responsible sector				
2.1:- Sustainable mining communities	**2.1.1:-** Assist in building viable mining communities	2.1.1.1 Collaborate in the design and implementation of skills training, agro-processing, micro enterprise development initiatives and replacement industries	**HEART, MOAF, MIIC, JBDC, JBI,** JAS, Private entities	
		2.1.1.2 Maximize the use of tenant farmer programmes in the pre-mining and post-mining stages in order to boost agricultural production in all active mining leases	**MOAF, JBI, JAS, Private entities**	

		2.1.1.3 Encourage corporate social responsibility to develop social infrastructure in mining communities	**MEM,** MOE, MOHE, MOAF, SDC, JBI, Private entities	
	2.1.2:- Coordinate the resettlement of mining communities and development of sector employees subdivisions	2.1.2.1 Ensure effective resettlement plans for communities or residents displaced by mining activities	**MEM, JBI,** LAs, NEPA, MOAF, MWH, Private entities	
		2.1.2.2 Encourage development of land subdivision projects for sector employees	**LAs, Private entities,** PDCs, NEPA, NLA	
	2.1.3:- Encourage partnership with communities which includes sharing of value created by mining	2.1.3.1 Strengthen use of Community Development Fund by CBOs in bauxite mining communities	**JBI, Community Councils,** Private entities, MPs	
		2.1.3.2 Deepen collaborative mechanisms with mining and quarrying stakeholders including establishment of community-based monitoring committees, especially in sensitive areas	**MEM, MGD, JBI, Community Councils,** Private entities	
2.2:- Harmonious relationships between communities and mining and quarrying entities	**2.2.1:-** Formally incorporate communities as stakeholders with corresponding responsibilities and obligations toward securing and maintaining the success of mining enterprises and viable communities	2.2.1.1 Strengthen role of Community Councils including capacity development and communications	**Private entities, JBI, SDC**	
		2.2.1.2 Recognize communities as stakeholders in MOUs agreed on by main stakeholders including owners, government and unions	**Private entities, JBI, Unions, Community Councils**	
	2.2.2:- Ensure a fair and prudent compensation policy as a basis for settling disputes between mining	2.2.2.1 Review and update compensation policy to ensure conformity with best practice	**Private entities**, unions, JBI, Community Councils, MEM	
		2.2.2.2 Include community representatives in review	**Private entities,**	

	operators and community residents over exposure to hazardous chemicals and plant emissions, vibrations and other impacts	and development of compensation policies	**unions, JBI, Community Councils**	
2.3:- Adoption of a holistic approach to the wellness of sector employees	**2.3.1:-** Proactively identify and adequately mitigate all inherent occupational safety and health risks including those due to exposure to dust, noise, vibrations, hazardous materials and emissions	2.3.1.1 Promote and ensure compliance with Personal Protective Equipment (PPE) Guidelines across all operational activities with appropriate equipment	**Private entities, unions, MLSS, MOHE, MEM**, NEPA, JBI	
		2.3.1.2 Ensure compliance with provisions of health and safety policy and operating procedures necessary for safe, healthy and injury–free environment	**Private entities, unions, MLSS, MOHE, MEM, NEPA, JBI**	
		2.3.1.3 Implement containment and early warning systems	**Private entities, unions, MLSS, MOHE, MEM, JBI**	
	2.3.2:- Ensure establishment of appropriate health and emergency facilities within and in vicinity of mining, quarrying and processing facilities	2.3.2.2 Ensure establishment, upgrading and maintenance of first-response health and emergency facility in major minerals processing facilities	**Private entities, unions, MLSS, MOHE,** MEM, JBI	
		2.3.2.3 Ensure planned access to designated emergency facilities for incidents at all mining, quarrying and processing facilities	**Private entities, unions, MLSS, MOHE,** MEM, JBI	
	2.3.3:- Participate in development and enforcement of occupational safety and health legislation and regulations for the mining and quarrying	2.3.3.1 Ensure adherence to legal and international standards through certification (OSHA, ISO, National Safety Council)	**Private entities, unions, MLSS, MOHE,** MEM, JBI	
		2.3.3.2 Ensure participation of mining and quarrying representatives in ongoing review and updates of occupational safety and health	**Private entities, unions, MLSS, MOHE**, MEM,	

	sector	legislation and regulations	JBI	
	2.3.4:- Conduct research into potential hazardous elements of mining and quarrying sector	2.3.4.1 Identify and classify major hazardous elements of mining and quarrying sector	**MOHE, Private sector, MQAJ, JBI,** JLI, NEPA	
		2.3.4.2 Develop research programmes for each classification and identify funding sources and implementing institutions	**UWI, NEPA, SRC, PIOJ, Private sector,** MQAJ, JBI, JLI	
		2.3.4.3 Undertake research programmes and disseminate findings	**UWI, NEPA, SRC, PIOJ, Private sector,** MQAJ, JBI, JLI	
Goal # 3:- Minimum negative environmental consequence from mining and quarrying				
3.1:- Effective control of negative environmental occurrences	**3.1.1:-** Promote compliance with environmental standards and legislation relevant to mining and quarrying sector	3.1.1.1 Ensure that environmental permits are required for new facilities	**NEPA,** MGD, JBI	
		3.1.1.2 Ensure that EIAs are required for all mining and quarrying activities	**NEPA**, MGD, JBI	
		3.1.1.3 Ensure that air pollutant discharge licenses are required for air emissions	**NEPA**, MGD, JBI	
		3.1.1.4 Encourage increasing levels of self monitoring and reporting (on monthly and annual basis) to environmental agency of emissions testing (at the stacks or suspended particulate measurements)	**NEPA**, MGD, JBI, MQAJ, private sector	
		3.1.1.5 Encourage minimization of generation of air pollutants to the environment	**NEPA**, MGD, JBI, MQAJ, private sector	
		3.1.1.6 Apply "polluter pays" principle to air emissions	**NEPA**, MGD, JBI	
		3.1.1.7 Ensure that penalties are applied for breaches of environmental standards	**NEPA,** MGD, JBI, Justice	

			system, JCF	
		3.1.1.8 Update environmental legislation and regulations based on tracking of global best practices	**NEPA,** MGD, JBI, MQAJ, private sector	
	3.1.2:- Promote and encourage ways of reducing and/or preventing negative environmental impacts	3.1.2.1 Ensure that red mud disposal systems keep pace with industry capacity expansion and are sufficiently insulated from groundwater sources	**NEPA, MGD, JBI, private sector,** WRA	
		3.1.2.2 Reduce the environmental impact of trucking minerals	**LAs, NWA, NEPA,** JBI, MGD, MQAJ, private sector	
		3.1.2.3 Ensure that practices associated with the handling, treatment, storage, transportation and disposal of hazardous waste are in conformity with best practice.	**NEPA, MGD, JBI,** Justice system, JCF, NSWMA, MFPS, LAs, private sector, MQAJ	
		3.1.2.4 Maximize the benefits to accrue under the EU's Emissions Trading Scheme (ETS) from the conversion to cleaner burning fuels	**PCJ, MOE, private sector**	
		3.1.2.5 Develop cost-benefit assessments of new environmental legislation and regulations	**Private sector, NEPA, MGD**, JBI, MQAJ, LAs	
		3.1.2.6 Establish appropriate buffer zones around existing and planned mining and processing facilities based on best available practices and technology	**NEPA, private sector, MGD,** JBI, MQAJ, LAs, MOHE, WRA, NWA	
		3.1.2.7 Provide incentives to encourage introduction of environmentally friendly technologies and conservation projects	**MFPS, MOE, MEM, PCJ,** NEPA, private sector, MQAJ,	

			OPM, JBI	
	3.1.3:- Research and develop scientifically sound procedures for controlling causes of environmental degradation	3.1.3.1 Develop scientifically sound procedures for controlling the uptake of cadmium by agricultural crops grown in bauxitic soil	**MOAF, JBI, UWI**, SRC, private sector	
		3.1.3.2 Seek to limit dust exposure by actively exploring the prospect of transporting feedstock by pipeline in the form of a treated slurry	**JBI, MQAJ, private sector,** NEPA, LAs	
	3.1.4:- Promote waste reduction, reuse and recycling	3.1.4.1 Encourage development and implementation of pollution prevention strategies in the sector	**NEPA, MEM,** MGD, JBI, JLI, MQAJ, private sector, NSWMA	
		3.1.4.2 Conduct environmental audits of operations	**Private sector, NEPA, JBI,** MQAJ, JLI	
		3.1.4.3 Encourage backward linkages using waste as inputs including waste oil	**Private sector, NEPA, JBI, MQAJ,** JLI, PCJ, NSWMA	
		3.1.4.4 Develop environmental accounting procedures	**Private sector, NEPA,** JBI, MQAJ	
	3.1.5:- Increase the awareness of sector participants on the need for responsible environmental stewardship	3.1.5.1 Develop and implement training programmes for sector enterprises and employees in environmental best practices and sustainable development	**Private sector, NEPA,** JBI, MQAJ	
		3.1.5.2 Carry out public education to increase environmental awareness of minerals development stakeholders	**NEPA, MEM, MGD,** JBI, MQAJ	
	3.1.6:- Strengthen capacity of regulatory agencies to	3.1.6.1 Consolidate environmental regulatory responsibilities for the sector (e.g. along the lines of the US EPA)	**OPM, NEPA,** MGD, JBI	

	develop and enforce environmental standards and legislation	3.1.6.2 Establish clear and consistent framework of environmental standards, regulations and guidelines in collaboration with stakeholders	**OPM, NEPA,** MGD, JBI	
		3.1.6.3 Develop and extend multi-agency model of coordination between environmental regulatory agency and the sector developmental agencies (e.g. MOU between NEPA and JBI) based on capacities and clear lines of authority	**OPM, NEPA, MEM, MGD,** JBI, JLI	
		3.1.6.4 Provide appropriate training for relevant staff in environmental regulatory and developmental agencies	**OPM, NEPA, MGD, JBI,** JLI	
		3.1.6.5 Upgrade and maintain equipment on ongoing basis (including dispersal modeling, SO2 monitors, particulate emissions, gas analysers)	**NEPA, MGD, JBI,** JLI, UWI, SRC, MOAF, private sector	
3.2:- Adequately rehabilitated mined-out mineral bearing lands	**3.2.1:-** Mine mineral resources with appropriate planning for the end use of land	3.2.1.1 Integrate use of mined-out sites with sequential land use planning for mineral resources	**Private sector, NEPA, LAs, MGD,** JBI, MQAJ	
		3.2.1.2 Link end use to licensing conditions	**JBI, MGD, private sector, NEPA,** LAs, MQAJ	
	3.2.2:- Improve monitoring and enforcement of rehabilitation of mined-out mineral bearing lands	3.2.2.1 Establish Restoration Committee for mining and quarrying operations	**MEM, MGD,** Private sector, NEPA, LAs, JBI, MQAJ, MOAF, Forestry Dept., WRA	
		3.2.2.2 Strengthen penalties for non-compliance to encourage self-monitoring	**MGD**	
	3.2.3:- Carry out research into	3.2.3.1 Fully determine types of dry limestone	**NEPA, MOAF,**	

	rehabilitating dry limestone ecologies	ecologies	**Forestry Dept.,** MGD, JBI, JLI, UWI	
		3.2.3.2 Determine types of plant species that can be successfully re-introduced into each type of ecology	**NEPA, MOAF, Forestry Dept.,** MGD, JBI, JLI, UWI	
	3.2.4:- Broaden the range of uses for abandoned and rehabilitated mineral exploitation sites	3.2.4.1 Determine feasibility of increased use of mined-out sites for non-toxic solid waste disposal, rainwater harvesting, recreation, tourism, real estate development and other uses	**MEM, MGD, Private sector,** NEPA, LAs, JBI, MQAJ, MOAF, Forestry Dept., WRA	
	3.2.5:- Conduct pre-mining biodiversity surveys and ensure post-mining restoration of ecological systems	3.2.5.1 Develop alliances with tertiary and research institutions for student-led research projects on biodiversity surveys in known reserve areas	**NEPA,** UWI, SRC, JBI, MGD, NCU, UTech, CASE,	
		3.2.5.2 Secure technical assistance from international development partners (IDPs) for pre-mining biodiversity surveys	**NEPA,** UWI, SRC, JBI, MGD, NCU, UTech, CASE, NEPA, PIOJ	

Note: Responsible Agencies and Stakeholders **underlined in bold** indicate the lead agencies for each action.

6.1 Underlying Assumptions

The following underlying assumptions are considered to be critical to the prospects for the successful implementation of the Mining and Quarrying Sector Plan, and represent actions and conditions whose accomplishment generally does not lie fully within the control and responsibility of the stakeholders directly involved in the sector.

Economic Viability

- Single digit rate of annual inflation
- Competitive exchange rate
- Relative stability in external markets
- Accelerated Depreciation Allowance for investment in plant reconfiguration to a double digester capability
- Continuation of Personal Income Tax Relief for Approved Productivity Incentive Schemes
- Streamlining the processing of Work Permit applications particularly in respect of mission critical personnel
- Updating the Labour Relations and Industrial Disputes Act to reflect the potential contribution of business process outsourcing to disciplined cost management
- Partial GOJ funding in support of a cost effective research and development programme aimed at extracting titanium oxide as a value added derivative from red mud residue
- Partial GOJ funding of research leading to the reduction of the level of beryllium contained in domestically produced alumina
- Establishment of the Hope Analytical Laboratories Network (HALN) to provide cost effective analytical services to the mining and quarrying sector

Environment

- Rigorous cost benefit analysis of the likely implications of new environmental legislation
- Continuous updating of environmental legislation to reflect International Best Mining, Quarrying and Processing Practices

Community

- GOJ consistently allocates 2% cess (2003) and 0.05% environment levy (2007) to community infrastructure development, skills training and micro and small enterprise development with input from local Community Councils
- Tax rebate on GOJ Approved Worker Training expenditure

Health and Safety

- Maintenance of an effective Occupational Health and Safety Regulator that is adequately resourced and competently staffed to evenhandedly enforce health and safety laws and regulations

7. Appendices

7.1 Appendix 1 – List of Task Force Members

Dr. Phillip Baker (Chairperson)	Director of Economics and Projects, Jamaica Bauxite Institute
Dr. Betsy Bandy	Director of Mines Development and Mineral Lands Management, Minerals Policy and Development Division, Ministry of Agriculture and Lands
Mr. Norman Davis	Managing Director, Rugby Lime Co
Mr. Roy Nicholson	Director of Revenue and Valuation, Mines and Geology Division
Mr. Ronald Edwards	Deputy Commissioner of Mines and Geology, Mines and Geology Division
Mr. Hugh Elliston	Manager, Chemical Lime Co.
Ms. Gillian Guthrie	Director of Projects and Enforcement, Min. of Local Government & Environment
Mr. Robert Kerr	Senior Consultant - Investment Promotion, Jamaica Trade and Invest (JTI)
Ms. Paulette Kolbush	Acting Director, National Environment Planning Agency
Ms. Susan Otuokon	Executive Director, Jamaica Conservation and Development Trust
Mr. Anthony Morgan	President, Mining and Quarrying Association of Jamaica
Mr. Lance Neita	Public Relations Manager, Alumina Partners of Jamaica
Mr. Oral Rainford	Senior Director, Minerals Policy and Development Division, Ministry of Agriculture and Lands
Mr. Coy Roache	Managing Director, Jamaica Bauxite Mining Limited
Mr. Carver Chen	Mine Technical and Property Manager, St. Ann Jamaica Bauxite Partners
Ms. Shani Parchment	Environmental Officer, Pollution Prevention Branch, NEPA
Mrs. Margaret Aratram	Geologist, Mines and Geology Division
Mr. Leighton Williams	Director, Economic Geology, Mines and Geology Division
Mr. Noel McKenzie	Quarry Manager, Caribbean Cement Company

Attendees at Private Sector Consultation:

Mr. Christopher Bovell	JAMALCO/Dunncox
Mr. Gabriell Henn	WINDALCO

Note: Positions of Task Force Members are given as at the time of their appointment to the Mining and Quarrying Task Force.

7.2 Appendix 2 – Listing of Task Force Meetings

- July 10, 2007
- July 17, 2007
- July 24, 2007
- July 31, 2007
- August 14, 2007
- August 28, 2007
- September 4, 2007
- September 11, 2007
- September 18, 2007
- September 25, 2007
- October 2, 2007
- October 9, 2007
- October 30, 2007
- November 6, 2007
- November 20, 2007
- December 12, 2007
- January 8, 2008
- January 28, 2008
- May 27, 2008
- June 24, 2008
- July 29, 2008
- August 19, 2008
- August 26, 2008
- September 16, 2008
- September 23, 2008
- November 18, 2008

7.3 Appendix 3 – List of Acronyms and Abbreviations

ALPART	Alumina Partners of Jamaica
BATCO	Bauxite and Alumina Trading Company of Jamaica Limited
BSJ	Bureau of Standards Jamaica
CAP	Clarendon Alumina Partners
CASE	College of Agriculture, Science and Education
CBO	Community Based Organization
CCC	Carib Cement Company Limited
CO	Cabinet Office

DBJ	Development Bank of Jamaica
ESSJ	Economic and Social Survey Jamaica
GDP	Gross Domestic Product
GOJ	Government of Jamaica
HEART Trust/NTA	Human Employment and Resource Training/ National Training Agency
IDP	International Development Partners
IMBJ	Incorporated Masterbuilders Association of Jamaica
ISA	International Seabed Authority
ISCF	Island Special Constabulary Force
JAMALCO	Jamaica Alumina Company
JAS	Jamaica Agricultural Society
JBA	Jamaica Bankers Association
JBDC	Jamaica Business Development Corporation
JBI	Jamaica Bauxite Institute
JBM	Jamaica Bauxite Mining
JCF	Jamaica Constabulary Force
JCTU	Jamaica Confederation of Trade Unions
JEA	Jamaica Exporters Association
JEF	Jamaica Employers' Federation
JIE	Jamaica Institution of Engineers
JLI	Jamaica Limestone Institute
JMA	Jamaica Manufacturers Association
JPC	Jamaica Productivity Centre
JPSCo	Jamaica Public Service Company Limited
JTI	Jamaica Trade and Invest
KMA	Kingston Metropolitan Area
LA	Local Authority
MDAs	Ministries, Agencies and Departments
MEM	Ministry of Energy and Mining
MFAFT	Ministry of Foreign Affairs and Foreign Trade
MIIC	Ministry of Industry, Investment and Commerce
MGD	Mines and Geology Division
MLSS	Ministry of Labour and Social Security
MMT	Ministry of Mining and Telecommunications
MNS	Ministry of National Security
MOAF	Ministry of Agriculture and Fisheries
MOE	Ministry of Education
MOFPS	Ministry of Finance and the Public Service
MOHE	Ministry of Health and the Environment
MOU	Memorandum of Understanding
MPDD	Minerals Policy and Development Division
MQAJ	Mining and Quarrying Association of Jamaica
MSE	Micro and Small Enterprises
MSME	Micro, Small and Medium Enterprises
MTW	Ministry of Transport and Works
MWH	Ministry of Water and Housing
NCTVET	National Council on Technical and Vocational Education and Training

NCU	Northern Caribbean University
NEPA	National Environment and Planning Agency
NGO	Non Governmental Organizations
NLA	National Land Agency
NSWMA	National Solid Waste Management Authority
NWA	National Works Agency
NWC	National Water Commission
ODPEM	Office of Disaster Preparedness and Emergency Management
OPM	Office of the Prime Minister
OUR	Office of Utilities Regulations
PAJ	Port Authority of Jamaica
PCJ	Petroleum Corporation of Jamaica
PDC	Parish Development Committee
PIOJ	Planning Institute of Jamaica
PSOJ	Private Sector Organization of Jamaica
QAC	Quarries Advisory Committee
RADA	Rural Agricultural Development Authority
SBAJ	Small Business Association of Jamaica
SDC	Social Development Commission
SRC	Scientific Research Council
STATIN	Statistical Institute of Jamaica
TAAD	Taxpayer Audit and Assessment Department
UTech	University of Technology
UWI	University of the West Indies
WINDALCO	West Indies Alumina Company
WRA	Water Resources Authority

7.4 Appendix 4 – References and Selected Bibliography

Conrad Douglas and Associates. (19996). *National Industrial Policy - Manufacturing Sector: Industrial Minerals, Chemicals and Metals.* Prepared for the Planning Institute of Jamaica on behalf of the Government of Jamaica and the United Nations Development Programme. Kingston.

Environment Australia (2005). Overview of best practice environmental management in mining. http://www.industry.gov.au/assets/documents/itrinternet/overview_Best_Practice_Environmental Management_in_Mining20051123111536.pdf. Accessed 08/08/07.

Minerals Policy and Development Division, Ministry of Agriculture and Lands. (2006). *Proposed Classification of Entities within Jamaica's Industrial Minerals Sector.* Kingston.

Minerals Policy and Development Division, Ministry of Agriculture and Lands. (2006). *Survey of Local Quarry Operations.* Kingston.

Minerals Policy and Development Division, Ministry of Agriculture and Lands. (2006). *The National Minerals Policy: Ensuring a Sustainable Minerals Industry (3rd Draft).* Kingston.

Planning Institute of Jamaica (PIOJ). *Economic and Social Survey Jamaica.* Various Issues 1962-2005. Kingston.

U.S. Department of the Interior, U.S. Geological Survey. (2001). *Mineral Commodity Summaries 2001.* Washington, D.C.

Walker, J. & Howard, S. (2002). Finding the Way Forward. How Could Voluntary Action Move Mining Towards Sustainable Development? Environmental Resources Management (ERM) in collaboration with the International Institute for Environment and Development. http://www.iied.org/mmsd/mmsd_pdfs/finding_the_way.pdf. Accessed 09/08/07.