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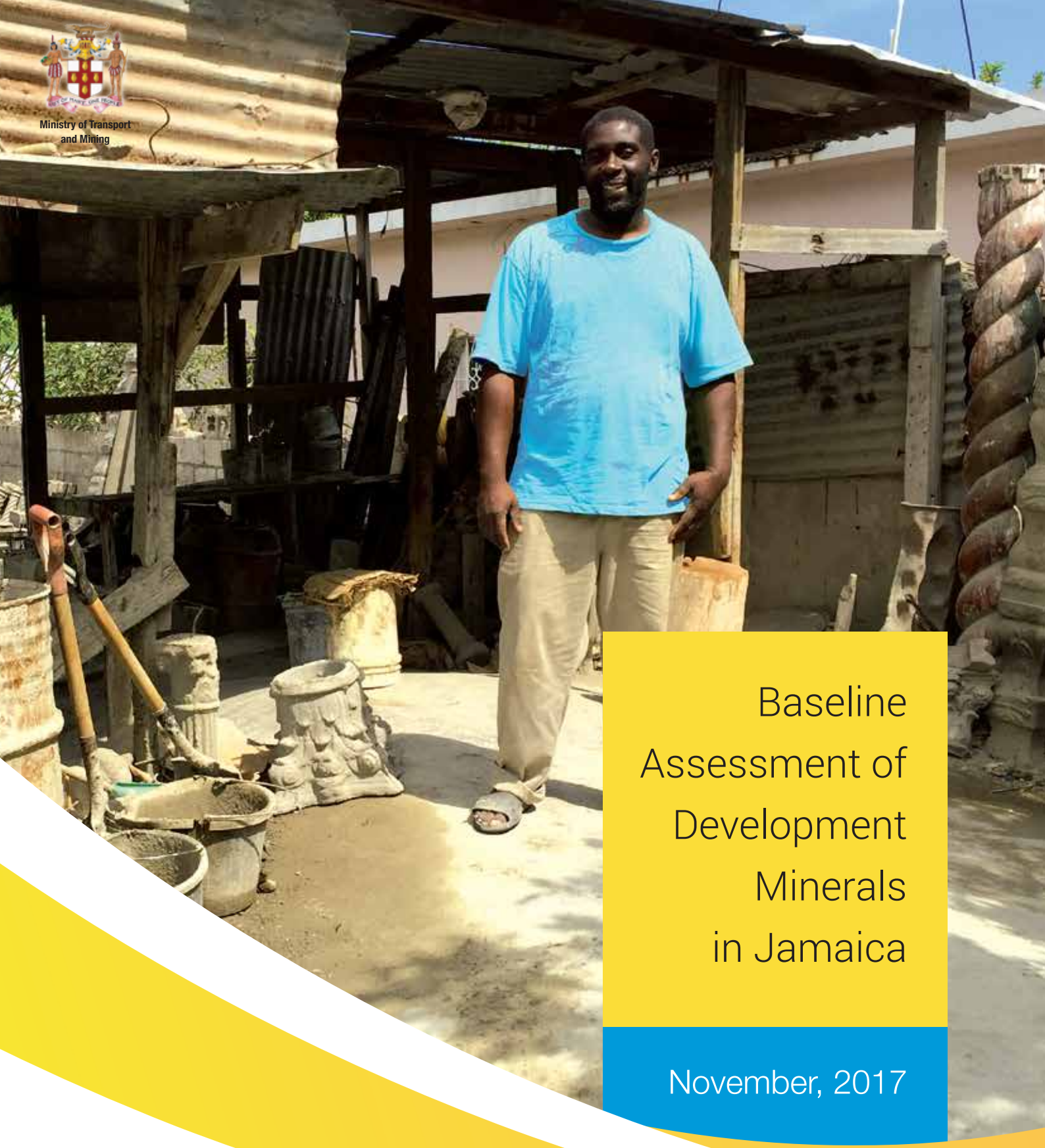

Baseline Assessment of Development Minerals in Jamaica

November, 2017

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About the ACP-EU Development Minerals Programme: The ACP-EU Development Minerals Programme is an initiative of African, Caribbean Pacific (ACP) Group of States, coordinated by the ACP Secretariat, financed by the European Commission and United Nations Development Programme (UNDP) and implemented by UNDP. This €13.1 million capacity building program aims to build the profile and improve the management of Development Minerals in Africa, the Caribbean and the Pacific. The sector includes the mining of industrial minerals, construction materials, dimension stones and semi-precious stones.

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The ACP-EU Development Minerals Programme is a three-year, €13.1 million capacity building program that aims to build the profile and improve the management of Development Minerals (industrial minerals, construction materials, dimension stones and semi-precious stones). The programme is an initiative of the African, Caribbean and Pacific (ACP) Group of States, financed by the European Union and the United Nations Development Programme (UNDP), and implemented by UNDP.

SLR Environmental Consulting (Ireland) Limited (**SLR Consulting**) and its partners, **AlpiConsult Stones** (Marco Cosi and Dario Barazzuol) of Italy, **Dr Arthur Geddes** and **Ms. Yolanda Drakapoulos** of Jamaica, respectively (hereinafter collectively referred to as **SLR Team**), were formally contracted in March 2017 by the UNDP to conduct a *Baseline Assessment of Development Minerals in Jamaica.*

The Baseline Assessment of Development Minerals in Jamaica was carried out in the period March-June 2017 under five key components (1-5), as set out in the terms of reference. This report presents the Final Baseline Assessment as the third deliverable of the Project.

The key findings and recommendations are presented below in this Executive Summary.

Jamaica: Context for the Study

As a country in transition, Jamaica has a number of positive factors to become a leader in the Caribbean region for Development Minerals and downstream industries, including:

i. Well established institutional administration structure;

ii. Rich mineral endowment, including a range of Development Minerals;

iii. Availability of geological, mining and technical data, to inform the preparation of investment and promotional campaigns to attract foreign investment and/or to encourage local investment in the sector;

iv. Well established Private Sector, and skilled consultants, in the position to support the development of the Development Minerals sector;

v. Good export market potential, focused on Caribbean, nearshore USA, Canada and both Central and South America; and

vi. Potential for increased economic linkages, mainly in supplying construction, infrastructure, tourism and industrial areas of the economy.

However, Jamaica has to date demonstrated sub-optimal performance of its Development Minerals production and exporting sectors, for a range of economic and geo-political reasons, linked to:

i. Insufficient exploration and resource/ reserve definition in the past;

ii. Sub-optimal regulatory frameworks for the mining sector, in particular for MSME scale mining and quarrying activities of local construction materials, dimension stones and industrial minerals.

iii. Sub-optimal regulatory and monitoring capacities of relevant public institutions for the mineral resources sector.

iv. Inadequate facilitatory capacity and experience of the relevant Institutions to support and promote the small mining / quarry sector.

v. Weak environmental, social and labour standards across the quarrying sector.

vi. Weak education and bespoke training for quarrying of Development Minerals;

vii. Weak enabling environment and capacity for value adding within the domestic economy and for export of critical supplies of Development Minerals.

viii. Industry association that is ill-equipped to support the sector by sectoral research, lobbying and promotion; weak ITC support to membership.

ix. Poor engagement of the SME quarrying industry with the lending agencies; poor understanding of the sector by the financial institutions.

All of the above impede the long term development of Jamaica and the establishment of a solid, local private sector. A strong enabling environment could create a "win-win" situation, whereby well organized and strong MSMEs would ensure registration of operators, improved compliance with licensing and regulatory standards and increased fiscal returns to government.

Key Findings of the Baseline Assessment

Component 1: Profile of the Sector:

The review of the current profile of the Development Minerals sector found that there has been very considerable research into the geological potential of the island of Jamaica, carried out by the relevant national agencies, notably the Ministry of Transport and Mining (MTM, and precursors MTE, MSTEM) and the Mines and Geology Division (MGD) of Jamaica. External support agencies (including UNDP, GET Czech, BGS among others) have provided extensive mapping and characterisation of key commodities. Much of the recent MTM/MGD research focused on quarry materials, production volumes and pricing, but has also characterised the socio-economic impacts of the sector over the past decade.

There is relatively little research on demand side data and the potential for value adding of a range of Development Minerals on the island, although the Conrad Douglas & Associates (2013) report for JAMPRO/ CDE provides an excellent basis for adding value to limestones and its derivative materials.

A number of seminal papers by Rainford et al. (2008, 2011) have highlighted the constraints and barriers to the sector's development, including lack of capacity in resource definition and quarry management, skills requirements for the sector, infrastructure (roads, rail, ports) and energy costs.

Component 2: Legal & Policy Framework

Following the review of the legal and policy framework for Development Minerals, the assessment recommends the immediate implementation, and prioritising, of key actions defined in the ***National Minerals Policy (NMP 2017-2030).*** These priorities should at all times be linked to the objectives of the *Vision 2030 Jamaica: National Development Plan*, the *Medium Term Economic Outlook* and the international *Sustainable Development Goals*.

A new ***Minerals Development Act***, combining mining and quarrying under a single, yet differentiated, piece of legislation, would introduce clarity and a more robust application process for quarrying. This would link to the applicant's capacity to meet defined technical, environmental and health & safety standards. Such skills could be hired/ contracted into the service of the applicant to run the operations. Note that this finding is not intended to discourage participation in the sector; rather it is intended to raise standards linked to a defined programme of capacity building.

A ***Mining Cadastre*** to meet modern international standards is required to facilitate both the management and regulation of the licensing process, promoting transparency and ease of access to technical licence details (licensee; renewal, reporting and relinquishment dates; statutory reports, etc).

The proposal in the NMP 2017-2030 to develop a ***National Minerals Institute*** could be expedited to address training shortcomings, to provide integrated modular training in quarry planning, technical and business management; geology, resource estimation and mining methodologies; processing techniques; market research and sales etc.

Weak spatial planning means that many finite mineral resources are being sterilised by other land uses e.g. housing developments. Improved spatial zoning for quarrying would ensure that allocated zones for agriculture, forestry, housing and environmentally designated zones are demarcated, providing clarity to regulators, quarry operators/ investors and residents / farmers.

Component 3: Institutional & Technical Operating Context

Institutional review: the roles of various public institutions were reviewed in the context of the Development Minerals sector. A range of regulatory bodies exists for licensing, administration, regulation and facilitation of the quarrying sector, the most central of which is the MGD. The National Environmental Planning Agency (NEPA) provides environmental regulation, while the Quarries Advisory Board oversees the administration of licensing and advises the Minister on requests to grant/ refuse a licence. The regulation of Occupational Health & Safety (OHS) within the Development Minerals sector is also carried out by MGD, although the Ministry of Labour and Social Security (MLSS) is responsible for the legislative framework governing workplace OHS. There is a proposal in the *National Minerals Policy* to more closely align some of these functions under a single body, which would be supported by the current baseline assessment.

Capacity building and resourcing of the regulatory functions are required as a priority to ensure improved practice and levels of compliance across the Development Minerals sector in technical, environmental, social and safety practices.

Linked to this is the need for the *National Minerals Policy* to be implemented, with legislative powers, to support effective enforcement and penalties for infringement of licence terms.

GeoData: The MGD provides the national repository of geological and geoscientific data (GeoData). While certain resources are available, it is recognised by management that significantly improved digital data management using GIS platforms is required. As well as hardware and software requirements, MGD staff capacity building is required in managing spatially acquired data, integration of existing maps, reports and quality data, and generations of digitally accessible geological datasets. This is a priority for attention as identified in the Road Map (2016) for the ACP-EU Development Minerals Programme in Jamaica and would position the MGD in international best practice for digital availability of GeoData.

Promotional Activities by the sector in Jamaica are generally weak to non-existent, particularly in the use of online or other digital media to promote Jamaica's considerable Development Minerals' potential. This may be addressed by institutional strengthening in the MGD through a dedicated Minerals Promotion Unit, as is the norm in similar organsiations worldwide. Promotional activities would also be enhanced by organisational strengthening of the industry's Mining & Quarrying Association (MQAJ). Regular attendance at targeted international Development Minerals trade and investment conventions would also be helpful in attracting critical investment.

Mining & Quarrying skills were reviewed in the technical operating context. The teams visited 54 operations across a range of commodities and geographies. There are very significant shortcomings in:

- Quarry planning, layout and technical management are absent in >90% of quarries visited.
- Environmental planning, monitoring and management were absent in almost all but one quarry;
- There was a total absence of planning for mine closure.

These deficits lead to poor selection and sterilisation of prime materials.

Support Services provided to Miners and Employees: Baseline data for average wage rates in the Development Minerals quarrying sector are not available officially. The level of wages as reported to the field researchers is 20-25% higher than the minimum wage (J$6,200/ 40 hour week or $155/ standard hour)[1].

There is no system of apprenticeships for quarrying trades, with training in visited quarries delivered informally 'on-the-job'. Skills shortages for the sector are marked and bespoke design of trades and apprenticeships is urgently required, in association with the HEART/ NTA, the national training agency, and third level institutions.

Integrated capacity building, perhaps coordinated through the proposed National Minerals Institute is required at every level for advanced technical, environmental and social aspects of quarrying operations.

The industry body, the Mining & Quarrying Association of Jamaica (MQAJ) represents c. 10% of operations. The MQAJ needs institutional strengthening to become a much more dynamic organisation to represent the needs of the Development Minerals sector. It requires a new management structure, comprising dynamic female and male quarry operators, with training in

[1] http://jis.gov.jm/minimum-wage-rates-effective-march-1/

governance, strategic planning and advocacy. This can be achieved through capacity building events, with courses, seminars and trade missions pitched specifically to meet the needs of members. The inclusion of a new Women's Chapter in MQAJ, with parish-level representation, is advocated by women working in the sector. Supports for such institutional strengthening are available through the Development Bank of Jamaica (DBJ) and also through the Jamaica Business Develoment Corporation (JBDC).

There is trade union representation only in the largest Group 4 quarries.

Access to Credit and Finance of any kind is expensive and almost impossible for smaller operators. Many do not have quantified estimates of their resources and reserves, thus have not the capacity to produce sound business plans linked to their mineral resource production scheduling. This means that bankers, both private and development banks, categorise quarrying as medium-high risk and will not provide loan capital to the sector.

There will need to be a sensitisation programme for lenders concerning the needs of the Development Minerals producing sector, as well as improved communications between the financial industry and industry. Quarry operators must undergo training in Business Planning and understand the need for expert resource and reserve estimation to schedule their production, linked to loan repayment terms and thus reduce the risk for lenders.

Technical and financial assistance may be advanced to those companies willing to implement new product diversification plans, upgrading existing operations and implementing advanced environmental, health & safety management plans to international standards.

Research and Development in relation to the Development Minerals quarrying sector is minimal, with poor linkages from industry to third level institutions. The proposals in the Draft National Minerals Policy to establish a National Minerals Institute will redress this deficit if implemented.

There is generally poor adoption of ITC in rural areas as many quarry operators do not have access to high speed broadband and rely on mobile phone telephony for email contact.

Component 4: Environmental, Health & Safety, Socio-Economic Impact Analyses

Environmental Impacts: Due to the inherently benign nature of Development Minerals, the environmental impacts of quarries are largely confined to the immediate quarry area. Many smaller quarries are located in relatively remote areas and the negative impacts of quarrying (noise, dust, vibrations from blasting, traffic etc) were largely negligible in those instances. However, a significant number of larger operations are located in the peri-urban fringes of villages and towns. In such cases, the landscape and visual impacts can be significant, particularly near Kingston city.

The adverse impacts reported by residents were mainly in relation to noise, dust, safety and traffic, but operators attempt to suppress dust and value having positive relations with their neighbours. It must be noted that one national environmental NGO asserted that communities are being paid off to 'keep quiet' about such adverse impacts, but this was not observed or recorded at any of the 54 visited operations.

The cumulative impacts of quarrying can be significant in a given area, where a number of quarries are located closely. The total environmental footprint of those quarries visited was 346 hectares, which if scaled up for all currently operating quarries, amounts to 769 hectares, a relatively small

area in the context of the size of the island Jamaica (0.07% of total area of just under 1.1 million ha).

Importantly, there is a need for much improved environmental planning and production management to reduce the impacts of quarrying. Critically, rolling rehabilitation must start from the outset of operations so that restoration of the landscape is achieved gradually, while visual impacts are minimised as resources are extracted.

Health & Safety Management has two key aspects, neither of which is well managed across the 54 operations.

Geotechnical safety is severely compromised by crude, gravitational 'rip and push' methods of extraction within quarries, and also by unsafe overhangs where materials are excavated from the base of the quarry face. Only in a few Group 3/ 4 (medium to large scale) quarries was there any observance of geotechnical safety design and management.

Occupational health and safety management of employees is negligible, with almost universally zero training. Fatalities have occurred over the past decade (as reported verbally to the researchers) that were not reported to the authorities. This requires urgent attention to both operational practice and regulation.

Many employees and their families have access to health services through their employment in the quarrying sector.

Social Impacts: There is a very strong and positive informal system of social support to communities, church and schools in the vicinity of quarries, which is appreciated by residents. Support is also given for funerals, school books and treats by operators. Ideally, this should be formalised and recorded in terms of social impact assessment and corporate social responsibility by the sector. However, many operators prefer to do this quietly and privately on a case by case basis. A survey of 317 industrial minerals operations reported an average of J$1.2 million per operation to local social funds (MTM 2016).

It is recommended to develop *transparent grievance & complaints procedure*s for local community residents adjacent to quarry operations to ensure their voices are heard.

Th establishment of *Community Forums* at parish level would allow women and men that are impacted by quarry noise, dust and traffic to participate in raising issues and in design of effective mitigation measures. This would also allow women in particular to have a voice in Development Minerals projects.

Economic Impacts: It was found in the assessment that the quarrying of Development Minerals in 2015 contributed J$218,400,000 (US$1.7 million) in royalties to the exchequer.

The employment benefits of quarrying in rural areas are very significant: 788 direct jobs were reported among 54 quarries surveyed (45% of the total operating quarries in 2017) which may be factored to 1,750 jobs across all 120 operating quarries. This creates an estimated 7,000 – 8,750 indirect jobs across the sector, based on an MTM (2016) multiplier of 4-5 indirect jobs for evey one direct job. Employment is perceived by community residents to outweigh any adverse impacts of noise, dust and traffic, even when living close to operations, given that there are limited employment opportunities elsewhere in rural areas.

Many small shops in rural areas and villages benefited significantly from having a quarry located locally with increased revenue from workers and drivers.

In terms of economic linkages to other parts of the economy, quarrying of Development Minerals is vital for construction of housing, road building, agriculture (fertiliser) and a range of processing industries on the island (e.g. paint manufacture, cement, plasters, fertiliser).

The industry could also support the indigenous *Arts & Crafts* industry, through supply of suitable clays for pottery, ceramics and semi-precious stones for jewellery-making on the island. At present, most of these materials are imported as there is not a sustained supply of e.g. pottery clays. A model for an Artists' Collective, sharing equipment and facilities modelled on the Tanzanian African Minerals & Geosciences Centre (AMGC)[2], is proposed, with support from UNDP, MGD, JBDC and JAMPRO, as well as the Ministries of Mining, Culture & Tourism.

The critical *infrastructure barriers* for full economic integration were identified as the poor *roads* network; under-capitalised *railway* network and inadequate access to suitable *ports* with loading / unloading and bulk handling facilities for aggregates. These three issues are well documented and must be addressed urgently as a national priority. The political inertia in relation to ports development must be overcome, as there is otherwise no means of shipping value added, bulk products for export.

Gender & Youth Assessment: The gender assessment was undertaken during field research. It was found that 12% of quarry employees are women, working in office administration, accounting, sales, management and engineering, similar to the figure (11%) reported by MTM for 2015. There were no specific barriers to female employment found in the operational aspects of quarrying, other than unskilled/ semi-skilled young men are more likely to work as operatives, while young women are better educated so tend to work in 'cleaner' semi-skilled to skilled office-based jobs.

The over-riding youth issue in Jamaica is unemployment and this is reflected in the consultations with Development Minerals quarry operators. This is compounded by the lack of apprenticeships and bespoke training available to young people. A focus group of women working in the sector was equally concerned that there are no clear training avenues for youths, particularly boys, to encourage entry to the sector. It is recommended to design sector-appropriate *Vocational Training and Apprenticeships* with existing training schools (HEART/ NTA; UTech), for youth (boys and girls) and awareness about work/ career opportunities in the sector.

The women in management interviewed were keen to upskill and improve their *exposure to international standards* in OHS; environmental management and impact assessment, monitoring & regulation; as well as adopting suitably scaled *Social Impact Assessment* and participatory mechanisms for effective community engagement. The use of *Community Forums* to engage with women in surrounding communities would encourage participation in decision making and mitigation of adverse impacts.

There is scope for *improved communications and mutual support among women* working in Development Minerals through the MQAJ. One suggestion was to establish regular and sector-specific meetings at the Parish level, while another was to establish a Women's Chapter within the MQAJ to advocate on issues of concern. Such targeted measures to enhance women's participation in all aspects of quarrying of Development Minerals (production, processing,

[2] see http://www.seamic.org

marketing, sales and value adding) would allow improved performance for Jamaica under the UNDP Gender Seal.

Human Rights: Based on the World Bank framework 'Human Rights Impact Assessment' (2013) and the Ruggie (UNDP 2008) '*Protect, Respect and Remedy*' principles, a series of issues were assessed, including child rights and child labour; conflict; employment; gender; community issues and local economic issues. No major prejudices to Human Rights were identified during the baseline assessment. Children do not work in the Development Minerals quarrying sector in Jamaica.

Access to land and to uptake in the sector could be enhanced by official application of regulations and good practices to ensure *fair lease agreements* and encourage partnerships between large land owners and quarry entrepreneurs.

The establishment of *Community Forums* as suggested above would provide a space for meaningful community engagement, airing of grievances and transparent redress mechanisms, which would reduce the potential for conflict.

Component 5: Market & Value Chain Analysis

The following findings were made in relation to the market analysis. It is anticipated that Government and public agencies will act as key enablers, while industry will extract, process and add value to Develometn Mineral products.

- **Strong potential to add value** for key identified commodities, including:
- Limestone; High Grade Limestone; Clays for cement, ceramics, pottery; washed Sand & Gravels; Dimension Stone – all requiring detailed geological and industrial research. The use of Gypsum/ Pozzolan in cement making is changing due to technological changes and the drive for cost efficiencies – however, the feasibility of their use could be investigated within detailed commodity assessments.
- **Strong potential to import substitute** for key supplies - *(stone, paint, plasters, inputs to animal feeds etc)* as domestic demand increases, linked to construction and tourism*;*
- **Production (Supply) data is well tracked, but Demand side data for Development Minerals** must be researched (*domestic /CARICOM/ international*); via JAMPRO, MTM and university research facilities. Although some research is available, it is necessary to continuously track and understand what domestic/ CARICOM/ nearshore Americas require and aim to process and substitute where it is cost effective to do so.
- **Key markets**: focused Market Strategies for focal Development Minerals (based on above research) are needed to target CARICOM / nearshore USA/ Central and South American markets. In the near term, this may include high quality, fine-grained limestone products (GCC, PCC) for paper, pharmaceuticals, paints, animal feeds, industrial processing etc; or washed, sized and crushed river sands and gravels, for example. It is clear that some indigenous bulk Jamaican products are available in other Caribbean islands (aggregates, dolomitic limestones) and may not be economical to export.

- **Collaboration among key suppliers** could achieve significant economies of scale and guaranteed supply of quality assured materials.

Current barriers to value adding by private sector producers and processors of Development Minerals were identified and classified by the team as 'soft' and 'hard' issues, as follows.

Soft Barriers' to Sectoral Development

- Weak knowledge of market demands at all levels; with a fundamental lack of demand side data;
- Poorly defined resources & reserves across many commodity groups, with weak to no quality assurance systems;
- Lack of capacity, experience in value adding production and processing;
- Lack of targeted investment due to lack of access to capital or investing partners.
- Weak promotion of the sector by the industry, allied to negative public perceptions
- Poor culture of "collaboration to compete" to guarantee supply of key minerals to markets.
- Lack of characterisation of commercial structures of target markets.

'Hard Barriers' to Sectoral Development

- Costs of Energy are prohibitive for many operators, such that they are curtailed in terms of developing energy-intensive value adding production to their operations;
- Transport and shipping costs are a major impediment to the development of a solid export base;
- Transport Infrastructure (roads, rail, ports access) is inadequate and an integrated transport network is a requisite in providing strategic competitive advantage to Jamaican Development Minerals producers.
- National inter-ministerial and institutional leadership is urgently required to address these issues.

Targeted development plans, with the collaboration of the public and private sectors, for key Development Minerals will assist in developing a robust value adding industry.

Recommendations

It is recommended that the following actions for each of Components 1-5 are addressed through an integrated strategic plan for the development of the Development Minerals sector in Jamaica. The table at the end of this section shows a Matrix of Priority Actions and summarises many of the following recommendations.

Component 1: Profile of Development Minerals Sector

- Improved **mapping and resource/ reserve characterisation** of focal Development

Minerals (high quality limestone and dolomite formations, clays, marbles suited to dimension stone production, andesitic volcanic rocks, etc).

- Improved **archiving and availability of online digital data** for citizens, quarry operators and potential investors in Development Minerals.
- Improved **integration of data sources**, including laboratory tests undertaken as part of the licensing process, across Government divisions to e.g. provide quality assurance data for target limestone units to encourage investment.

Component 2: Review of Legal & Policy Framework

- **Minerals Development Act** requires to be updated to include Mining & Quarrying under one piece of legislation, to facilitate application of operational standards (technical, environmental, social, closure), regulation and compliance;
- **National Minerals Policy** requires prioritisation and scheduling of key actions, with urgent implementation to support all other actions;
- **Mining Cadastral system** requires to be updated, linked to MGD's GIS systems.
- Creation of the **National Mineral Institute** to drive the development of the non-metallic quarry sector and the implementation of recommended actions, including Capacity Building via training courses and on job training programmes.
- **Promotional Activity must improve:** MGD to produce thematic "investment-promotion maps" to support local and international investors' decision making during the opportunity/ pre-feasibility/ investment phases.
    - Production of **Commodity Reports** for focal minerals.

Component 3: Review of Institutional & Technical Operating Context

- **Geo-Data:** Full capture and integration of data (geology, chemico-physical quality of materials, mapping, etc) in robust GIS management system;
    - Purchase of recommended software & hardware, with secure storage / back-up systems;
    - Training for key MGD operators.
- **Capacity Building for Regulators** at MGD to meet international standards in:
    - Quarry planning & management, use of equipment; optimisation of production; etc
    - Environmental management and monitoring, mine closure;
    - Occupational health & safety aspects of quarrying.
    - Stronger Regulation by MGD and NEPA with penalties for breaches of Licence terms

- Consider establishment of the modular Mining School to build skills across the sector.

- **Capacity Building for Quarry operators** (private sector) to meet international standards in:
  - Quarry planning, optimisation & scheduling of production,
  - Environmental planning and management (see also below),
  - Tailored apprenticeships/ trades for youth to encourage skills entry to the sector.
- **Improved Access to Finance** will require capacity building in:
  - Business planning and development of tailored Business Plans for operators;
  - Planning and scheduling of optimised production to meet loan repayment terms;
  - Sensitisation of lending institutions to sectoral needs.
- Infrastructural constraints must be overcome:
  - **P*orts, rails, road*** must be addressed and political inertia must be overcome.
  - ***Energy policy*** must support the energy intensification of the sector for value adding.
- **Development focus must be on quality assurance, value adding** and **aggressive marketing** of Development Minerals products to domestic/ regional /export markets.

Component 4: Environmental, Health & Safety, Socio-Economic Impact Analyses

- **Capacity building across the board for Quarry operators** (private sector, in association with MQAJ) to meet international standards in:
  - Environmental planning and management, mine closure and reporting;
  - Environmental impact assessment;
  - Integrated health & safety management systems appropriate to quarrying;
- **Environmental Monitoring of Impacts** of quarrying by regulators, particularly:
  - Improved spatial planning and zoning of quarrying in appropriate sites
  - Monitoring of cumulative landscape & visual impacts; and dust, noise, vibrations
  - Environmental planning and management, mine closure and
  - Enforcement of regulations, with penalties for infringement.
- **Improved Social Impact Assessment:**
  - Formalised records of corporate donations to communities by the sector.

- Improved social impact assessment (SIA) processes, tailored to quarry scale.
- Develop transparent grievance & complaints procedures for community residents.

- **Economic Impacts:**
  - Monitor employment trends and contributions of quarrying; continue the excellent MTM/MGD series of surveys;
  - Support the formation of a Jamaica Artists' Collective, sharing equipment and facilities modelled on the Tanzanian AMGC[3] centre, with support from UNDP, MGD, JBDC and JAMPRO, as well as the Ministries of Mining, Culture & Tourism.
  - Finally address the critical *infrastructural barriers* for full economic integration to the Jamaican economy.
- **Gender & Youth Assessment:**
  - Continue to monitor female participation in the quarry sector
  - Encourage entry to youths, to proposed vocational apprenticeship training
  - Training for women in quarrying groups to improve their exposure to international standards in OHS; environmental management and impact assessment, monitoring & regulation; social and community engagement.
  - Support the establishment of a Women's Chapter within the MQAJ to advocate on issues of concern.
- **Human Rights**
  - Continue to monitor human rights issues in relation to quarrying (through MTM surveys). Engage in activities with the quarry operators to ensure full awareness of core issues.
  - Consider official application of regulations and good practices to ensure fair lease agreements and encourage partnerships between large land owners and quarry entrepreneurs.

Component 5: Market & Value Chain

- **Focus on adding value** to key focal commodities:

  Limestone; High Grade Limestone; Clay, Sand & Gravels; skid-resistant stone; Dimension Stone; Paving Stones, and Semi-Precious Stones with requisite research and development support.

[3] African Minerals & Geoscience Centre (AMGC) located in Dar es Salaam, Tanzania – see www.seamic.org

This will require:

- Development of accredited laboratories (public / private, internationally accredited);
- Implement digital quality assurance/ quality control (QAQC) data availability, for key geological units, available freely online, to encourage investment in quality resources.
- Develop industry collaborations to realise scale of opportunities, fostered by incubation at JBDC and/or University Business Schools.

- **Ongoing Capacity Building** actions, in line with the UNDP Development Minerals Programme road map, including training courses and workshops, field and on-job training actions, for private and institutional sectors, in evaluation, mining and market management, production of value added products, export market access, etc. Ideally such actions should be part of continuous professional development, beyond the life of the Programme.
- **Import substitute** for key supplies, based on rigorous feasibility analysis
  - Paint, plasters (grout, stucco, thin set), range of Stone Products, etc, based on hard research.
- **Market Intelligence & Surveying** needs significant improvement (Americas/ CARICOM)
  - Demand side data must be researched (*domestic /CARICOM/ international*) so that products can be tailored to meet specific demands;
  - Detailed and consistent analysis of markets and trends required (JAMPRO/ MTM);
  - Outward technical-market missions for private companies.
- **Develop targeted Marketing Strategies**, with specific Commodity Reports for each of the focal Development Minerals, linked to potential and specific market places.
- **Transport and infrastructure bottlenecks in roads, rail and ports**, as well as **energy costs**, must be addressed. These issues are larger than the Development Minerals sector, but will require concerted political support and delivery if intensification of the industry is to happen.

Matrix of Priority Actions

A matrix of priority actions is proposed overleaf in tabulated format to address the key findings and recommendations presented above. Based on these baseline priorities, an aggressive Development Strategy for the Development Minerals Sector should be implemented.

Matrix of priority actions

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When[4] S	M	L
COMPONENT 1: PROFILE OF THE SECTOR							
1	**Profile of the Sector**	Excellent research conducted on the geological potential of Development Minerals in Jamaica. Demand side research is required. Key challenges facing the sector have been well documented; action is required.	Integrated research on the full value chain for Development Minerals. Regular research into demand side data to monitor trends in minerals demand. Develop an integrated 'SMART'[5] Action Strategy to realise the full potential of the sector in Jamaica, based on the priorities identified herein.	**MTM MGD** **JAMPRO** **MTM/ Inter-Ministerial**	■	■	■
COMPONENT 2: LEGAL & POLICY REVIEW							
2	**Legal & Policy Review**	Minerals Development Act requires to be updated and enacted to include Mining & Quarrying under a single Act	Review current legislation and update in light of findings in Baseline Assessment.	**MTM**		■	
		National Minerals Policy requires prioritisation and scheduling of key actions (*what, by whom, by when*)	Finalise and publish the National Minerals Policy as soon as possible. Prioritise the key actions and allocate '*by whens*' to the responsible agencies.	**MTM**	■		
		Mining Cadastral System requires to be updated, linked to GIS systems	Integrate the Mining Cadastral system with MGD's geological and technical GIS-based databases/ mapping facilities. Ensure all MGD regulatory staff have training and access to the system.	**MGD**	■		
		Spatial Planning must be strengthened to avoid conflict among competing land users.	Strengthen the strategic spatial planning function with clearly demarcated zones for quarrying of Development Minerals and other land uses (housing, agriculture, environment, forestry, mining etc.)	**MTM NEPA PIOJ**	■	■	
		Establish Minerals School as proposed by MTM/ National Minerals Policy	To advance training across all requisite disciplines, in association with universities and colleges.	**MTM/ Univ**	■	■	
		WRA *flood monitoring* to be integrated with MGD's geo-systems to monitor impacts of rising sea-level on coastal infrastructure	This should take account of national climate mitigation and adaptation plans.	**MRA MGD**		■	

[4] Timeframe (by when): **S short term – 1-2 years – M medium term – 2-5 years – L longer term -> 5 years**

[5] **SMART** *sustainable, measurable, achievable, realistic, timeframed*

COMPONENT 3: INSTITUTIONAL & OPERATING CONTEXT							
3a	**Institutional Context**	Complex array of agencies involved in the administration and regulation of Development Minerals	An alignment of agencies was proposed in the draft National Minerals Policy 2017-2030 and this should be advanced by Government. Any review of the institutional structure should consider separation of regulation from promotional activities.	**MTM**			
		MGD regulatory capacity for Quarrying and Mining requires to be strengthened.	MGD Regulators to be trained in advanced practice in environmental planning, management, rehabilitation, restoration and quarry closure.	**External expertise**			
		Community engagement is not required under the current licensing regime.	Meaningful community engagement and *Social impact assessment* could be considered as part of future Mining & Quarry licensing process.	**MTM**			
3b	**Availability & Accessibility of Geo-Data**	MGD produces high quality Geo-Data, but is poorly organised and inaccessible. Poor integration of Geo-data (geology, geochemistry, physical properties, etc)	Design of integrated GIS data management systems, future proofed and fit for purpose. Broad-based GIS training for key MGD staff in systems & data management.	**MGD** **External expertise**			
		GIS management systems and data integration required.	Capture and integration of geo-data (analogue and digital) data to GIS platform - generation of economic maps on country-basis.	**MGD staff**			
		Current system is vulnerable to data loss through server failure or viral attack.	Improved e-security systems / back-up systems	**External expertise**			
		Quality control data (chemico-physical quality of key Development Minerals) not available to potential investors.	QC data held in MGD files should be digitally captured, mapped in GIS and promoted widely, available freely online.	**MGD staff**			
3c	**Operational Management Capacity**	Weak quarry planning & management skills means there is no optimisation of production.	Training in Quarry Planning and Management for all Quarry operators, including geotechnical design for safety. Such training could be a pre-requisite for granting of a new licence.	**External expertise**			
		Access to finance is exceedingly difficult due to weak operational business planning.	Training in Business Planning and Financial Management for operators Sensitisation of financial institutions to sectoral needs	**UWI/JBDC** **DBJ/ EXIM**			
3d	**Vocational Training**	There is a dearth of formal apprenticeship training for the Development Minerals sector.	Engage with HEART /NTA to develop bespoke apprenticeships for quarrying skills Establish a *National Minerals Institute* with modular training across a range of training/ educational institutions	**HEART/NTA** **MGD** MLSS Education			
3e	**Industry Associations**	MQAJ has inadequate organisational structures, with weak advocacy/promotional skills; requires capacity and new entrants.	Organisational capacity building and recruitment of new officers.	**JBDC** **DBJ**			

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When S	M	L
3f	**Access to Finance**	Access to finance is particularly difficult for many SME quarry operators, due to weak technical (reserves estimation), business planning and weak environmental standards.	Training in for quarry operators to prepare credible Business Plans; Understanding of markets, technical specifications and demand; Training in resources and reserves estimation to international standards, and Environmental management to meet banking requirements	**JBDC** **DBJ**			
COMPONENT 4: ENVIRONMENTAL, HEALTH & SAFETY, SOCIO-ECONOMIC IMPACT ANALYSIS							
4a	**Environment Planning & Management**	No environmental management systems in place for > 98% of quarries observed. Environmental planning and management; rolling rehabilitation and restoration of lost habitats must be addressed. Environmental impacts of quarrying appear to limited to quarry footprint. Environmental NGOS oppose quarrying and call for greater regulation and penalties for infringement. Regulation and enforcement of environmental law and standards needs to be significantly improved, as pointed out by environmental NGOs. Positive impacts of quarrying appear to outweigh negative socio/ environmental issues for communities	Integrated training in environmental planning and management for quarry operators and key operational staff. Stronger enforcement of environmental laws and regulations Stringent penalties for breaches of licence terms Quarrying must be supported as a key economic driver and source of sustained employment in in rural areas.	**External expertise** **NEPA** **MGD** **MTM** PIOJ			
4b	**Occupational Health & Safety**	Occupational Health & Safety and Geotechnical Safety management and training systems are largely absent. Poor reporting of safety breaches.	Training in Quarry safety planning, staff training and management systems to improve safety standards across all operations. Introduce stronger regulation with penalties for breaches of Licence terms. Mandatory reporting of accidents and fatalities must be introduced	**External expertise** **MGD** **MLSS**			
4c	**Community**	All quarries surveyed provide direct financial and material support to local communities, ranging from schools, church, police, etc	Implement a formalised system of recording social / community donations (*noting that many operators prefer to keep this on discretionary 'as needs' basis*).	**MTM** **MDG**			
4d	**Human Rights**	No major prejudice to Human Rights was identified during the baseline assessment. There is no child labour in Jamaican quarries.	Government to engage in ongoing dialogue with Development Minerals industry to ensure responsible behaviour and respect for human rights.	MTM MGD			

4e	**Conflict Resolution/ Conflict of Interest**	No specific land conflict was identified as many limestone lands are not suitable for agriculture/ forestry	Monitor this issue as land pressures become more intensified as population expands.	**PIOJ NEPA**			
		Conflicts of interest noted between public functions and private interests.	Politically sensitive issue that requires monitoring and legal redress where such conflict exists.	MTM			
4f	**Access to resources**	Poorly regulated 'Pop-up' quarries create undue pricing competition for quarries that work to meet standards.	Laws should be strengthened to permit only licensees with requisite technical, management and planning skills. Upskill the 'pop-up' operators to next levels to ensure they stay in sector.	**MTM** **MQAJ**			
4g	**Socio-Economic/ Employment**	Positive economic impact through 788 direct jobs reported in 54 quarries (45% of the total active quarries) – estimated at 1,750 people directly employed in 120 active quarries (100%)	Communities appreciate the employment options but this requires to be monitored in terms of public health - are people accepting adverse dust and noise impacts to retain jobs in rural areas? Indirect job creation may be as high as 7,000 – 8,750 based on multiplier of 4-5 for every direct job (MTM, 2016).	**MLSS MTM**			
		Working conditions and wages are reported to be fair by operators and operatives. These jobs may be the only paid employment in the local area.	Conduct bi-annual survey of employment conditions: contracts , terms and social security, wage rates etc	**MTM MLSS**			
4h	**Economic Linkages**	Development Minerals underpin other areas of the economy (construction, housing, roads, industrial processes etc).	Better promotion of the role of Development Minerals in underpinning other economic activity, especially to planners, policymakers, and decision makers.	**MGD MTM MQAJ**			
		Support the establishment of Artists Collective for artistic / creative sectors.	Establish integrated framework for source and supply of indigenous clays, semi-precious stones, decorative stone and other minerals. Develop a shared facility for equipment, processing, training and marketing of Jamaican artists' products of Development Minerals.	**MGD, UNDP JBDC**			
4i	**Infrastructure** **Energy**	Critical infrastructure, in terms of integration of transport chain (road, rail, ports) is a significant inhibitor of the Development Minerals sector. Energy Costs are prohibitive for sector.	Plans for railway and ports developments have been considered for many years. It is crucial that phased developments are executed without delay to allow access to markets domestically and regionally. Energy policy needs to shift radically away from oil dependency, with costs in line with regional competitors.	**GoJ/ Relevant Ministries**			
4j	**Gender & Youth**	There no evidence of female barriers to the sector; women can access higher-skilled jobs in quarries, due to higher educational attainment. Youth work as operatives.	Strengthen women's organisational capacity through regular parish-meetings and engagement through women's chapter of MQAJ	**MGD MQAJ Women**			
		Concerns that young men are dropping out of school and training in trades / apprenticeships is required	Bespoke apprenticeships are required to entice young men to enter the quarrying sector.	**HEART/NTA MTM**			
		There were no specific health & safety issues for women or children identified.	Occupational health risks are high for young men, due to exposure to noise, dust, vibrations/ lack of PPE in quarries and must be addressed.	**MLSS MGM**			

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When S	M	L
COMPONENT 5: MARKET & VALUE CHAIN ANALYSIS							
5a	**Barriers to Development**	Weak knowledge of market demands at all levels; with a fundamental lack of demand side data. Lack of knowledge of large public project pipelines; mineral specifications, costs Poorly defined resources & reserves Lack of QAQC data for key commodities Lack of capacity & experience in value adding production Lack of targeted investment due to lack of access to capital Weak promotion of the sector by industry Poor culture of "collaboration to compete"	Ongoing research required in market demands in domestic, regional and international (near-shore Americas) Publication of large public projects online in advance to allow suppliers to position themselves/ collaborate. Training in resource/ reserve estimations to international standards. Develop and promote QC databases, publicly available to investors Training & sensitisation in potential for value adding for a range of products / study visits – based on demand forecasts (see above) Sensitisation of lending institutions to sectoral needs (see C 3c above) Capacity building for operators (see C 3c) Improved and 'joined up' promotion of sector to public/ lenders Capacity building on joint bidding/ shared client management	**JAMPRO** **MTM** **NWA** **External expertise** **MGD** **External expertise** **DBJ/ EXIM** **JBDC** **MTM/ MQAJ** **JBDC/DBJ**			
5b	**Opportunities**	Focus on adding value to key commodities: Limestone; High Grade Limestone; Gypsum/ Pozzolan products Clay, Sand & Gravels; Dimension Stone, and derivatives; Semi-precious stones - artisanal	Conduct resources/ reserve estimation for key minerals Develop *Commodity Reports* for key minerals, for promotional purposes Feasibility studies for value adding activities (whiting, GCC, PCC, cement, paving stones, inter-locks; high grade limestone for paint, foods, pharma) Support *feasibility studies* by private sector Trade missions to key target markets (private and public sector)	**JAMPRO** **MTM** **MGD**			
5c	**Market Intelligence**	Market Intelligence needs significant improvement (Americas/ CARICOM)	Demand side data must be researched (*domestic /CARICOM/ international*). Detailed and consistent analysis of markets required Develop targeted Marketing Strategies, with specific *Commodity Reports* for each focal Development Mineral, linked to specific market places.	**JAMPRO / MTM** **JBDC/ UWI**			
5d	**Import Substitution**	Import substitute for key supplies, based on rigorous feasibility analysis	Conduct *research for substitution* for paint, plasters (grout, stucco, thin set), cement, clinker, etc, based on hard research. *Development plans* for highest opportunity products	**JAMPRO** **Univ** **MTM**			
5e	**Infrastructure**	Transport, Energy & Infrastructure bottlenecks must be addressed.	As above (4i) - issues are larger than Development Minerals, and will require *concerted political support and delivery.*	Inter-Ministry MTM			

Introduction

SLR Environmental Consulting (Ireland) Limited (**SLR Consulting**) and its partners, **AlpiConsult Stones** (Marco Cosi and Dario Barazzuol) of Italy, **Dr Arthur Geddes** and **Ms. Yolanda Drakapoulos** of Jamaica, respectively (hereinafter collectively referred to as **SLR Team**), were formally contracted in March 2017 by the UNDP to conduct a *Baseline Assessment of Development Minerals in Jamaica*.

The ACP-EU Development Minerals Programme is a three-year, €13.1 million capacity building program that aims to build the profile and improve the management of Development Minerals (industrial minerals, construction materials, dimension stones and semi-precious stones). The programme is an initiative of the African, Caribbean and Pacific (ACP) Group of States, financed by the European Union and the United Nations Development Programme (UNDP), and implemented by UNDP.

The ACP-EU Development Minerals Programme is being implemented at both the regional and country levels. At the *regional level*, the programme conducts capacity building activities with participants from forty ACP countries through regional training workshops, field trips, the production of guidance products and knowledge exchange. The programme will also host a final conference to enhance the knowledge sharing activities conducted during the programme. Participants in the regional training workshops implement the skills and knowledge that they gain from the training through 'return to work' plans.

At the *country level*, in depth capacity building is being undertaken with six focus countries: Cameroon (Central Africa); Guinea - Conakry (West Africa); Uganda (East Africa); Zambia (Southern Africa); Fiji (Pacific) and Jamaica (Caribbean). This report refers to Jamaica only.

This report presents the final results of the Baseline Assessment carried out by the SLR Team during the term of the contract, providing details of the activities, field research findings and recommendations for future actions under the programme.

Programme Objectives & Rationale

Development Minerals are defined as "minerals and materials that are mined, processed, manufactured and used domestically in industries such as construction, manufacturing and agriculture. Development Minerals are economically important close to the location where they are mined or quarried"[6] – see Table 1 below.

The quarrying of construction materials and industrial minerals supports the economic development of all economies; however, in emerging economies these minerals provide essential economic inputs to agriculture (fertilisers, materials), construction (housing, roads, infrastructure) and various industrial sectors. In ACP countries, the Development Minerals sector is dominated by micro-, small and medium scale domestic enterprises (MSMEs), where minerals are excavated and sold locally/regionally for the main part, creating a potent driver for job creation in plant hire,

[6] Franks, Daniel, Pakoun, Lacina & Ngonze, Caroline. (2016) as defined in *Development Minerals in Africa, the Caribbean and the Pacific* ACP-EU Publication Series (2016). See http://developmentminerals.org/themes

transport and retail MSMEs, with a positive net impact on poverty reduction. However, due to weak regulation and a lack of financial and/or management capacity, they pose a number of environmental, social and economic challenges.

Development Minerals tend to be, however, weakly supported by Governments due to their perceived low value and non-tradeability in international commodity markets. Depending on the geological history, the resource endowment and economically viable reserves of Development Minerals vary widely within countries and regions.

Table 1 Definition of Development Minerals

Development Minerals are minerals and materials that are mined, processed, manufactured and used domestically in industries such as construction, manufacturing, infrastructure and agriculture. Development Minerals are economically important close to the location where the commodity is mined and include industrial minerals, construction materials, dimension stones, and semi-precious stones. (after Franks et al. 2016)	
Industrial minerals	Substance of economic value, exclusive of metal ores, mineral fuels, and gemstones (e.g. barite, bentonite, borates, calcium carbonate, clays, diatomite, feldspar, granite, gypsum, industrial sand, kaolin, silica, soda ash, talc, wollastonite and zeolite)
Construction materials	Sub-category of industrial minerals sometimes called 'industrial rocks'): substances used in the construction of infrastructure, housing and other built structures (e.g. gravel, limestone (cement), construction sand, aggregate, scoria, glass, ceramics, bricks)
Dimension stones	a sub-category of industrial minerals and construction materials): rock quarried for the purpose of obtaining blocks or slabs that meet specifications as to size (width, length, and thickness) and shape (e.g. granite, marble, slate, sandstone).
Semi-precious stones	a mineral crystal or rock that is generally cut and polished to make jewellery, *but that does not include diamond, ruby, emerald and sapphire (precious stones).* Examples of semi-precious stones include quartz, amythyst, garnet, aqua-marine, opal and pearl

Development Minerals commonly operate in a less focused legal and regulatory environment, lacking definition of mineral resources and reserves, which exacerbates wasteful exploration and extraction. The regulation of environmental, social, health and safety issues is typically weak and issues such as low management capacity, lack of access to capital, specialist training, appropriate equipment, investment information and marketing are characteristic of the sector, inhibiting appropriate levels of investment[7].

However, support for the Development Minerals sector in Jamaica has the potential to contribute significantly to the country's integrated development, as set out in *Vision 2030: National Development Plan*, through enhanced supply of minerals by local MSMEs to allow (i) import substitution through the use of local materials/ minerals and (ii) improved employment and revenue opportunities by value adding activities. The sector also has significant potential to contribute to balanced regional development and provide socio-economic opportunities for women and young people in rural areas.

[7] http://www.undp.org/content/brussels/en/home/ourwork/sustainable-development/in_depth/capacity-development-of-mineral-institutions-and-of-small-scale-.html

Country-level activities of the ACP-EU Programme include: training; small grants; the production of maps and databases; development of regulations on environment, health and safety; organization of community dialogues, technology fairs and networking events. The aims of these capacity building activities are to:

1. Enhance employment and incomes, including employment and incomes of women
2. Improve the policy and regulatory environment
3. Minimize environmental impacts on communities
4. Address individual and community rights and preventing conflict
5. Ensure decent working conditions
6. Facilitate South-South cooperation and cross-country learning

Regional and country level training and knowledge exchange are being provided in the following thematic areas:

1. Mine and quarry management;
2. Environment, health and safety;
3. Entrepreneurship skills;
4. Market analysis and investment promotion;
5. Geo-data management and maps design;
6. Community relations and addressing grievances.

These training modules are currently being rolled out by the ACP-EU Development Minerals Country Working Group in Jamaica in parallel with the baseline assessment, to address defined capacity requirements across the sector.

The Government of Jamaica and the ACP-EU Development Minerals Programme recognise that Jamaica could benefit significantly from diversification of its mining sector. Prior efforts to develop the sector saw regulatory support for bauxite, without support for smaller mining and quarrying activity that represents the foundations for long term development of the domestic economy. The recent fall in bauxite output has led to a national re-evaluation of the potential of Development Minerals to re-balance the economy[8].

Rainford (2008)[9] noted:

> *To this extent, the political directorate has to decide whether or not the <Develompent Minerals> sector warrants national attention. If it is decided that it does, then it ought to be treated with a level of prominence similar to that accorded to the Bauxite/Alumina Sector by putting in place*

[8] Economic and Social Survey Jamaica 2016, Planning Institute of Jamaica – Quarterly press briefing (16/16/2016). http://www.pioj.gov.jm/NewsDetail/tabid/86/Default.aspx?news=7499

[9] Rainford, Oral (Feb. 2008). *Transforming the Industrial Mineral Sector of Jamaica*. Ministry of Energy, Mining & Telecommunications.

the structures which will effect this transformation, especially as it relates to the limestone sub-sector and the production of value-added products".

The strengthening of the Jamaican Development Minerals sector will:

- encourage the utilisation of domestic mineral resources, avoiding the import of raw materials;
- enable the start-up of new small industries (e.g. paint, plaster, glass, tile, brick making, etc.);
- allow development of a vibrant and entrepreneurial private sector, that can be a driving force for economic and social development.

It is in this context that the Baseline Assessment of the potential for Development Minerals to contribute to the future expansion of Jamaica's economy, in an environmentally and socially sustainable manner, is being undertaken.

Constraints to the Conduct of the Baseline Assessment

The following constraints were recorded by the SLR Team in undertaking the Baseline Assessment:

- Absence of detailed socio-economic baseline data on the impacts of quarrying for Development Minerals in Jamaica, noting that the excellent '*Survey of Local Quarry Operations*' series on Industrial Minerals by the MTM (2008 -2016) have recorded data on employment and job creation, gender balance and social contributions of the quarrying sector.
- Absence of detailed, baseline data in relation to the social, gender and human rights impacts of quarrying for Development Minerals in Jamaica, noting that the UNDP had commissioned research on the penetration of gender mainstreaming, community resilience and natural resources management (Vassell 2016)[10].
- Time constraints in undertaking the field research prohibited in-depth analysis of some elements of the study, particularly in recording the seasonality of potential environmental impacts; in-depth community engagement and convening of representative focus groups living in the vicinity of quarry operations.
- Lack of access to email and outdated phone numbers among many rural Development Minerals operators lead to significant time spent in contacting key personnel to arrange site visits.
- The field research was conducted during the wet season in Jamaica, which rendered some rural communities, quarry sites and key meetings inaccessible. The in-built flexibility largely overcame this constraint by rearrangement of logistics accordingly.

[10] Vassell, Linnette (2016). *Review of Portfolio of Projects UNDP Jamaica Country Office. Climate and Disaster Resilience Sustainable Development Democratic Governance - Final Report* - Gender Strategy Consultancy 2015-2016.

Socio Economic Context

Jamaica is the third largest island of the Greater Antilles archipelago, after Cuba and Hispaniola. It is 235 km long (northwest-southeast axis) and varies from 34-84 km in width along its northeast-southwest axis, with an area of 10,911 km^2.

The IMF estimates that global output will grow by 3.5% in 2017 and 3.6% in 2018. The projection for economic activity is expected to continue, as Europe, Japan and China continue to grow their economies. Despite global uncertainties, this will create positive demand in emerging markets and developing economies. According to the IMF, growth in emerging markets is rising from 4.3% in 2016 to 4.6% in 2017 and 4.8% in 2018. The medium term uncertainty in advanced economies, particularly in the USA and UK, however, means that "commodity exporters should continue adjusting to lower revenues, while diversifying their sources of growth over time" (IMF, July 2017[11]). The economies of Latin America (Brazil, Argentina, Mexico in particular) are projected to grow as they exit recessions, with the exception of Venezuela.

Jamaica is a highly indebted, small island developing state (SIDS), but is making progress in terms of macroeconomic stability. It has managed to reduce its debt to GDP ratio under the Economic Reform Programme from 126.1% in 2015, and GDP growth of 1.5% was forecast for fiscal year 2015/2016[12]. Unemployment declined from 14.2% in January 2015 to 13.3% in January 2016, but youth unemployment remains challenging at 33.3%.

The Planning Institute of Jamaica (PIOJ) under the Ministry of Finance coordinates Government and partner-supported programmes to ensure alignment with the NDP and the Sustainable Development Goals (SDDGs). In its *Economic & Social Survey Jamaica 2016*, the PIOJ reported growing economic performance in key Jamaican industries—agriculture, hotels, electricity & water, whereas Mining & Quarrying experienced a decline of 1.3% cent in 2016, representing the 4th consecutive quarterly decline[13], reflecting the sluggish domestic and international minerals markets. On the upside for Development Minerals, the Jamaican economy is continuing to sustain positive 1-2% growth in 2017, supported by increased construction activity and improved hotel development in the tourism sector[14].

Jamaica's *Human Development Index* (HDI) increased 12.1% from 1990 to 2015 to reach a 0.730 HDI value placing it in the 'high development' category, following a number of challenging years following the global financial crisis in 2008[15].

[11] IMF World Economic Outlook, July 2017 - https://www.imf.org/en/Publications/WEO/Issues/2017/07/07/world-economic-outlook-update-july-2017
[12] Statistical Institute (STATIN) of Jamaica (2015), Labour Force Survey. http://statinja.gov.jm/PressReleases.aspx.
[13] http://www.pioj.gov.jm/NewsDetail/tabid/86/Default.aspx?news=7467
[14] Caribbean Cement Company Limited – Annual Report 2016
[15] UNDP Country Explanatory Note 2016. www.jm.undp.org/jamaica/JM-Jamaica_Country%20Explanatory%20Note_HDR2016.pdf

The UNDP *Gender Development Index* (GDI) which measures gender equality among 160 countries, valued Jamaica's women at 0.719 in 2016, in contrast to men at 0.738, resulting in a GDI value of 0.975. This placed the country in the second of five groups, which means that there is medium-high equality in achievements between men and women. However, the UNDP *Gender Inequality Index* (GII), which covers gender-based inequalities in three dimensions (reproductive health, empowerment and economic activity, respectively), ranked Jamaica 93 out of 159 countries by 2016. The GII may reflect a loss in human development due to inequality between female and male achievements across the three dimensions.

The sustainable development of natural resources is critical to building resilience to poverty. Jamaica recognizes the importance of social protection for all citizens and its influence on social stability. The need for viable social protection initiatives has been underscored and a model proposed that pairs social investments and economic growth. Thus the identification of potential sources of growth, based on the island's natural endowment of resources, is of central importance in realising the objectives of *Priority 4 Natural Resources Management* of the UNDP's country programme focus[16].

There is significant upside potential for exploitation of Development Minerals to contribute to the development of the country's economy and society. This is recognized in the *Vision 2030 Jamaica: National Development Plan* (NDP) and related sectoral documents (Construction, Mining), setting development targets for the non-metallic sector as a potential contributor to the construction, agriculture and environmental sectors.

During the last fifteen years, several companies within the Development Minerals sector have grown consistently and are currently positioned for further expansion. Significantly, several large foreign-owned companies are now actively seeking to establish businesses on the island. It is thus timely to promote this sectoral expansion and support MSMEs and other groups such as cooperatives, which have historically suffered from limited financial and technical capacity.

Transport and materials handling facilities are outdated with a high cost energy and business base. The social (dislocation; gender disparity; skills) and environmental costs are potentially high (deforestation, loss of habitat), while the research supporting framework is weak. The *Vision 2030: National Development Plan* and *Minerals Policy* are clear that there needs to be a stronger policy and regulatory framework, with targeted investment in the non-metallic industries based on sustainable land use and spatial planning. Improved regulation, capacity building and facilitation of the sector should deliver improved environmental and social outcomes for the citizens of Jamaica.

International Frameworks for Research

The baseline assessment was carried out within the context of international frameworks and standards pertaining to resources development, human rights, environmental and social sustainability, as well as protocols of respect in all dealings with participants in the research.

Underpinning the baseline research are the *Sustainable Development Goals* (SDGs), defined by the UNDP as "*a universal call to action to end poverty, protect the planet and ensure that all people enjoy*

[16] Executive Board of the UNDP, UNPF and UNOPS (July 2016). Country Programme Document for Jamaica (2017-2021)

peace and prosperity"[17]. The SDGs build on the Millennium Development Goals, but introduce new areas such as climate change, economic inequality, innovation and sustainable consumption, among other priorities. The SDGs provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and environmental challenges.

Other key international frameworks that informed the research on Development Minerals include:

- UNDP, 2014, Social and Environmental Standards, http://www.undp.org/content/undp/en/home/librarypage/operations1/undp-social-and-environmental-standards/
- UNDP, 2008. "*Protect, Respect and Remedy" Framework and Guiding Principles*. https://business-humanrights.org/sites/default/files/reports-and-materials/Ruggie-report-7-Apr-2008.pdf.
  https://business-humanrights.org/en/un-secretary-generals-special-representative-on-business-human-rights/un-protect-respect-and-remedy-framework-and-guiding-principles
- International Association for Impact Assessment (IAIA), 2015, Guidance for assessing and managing the social impacts of projects. http://www.iaia.org/uploads/pdf/SIA_Guidance_Document_IAIA.pdf
- Inter-Governmental Forum on Mining, Minerals, Metals and Sustainable Development: Guidance for Governments on Managing Artisanal and Small-Scale Mining (ASM). RCS September 2015. http://igfmining.org/guidance-documents
- World Bank, 2012, Gender Dimensions of Artisanal and Small-Scale Mining: a Rapid Assessment Toolkit http://siteresources.worldbank.org/INTOGMC/Resources/toolkit-web.pdf
- World Bank: Guidance on Human Rights Impact Assessment in Mining http://siteresources.worldbank.org/PROJECTS/Resources/40940-1331068268558/HRIA_Web.pdf
- International Finance Corporation (IFC) Performance Standards (PS) 2012. http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards
- (PS2*) Labor & Working Conditions*; (PS3*) Resource Efficiency*; (PS4 *)Community Health, Safety & Security*; (PS5) *Land Acquisition & Involuntary Resettlement*. (PS6) Biodiversity Conservation & Sustainable Management of Living Natural Resources (2012); (PS7) Indigenous People; (PS8) Cultural Heritage.
- Organisation for Economic Cooperation and Development (OECD): *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.* http://dx.doi.org/10.1787/9789264185050-en

[17] http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

- EBRD Environment and Social Policy: Performance Requirements (May 2014) http://www.ebrd.com/who-we-are/our-values/environmental-and-social-policy/performance-requirements.html%20
- ISO 26000: Guidance on Social Responsibility for Developers (2010) https://www.iso.org/standard/42546.html
- Kimberley Process – illicit trading of conflict diamonds/ minerals – see December 2014 UN General Assembly: http://www.un.org/press/en/2014/ga11602.doc.htm
- Government of Jamaica: National Policy on Gender Equality http://landwise.resourceequity.org/record/2515
- International Declaration of Human Rights: http://www.un.org/en/universal-declaration-human-rights
- International Council on Mining & Metals (ICMM). https://www.icmm.com/en-gb/society-and-the-economy/mining-and-communities/human-rights
- Additional relevant documents were used to inform the assessment, including a range of World Bank frameworks for e.g. role of women entrepreneurs in the extractives sector; and UK Department for International Development (DFID) documentation on Gender Issues in the Mining Sector; etc.

Although many are focused on large scale international metallic mining projects, these internationally agreed frameworks provide an essential foundation in consideration of sustainable exploitation of development mineral resources.

Photo 1 Spanish Hill Limestone Quarry in Hanover Parish, Jamaica, May 2017

Methodology

Terms of Reference for the Baseline Assessment

The Terms of Reference (TOR) for the *Baseline Assessment of Development Minerals in Jamaica*, as part of the overall Programme delivery, are presented in full in Appendix 1. The overarching rationale for this assessment is to provide a comprehensive, inter-disciplinary assessment of the sector to define the current dynamics and key issues relevant to positively developing the sector in Jamaica.

The TOR clearly set out the core activities and objectives for each of five components:

- Component 1: Profile of the sector
- Component 2: Review of legal and policy framework
- Component 3: Assessment of institutional and technical operating context
- Component 4: Environmental, health and safety, and socio-economic impact analyses
- Component 5: Market and value chain analyses

The Baseline Assessment was conducted by the SLR Team in five phases over 4 months from commencement of the contract, linked to clear deliverables and milestones. Four project reports were delivered over the period: (i) Inception Report; (ii) Field Report of preliminary findings of the field research; (iii) Draft Baseline Assessment providing anaylsis of the five components; and (iv) Final Baseline Assessment Report.

Methodological Approach

The methodological approach focused initially on building an understanding of the institutional, technical, environmental, economic and social context of Development Minerals in Jamaica through desk research and extensive stakeholder consultations. Detailed field surveys of upstream producers followed, selected on the basis of variable mineral commodities, operational size and ownership models in each of the thirteen parishes of Jamaica.

Figure 1 Map of Jamaica, showing administrative Parishes

Based on the 4-month timeframe for delivery, *Phase 1* commenced with desktop research and a series of consultations with key stakeholders in Kingston in Week 2-3 in late March 2017, greatly assisted by the Country Programme Manager. The design of project research tools was copmpleted during this phase.

Field planning commenced in Week 3 to make pre-arrangements with quarry operators for site visits and institutional consultees for appointments. The team telescoped field activities to optimise the *Phase 2* legal and regulatory review; *Phase 3* institutional and operating review; and *Phase 4* field environmental/ health & safety/ economic/social/ gender research, between Week 6-Week 9.

Phase 5 analysis of downstream processing, marketing and trading along the full value chain of Development Minerals was conducted through Weeks 7-10.

Data compilation, analysis and reporting took place concurrently throughout the research period.

A series of international frameworks underpinned the field research, specifically for social and environmental impact assessment and management, gender issues and human rights impact assessment.

Data Collection Methods

A range of data collection methods were employed during the field research, as follows:

- Desk/ web research and sourcing of key Development Minerals documents from stakeholders in Jamaica;
- Face-to-face interviews with institutional and operational stakeholders (and repeat interviews as warranted);

- Use of project-designed questionnaires for structured interviews with quarry operators and workers;
- Semi-structured workshop with women working in Development Minerals, broadly using the World Bank *Women in Entrepreneurship* framework, which was verified by the participants.
- Semi-structured interviews with community residents close to quarry sites.
- Two key Stakeholder Workshops were held during the Assessment:
    - *Preliminary Findings of the Field Study* were presented to the Country Working Group on Wednesday 17th May 2017 at MGD in Kingston.
    - *Draft Key Findings* were presented to a broad stakeholder grouping on Thursday 15th June in Kingston.

Quantitative data from the questionnaires were entered to pre-designed excel speadsheets and imported to MapInfo GIS package to generate numeric evaluation of results and spatial trends. Maps were generated to present these data visually for clarity of communication.

Qualitative data were recorded during interviews/ focus groups and cross-referenced with published data and secondary interviews. These were in turn analysed through internal team discussions. Where any uncertainties or ambiguities arose, these were clarified with the interviewee and/or through the advice of the ACP-EU Development Minerals Programme Jamaican Country Working Group.

The full results were collated and integrated on a rolling basis as they were collected. Based on multiple decades of combined international experience of the SLR Team, results were interrogated, discussed and interepreted to provide a full appraisal of the Development Minerals sector of Jamaica over a four month period from March to July 2017.

Desk Research

Desk research was carried out on available publications and web data pertaining to Development Minerals in Jamaica. Based on the team's extensive background geological, environmental, economic and social knowledge of the sector internationally, the review was not intended as a full literature review on the subject of Development Minerals.

A review of past and current mineral policy and legislation was undertaken to gain understanding of the potential for Development Minerals in Jamaica. A significant volume of technical data has been published on the development mineral potential of Jamaica, including through the UNDP 1980s programme (Busby 1989); a joint Government of Jamaica and Czech Republic (Mineral Resource Development Project- GET, 1990s, 2008) and the British Geological Survey (BGS, 1992-3), which are referenced in the following chapters as relevant. These projects collated enormous detail on various aspects of geological setting, outline Development Minerals resources, quarry planning and focal minerals for potential development. However, in many instances, legacy analogue data are fragmentary and difficult to retrieve, reflecting weak data management and retrieval systems within MGD.

There is an excellent series of surveys of Development Minerals (Industrial Minerals) quarry operations over the past decade, conducted by the Ministry of Transport and Mining (MTM) and its Mines & Geology Division (MGD), the principal agency for geological mapping, data repository and regulation in Jamaica. A full listing of reference reports is presented in Annex 2.

A 'rapid review' of current exploration and mining licences, extraction locations, principal commodities and extractive methodologies commenced within the first two weeks of the project, for entry to our GIS system, based on local knowledge by our team experts.

Field Research

A selection of development mineral sites (quarries) and commodities were considered for focal assessment in the Field Study phase (April-May 2017). Minerals exploitation is regulated by the Mines & Geology Division (MGD) in Jamaica, with an official online record of 330 licensed Development Minerals quarries, of which 120 were operational at the time of study[18]. A representative number of these quarries (targeting up to 50) were selected for site visits, based on size, commodity types, geographical spread and various management models (e.g. women in management or cooperatives). Advance telephonic contacts were made with operators to schedule appointments for site visits.

Two SLR sub-teams conducted site visits (*Teams 1, 2*), while *Team 3* consulted Institutional stakeholders in Kingston and *Team 4* reviewed geo-data accessibility at MGD, conducted training needs analysis of digital data management and also a half-day training session in GIS for fourteen staff. Consultations were also held with minerals traders, women in quarrying, communities residing near quarries and artists.

Quarry Site Research

Field research with formal operational quarries was undertaken over a three-week period in May 2017. Two sub-teams of SLR researchers undertook a series of west-to-east site visits across the island:

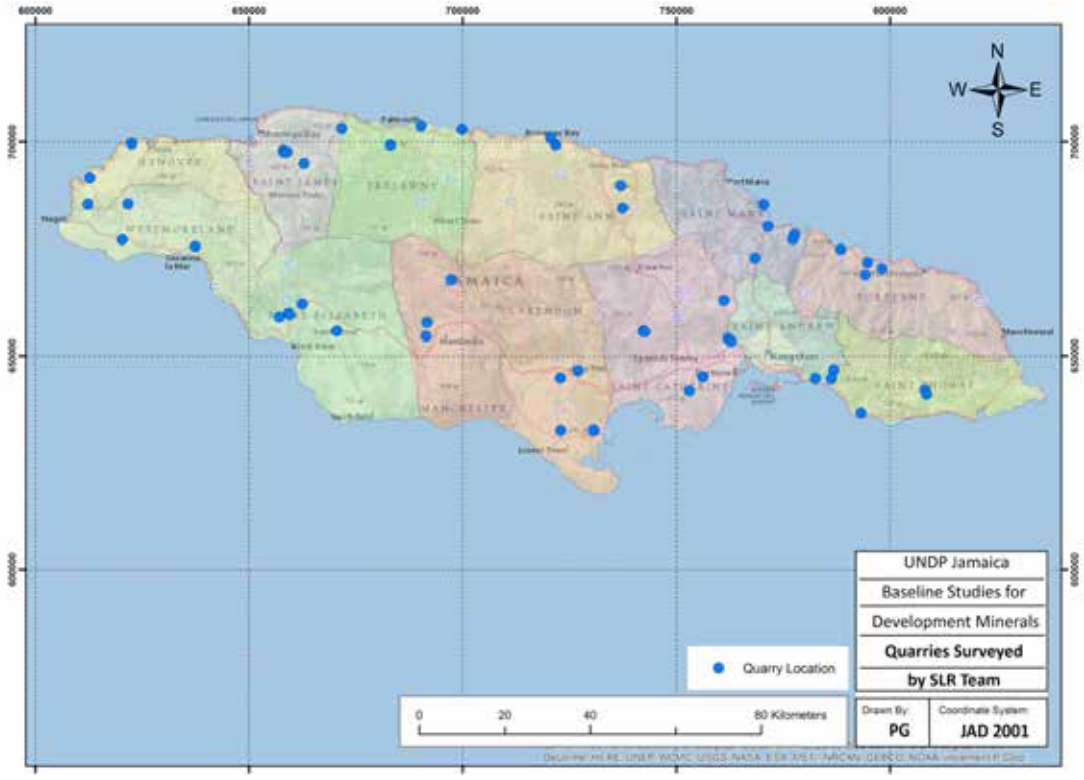
Team 1 - South Coast: *Westmoreland, St Elizabeth, Clarendon, Manchester, St Catherine, St Andrew;*

Team 2 - North Coast / SE parishes*: Hanover, St James, Trelawny, St Ann, St Mary, Portland, St. Thomas*

Each team comprised a mix of geological/ geotechnical, environmental, health & safety and social/ gender expertise. The teams visited 2-4 quarries per day, depending on the level of accessibility, travel time and availability of quarry management (*sites shown in blue spots*, Figure 2).

[18] http://www.mgd.gov.jm/licensed-quarries.html?task=document.viewdoc&id=106

Figure 2 Locations of surveyed Development Minerals Quarries (May 2017), Jamaica



Pre-designed project **Questionnaires** (Inception Report, see Annexe 1) were used to target consistent operational data for each site, across the following areas:

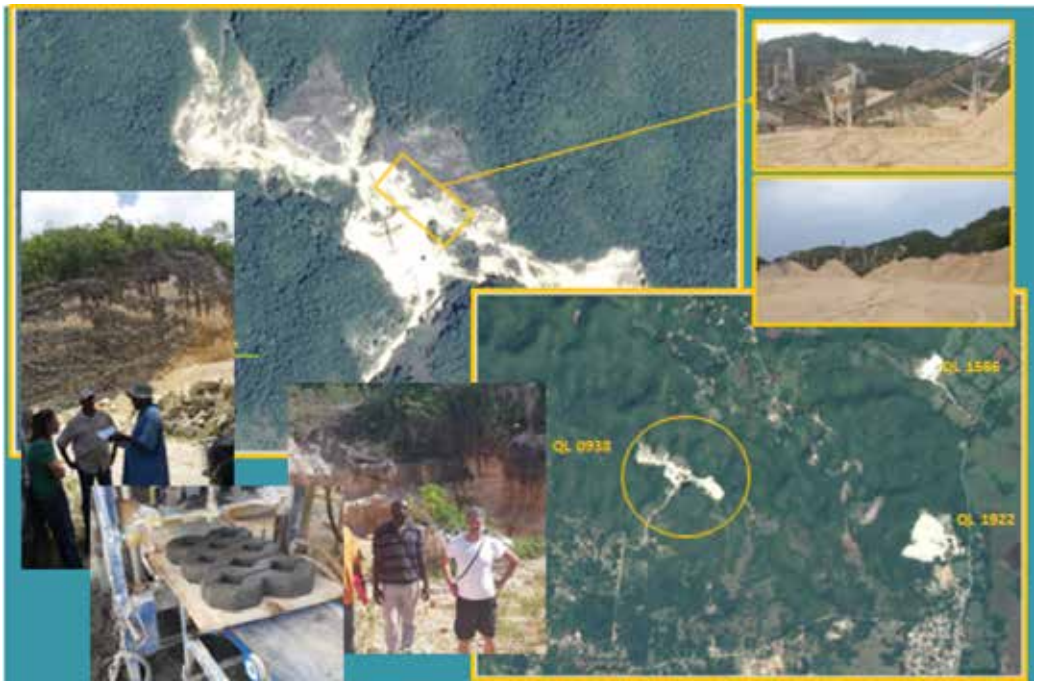
- Ownership, Operations, Production, Materials, Quality Assurance
- Value Adding, Sales & Marketing
- Geotechnical Safety; Occupational Health & Safety
- Environmental Planning and Management, Mine Closure
- Employment / Labour Issues
- Social / Gender Issues
- Community/ Human Rights

Guiding questions for interlocutors for each detailed topic were developed (see Annex 3), linked to the questionnaires.

At each quarry site, the specific location was noted by GPS in UTM / Lat-Long coordinates, which were later transferred to the SLR GIS database. Each site was also mapped on Google Earth to assess the total environmental footprint of each operation (both legacy and current).

Every site visited was also photographed and in some, short video recordings were made of typical operations and processing, as relevant (Figure 3).

Figure 3 Quarry Site: Typical Records during Baseline Assessment



In total, **54 quarries,** exceeding the target of 50, were visited, representing 45% of all currently operating quarries on the island of Jamaica. A listing of all quarry sites visited is presented in Appendix 4b.

During the field assessments, discussions were held and observations made to assess the level of informality in the sector and to make recommendations for enabling transition to the formal sector. Although informal (unlicensed) operations are active in Jamaica, they form a very small proportion of extractive Development Minerals operations and work only sporadically. No significantly sized unlicensed operations were encountered during the field assessments, although artisanal scale extraction of river gravels was observed once.

The field quantitative and qualitative data were input and collated (in excel based spreadsheets) and centrally integrated to provide a full analysis by the team of these operations across a range of commodities.

Social, Gender & Human Rights

Each Development Mineral site that was visited was also assessed in terms of the potential social, gender and/ or human rights impacts of these quarry operations.

The following consultative methods were utilised:

- Semi-structured discussion of the 'modus operandi' and motivation/ challenges of each of the quarry operators interviewed;
- Semi-structured interviews with individuals, labourers, community actors and NGOs in rural areas;

- Semi-structured interviews with educators in rural schools in rural areas
- Focus group with women who work in quarrying (using World Bank's *Women in Entrepreneurship* framework)
- Environmental non-governmental organisations (NGOs).

Quantitative labour and gendered employee data (numbers of female/ male workers and in which roles in each quarry) were gathered as part of the main quarry questionnaires. These were recorded and disaggregated in a separate excel worksheet for numeric analysis and graphic representations. Access to resources and land tenure issues that emerged during the field work were recorded via semi-directive interviews.

It was not possible to gather quantitative baseline data pertaining to youth issues; however, qualitatively, such issues arose in discussions with both male and female managers, where concern was expressed about the lack of entry opportuntities to the sector. These comments were recorded by the researchers.

Qualitative first hand data were recorded through semi-directive interviews in researchers' field notebooks, collated and assessed by SLR's Social/ Gender expert to understand the potential impacts of quarrying of Development Minerals on communities, women and children/ youth, and on human rights issues such as access to resources and land rights. These were analysed by qualitative methods, including identification of patterns related to practices; common representations, concerns/ discourse analysis and identification of correlations via cluster analysis.

Stakeholder Engagement

Extensive consultations were held with a range of key stakeholders from UNDP programme team, government, national institutions, quarry/ miners' organisations, financiers, development banks, NGOs and operators to gain informed perspectives from different types of stakeholders relating to the current status and future development of the non-metallic minerals sector (Appendix 4a), including (Table 2):

Table 2 Number of Consultations held with Key Stakeholders

CONSULTEE TYPE	CONSULTEE	No.	CONSULTEETYPE	CONSULTEE	No.
Policy	Ministry of Transport and Mining (MTM)	2	Development Agency	UNDP – various policy & sectoral experts	4
Mining Regulation Cadastre GeoData	Mines and Geology Division (MGD) – various officers	15	Critical Infrastucture	Jamaica Railway Corporation	1
Environmental Planning & Regulation	National Environmental Planning Agency (NEPA)	2		Port Authority of Jamaica	1
Geol. Institute Regulation	Jamaica Bauxite Institute	2	Water Regulation	Water Resources Authority	1

Planning Policy	Planning Institute of Jamaica (PIOJ)	1	Miners Association	Mining & Quarrying Association of Jamaica (MQAJ)	2
Investment Promotion	JAMPRO	2	Financial / Banking/ Lenders	Development Bank of Jamaica	2
SME business training & development	Jamaica Business Development Corporation	3		EXIM Bank	1
Government Statistics	STATIN Jamaica Statistics Institute	1		National Commercial Bank	1
Women working in Quarrying	Women in Quarrying Focus Group (eight women)	1	Gender	Bureau of Gender Affairs (*despite three calls/ emails*)	0
Artists	Artisans Collective (with JBDC) and individuals	7	Civil Society/ Environmental NGO	Jamaica Environment Trust	1
Marketing/ Sales	Various technical (marketing/ trading	5		Environmental Foundation of Jamaica *two cancelled meetings*)	1
Production	Quarry Operators	54		Community Activists	15

Although the Jamaica Chamber of Commerce is focused on micro-small-medium business development, trade and competitiveness, it does not have a mining committee[19].

Additionally, 54 mining/quarrying Companies were consulted in the field (*see Annex 4b for full listing*). None of the operators are members of the Chamber of Commerce or mentioned it in interview. There is no Chamber of Mines in Jamaica, which in many countries advocates on mining issues on behalf of mine and quarry operators. There is, however, a Mining and Quarrying Association of Jamaica.

Two scheduled focus group meetings were held, with:

(i) Women working in Development Minerals sector (upstream and downstream)

(ii) Artists who work in ceramics, pottery and jewellery making, using clays and gemstones.

Issues investigated included commodity base and endowment; legal or policy strengths and constraints; institutional framework (strength / weakness); infrastructural bottlenecks; vocational training; access to credit; environmental and social impacts; gender and human rights impacts; and potential market opportunities for Development Minerals in response to recent domestic economic growth and regional opportunities.

The key issues raised are summarised in Table 3 below, many of which were common across groupings.

[19] http://jamaicachamber.org.jm/resources/committees/

Table 3 Key Issues raised by Stakeholders during Research

CONSULTEE/ GROUP	KEY ISSUES RAISED
UNDP/ Development Agencies	Development minerals: social and environmental sustainability is critical Gender impacts and human rights; equality opportunities Need for improved technical, managerial and financial capacity Strengthening of standards Policy gaps and potential for alignment Project must develop key recommendations for action
Government (Mining & Quarrying)	Range of Development Minerals in Jamaica is positive with opportunities for positive contribution to NDP and export targets Good geological understanding of mineral occurrence, but poor reserve definition for most commodities Alignment of policy and legislation across the natural resources spectrum – updating of Quarry regulations Licencing terms for quarries too short (3 years currently) Data management/ GIS capacity & data provision Quality Assurance of product through the value chain, requiring accredited laboratories. New Minerals Policy 2017-2030 will address key policy issues in terms of alignment, training, land management, licensing (*if accepted by Cabinet*). Spatial zoning of Development Minerals lands to avoid conflict Need for value adding in downstream sector
National Agency/ Planning/ Environmental Regulator	Need for integrated planning of Development Minerals programme with the *Vision 2030 Jamaica: NDP* to ensure government is aware of potential on-costs Need to integrate national minerals strategy with local Parish development plans. Environmental compliance with national regulations requisite Biodiversity loss Competition for lands, spatial zoning improvements Managing conflict where needs collide (agriculture – mining- ecology)
Financing Institutions	Business planning and prudent management required Risk based assessment of loans: many operators are med-high, thus no loans Compliance with environmental and safety regulations requisite Willing to lend, but operators must be prepared Offer training and capacity building for SMEs Have supported some development mineral operators successfully
Development Minerals Quarry Operators	Survival – poor business operating environment for past 10 years Weak understanding of sector/ lack of respect given contribution to national development targets in construction, housing, tourism etc. Access to credit – very difficult Costs of doing business (transport and energy) Infrastructure deficits – port handling facilities, roads, railways insufficient Access to ongoing vocational training for operatives Need for plant and equipment Energy costs Improved OHS and environmental standards are recognised, but costs are prohibitive Market analysis and Strategic Plan required for the sector Government incentivisation to integrate all aspects of the minerals market Focused market research and critical analysis / projection of trends

SME Development agencies	Micro and SME business development potential Alliances of small producers in downstream activities such as pottery/ craft Potential for value adding in mineral products: ceramics, tiles, paving, stone, carvings, etc as well as manufacturing e.g. paint Potential for incubation of small producers Business planning training available for SMEs
Promotional Agencies	There is not a focus on Development Minerals to date The 'Value proposition' from quarry sector must move forwards; little change in 20 years. Focus on value adding for end users, but need to identify likely markets Limited number of operators with international/regional trading focus Near-shore USA, Panama, Central and South America are likely markets Linkages with Tourism Crafts and other initiatives positive Improved infrastructure requisite to get product to market: ports, rail, roads Energy costs too high for energy intensive industry/ processing minerals Limited market research for project pipelines / regional data.
Mineral Traders	Focus on key Development Minerals commodity groups Need for value adding to meet key market demands as the economy grows (paints, grouting, specialist plasters etc) The need for focused action to address well-recognised Infrastructure deficits – roads, railways and ports
NGOs	Many concerned more with impacts of bauxite than quarrying; others very exercised by visual/ water/ habitat impacts of quarrying Noise, dust, vibration impacts on communities are significant – people 'paid to stay quiet'. EFJ concerned about permitting of extraction of beach sands.
Artists/ Jewellery Makers	Need to identify sources of raw materials in Jamaica – consistent and affordable supply – with support from MGD Need for integration of effort: collective use of equipment and processing Marketing / online supports Potential for business incubation at JBDC Need for action – 'some 'have seen it all before'
Training/ Education	Business skills are required at every level in the industry if it is to move forwards in business planning to access finance Apprenticeships must be developed, tailored to quarrying needs Capacity Building in technical, business/ finance, environmental, social and safety aspects of Development Minerals is required for operators, regulators, and new entrants to the sector.

The development and planning agencies were concerned that the programme must be linked to broader national planning policies and underpinned by human rights, social and environmental sustainability.

Key issues of licensing, regulation and governance, regulatory compliance and environmental concerns were raised by the governmental and national regulatory bodies. The need for improved vocational and professional training was emphasised, with access to modular training through training institutes and universities. The need for quality assurance of products along the full value chain is requisite, which will require internationally accredited (public or private) laboratories.

Issues of infrastructure deficits (port handling facilities, roads, railways); the costs of doing business and compliance, underpinned by difficulties in financing operations and access to credit are critical for operators. Many have a sense that few understand their sector and specific challenges.

The financing institutions, while largely sympathetic to the challenges faced by Development Minerals operators, were insistent that basic issues such as business plans, resource definition, production scheduling and loan repayment terms must be observed. This was also raised by the SME development and promotional agencies. The need for focused, commodity based market research and strategic planning for minerals along the full value chain was recognised by many consultees.

Community residents and activists were more positively focused on the employment opportunities offered by quarrying, than on potential adverse impacts related to noise, dust, quarry safety and traffic. However, some women in the communities voiced concerns about traffic-related dust and have approached the relevant quarry managers to implement dust suppression measures successfully.

Environmental NGOs raised the issue of the need for much stronger regulation of the potential adverse impacts of quarrying (noise, dust, visual etc) on communities, as well as improved consultative processes.

A full list of Key Consultees is presented in Appendix 4a, with a list of Development Minerals quarry operations visited in Appendix 4b.

Data Collation, Analysis and Interpretation

The results of the various research methods (consultative interviews, questionnaires, structured and semi-structured interviews, focus groups) were combined as explained in Section 2.2.1 and integrated to inform a robust baseline analysis and recommendations for future action.

All **quantitative data** from the team's Field baseline research questionnaires were entered to our excel based templates, gathering technical and operational (mining, equipment, production, reserves etc), labour/ occupational health & safety (OHS) and labour/ gendered employee data, in this manner. The data were aggregated and statistically analysed using the inbuilt statistical capacity of MS Excel. The data were collated and stored on MS Access, and used to produce graphic representation of findings in MapInfo GIS package. All digital baseline data was passed to UNDP at the end of the project.

Spatial data were captured in excel and entered to a GIS platform (*as agreed with Client and MGD*) so that every quarry visited has detailed and accurate locational data, linked to the qualitative-quantitative analyses (Annexe 3). For particular companies visited, technical summaries, regarding the mining, market potential and management aspects, as well as health & safety and environmental issues, have been prepared, with representative photos of the project (Annexe 3). Experienced observations and recommendations are also made, and utilised in the Report to extract the key features of the sector.

SLR's analysis is based on site visits and project evaluation, consultations, visits to domestic traders and downstream users of locally produced and imported value added products (e.g. exporters, wholesalers, retailers). Where possible, maps and graphs are produced to track variabilities in issues such as material produced, quarry size, numbers of employees, labour and gender roles, environmental planning etc.

All **qualitative data** were collected from the questionnaires by each inquisitor and interrogated and aggregated to inform a robust team analysis of the core environmental, occupational health and safety and labour issues, with observations based on extensive national and international experience.

In this study, multiple methods were employed to assess the social, gender and human rights impacts of Development Minerals projects, based on document review, qualitative surveys, semi-structured interviewing, first-hand observation and short field case studies (based on research methodology proposed by the World Bank[20]), as well as internal team observations. Key findings were interpreted through interrogation of interviews and questionnaire results, numeric data analysis and graphic interpretation. Verification of data was based on contextualized analysis and triangulation from quantitiative and qualitiative sources.

All of these technical, environmental, labour, health & safety social / gender/ rights data were thematically grouped and key findings presented in tabular and graphic formats for ease of reference. Observational case studies, project specific records (see Annexe 3) and potential Development Minerals value adding products are presented to highlight specific issues.

The research for Component 5 Market and Value Chain Assessment was carried out in tandem with Component 3 and 4, through desk / web research and consultations with key players in Jamaica's minerals, retail and trading sector. Further substantiating desk analysis was carried out in early June 2017.

The Draft Key Findings were presented at a National Stakeholder Workshop held in Kingston on 15th June 2017 and feedback was recorded for final consideration.

Photo 2 SLR Team member conducting field surveys, Trelawny, May 2017

[20] See Case studies in Development Practices (WB)
http://blogs.worldbank.org/developmenttalk/making-case-case-studies-development-practice
Case study evaluations (WB): http://ieg.worldbankgroup.org/Data/reports/oed_wp1.pdf

Component 1: Profile of Develompent Minerals in Jamaica

Geological Endowment: Potential for Development Minerals

The geological framework of Jamaica underpins the baseline assessment. The island is located in a tectonically active zone, with a major plate boundary (the Northern Caribbean Plate Boundary Zone) running east-west to the north, just south of Cuba, and an east-west, seismically active fault zone extending from Haiti, which defines the north coast of Jamaica (Figure 4). Many of Jamaica's key landforms, including the central mountainous massif, are influenced by fault movements related to this geodynamic tectonic setting. The island is being gradually tilted to the south: thus the North coast is being elevated above sea level, while the South coast is being drowned with implications for sea-level rising and climate adaptation.

Figure 4 Google Earth image of Caribbean Sea, showing major Plate Boundaries

The geological evolution of Jamaica can be summarized into four main phases (and age groups):

i. *A volcanic arc related basement* (early to late Cretaceous): metamorphic low grade schists, serpentinites, basaltic and andesite lavas, volcanoclastic sandstones and conglometates and few shallow water limestones.

ii. A *succession of siliciclastic with minor evaporates and volcanics* (Paleocene to early Eocene Wagwater Group).

iii. An *impure to very pure carbonate platform limestone succession*, respectively the

Yellow and White Limestone Groups (Late Paleocene to Miocene)

iv. An association of *shallow and deep water clastic and carbonates* exposed around the periphery of the island (the Coastal Group: Pliocene to Pleistocene).

Approximately two thirds of the area of Jamaica is characterized by outcropping sedimentary rocks across 80% of its territory, dominated by limestone formations (Figure 5). The western end of the island is dominated by limestone deposits ranging in age from mid-Tertiary to predominantly Eocene, with a thin belt of Quaternary coastal limestones along the north coast. The limestones are deposited on top of older igneous, metamorphic and clastic sedimentary rocks.

The age of the limestone ranges from Paleocene to Middle Miocene (566 million - 14 million years) and can be divided into two main stratigraphic units: the older **Yellow Limestone Group** and the younger **White Limestone Supergroup**, of the Clarendon Block respectively (Figure 5).

The White Limestone Group is characterized by shallow and deep marine limestone deposits and covers 60% of the total outcropping rocks of Jamaica. It certainly represents the most important source of high quality pure and hard limestones on the island. In particular, the *Montpelier Formation* (on the west and east) and *Newport Formation* (mainly in the central-southern region) respectively, consist of evenly-bedded, bioclastic, limestones, up to five feet in diameter; these are the best sources of high grade limestones.

The Troy-Claremont Limestone Formation and the Somerset Formation, representing the older strata of the White Limestone Group, were deposited upon the Yellow Limestone Group during the middle Eocene stage. The *Troy Limestone* (to the west) consists of well-bedded to massive, yellow-brown to pink, recrystallized limestones and dolomites, often recrystallised due to hydrothermal fluid activity of the Lower Eocene *Newcastle* and *Halberstadt* volcanics. The *Claremont Formation* (in the east) is younger and consists of evenly-bedded, bioclastic limestones, which are rich in fossilised molluscs, up to five feet in diameter. The *Barbecue Bottom Fault* marks the division between these two formations.

The eastern portion of the island is dominated by the Lower Eocene *Wagwater Group*, underlying the Yellow Limestone Group, includes volcanogenic clastics and continental formations. Cretaceous clastic and metamorphic rocks form the core of the Blue Mountains, while volcanic and intrusive rocks (Cretaceous oceanic andesites and serpentinites; granodiorites; and Tertiary lavas & ignimbrites) and low grade metamorphic rocks outcrop in the eastern part of the island (Figure 6).

Figure 5 Geological Map of Jamaica

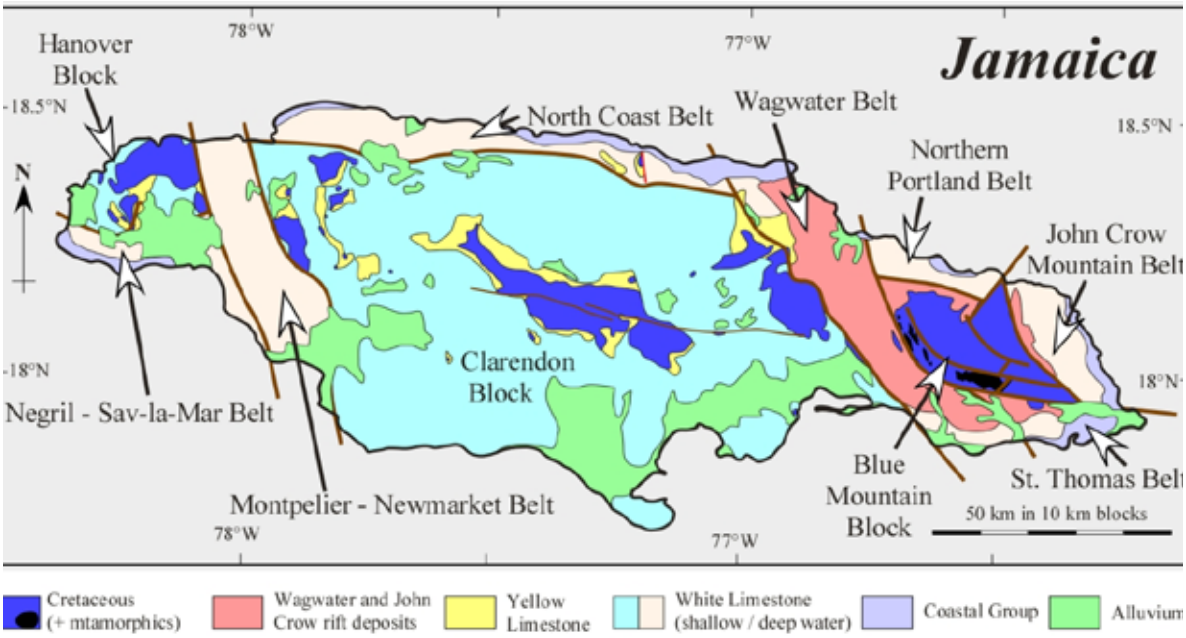
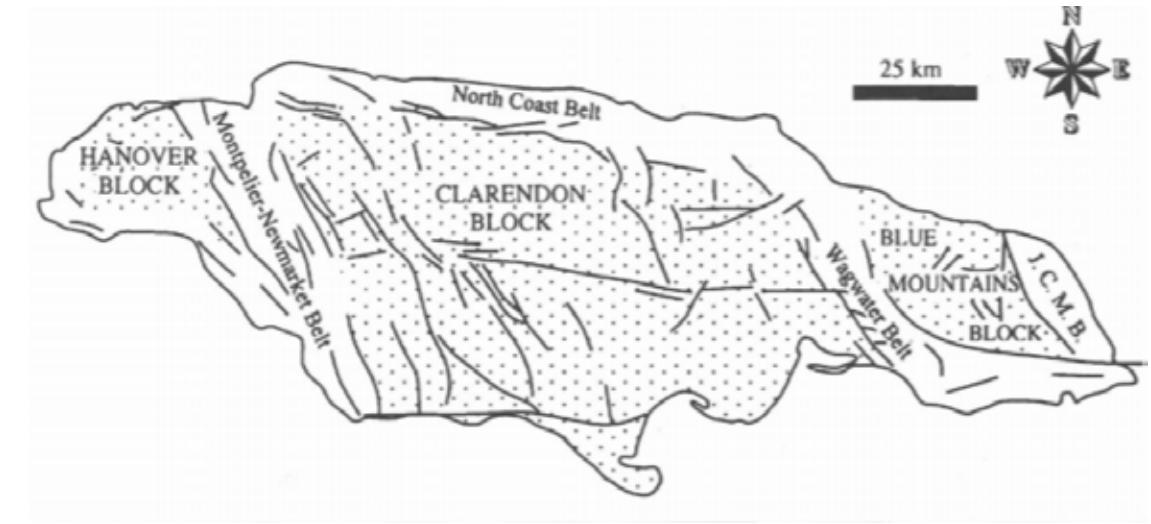


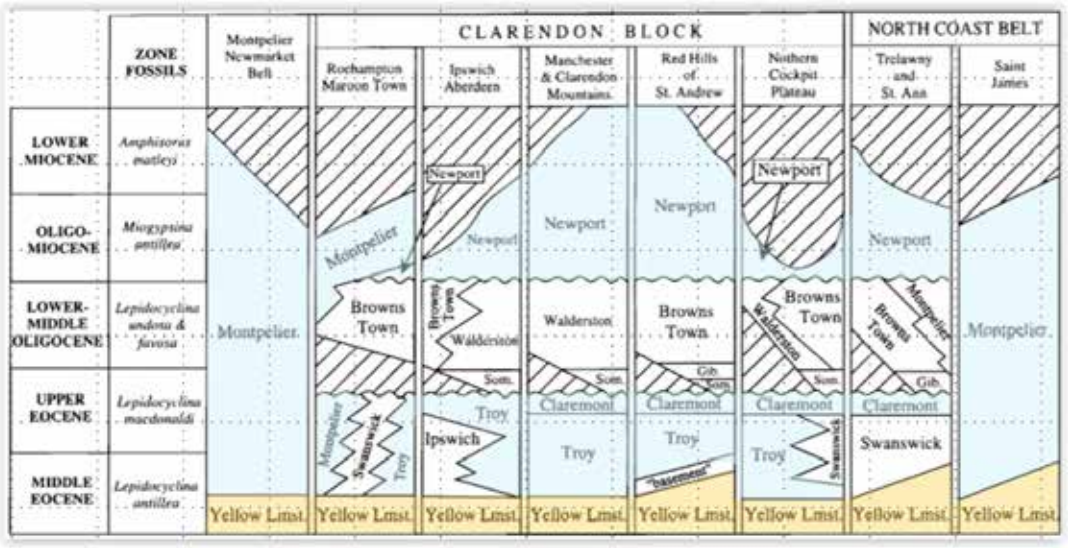
Figure 6 Simplified Structural Geological Map of Jamaica



Source: modified from Robinson, 1994

The stratigraphic column for the highest potential Yellow and White Limestones, demonstrates the lateral thickness variations across the island, and may be represented simply as follows (Figure 7). The formations with the highest potential as sources of high quality pure limestone (Montpelier, Newport, Claremont and Troy at the base of the White Limestone Group) are shown in pale blue, lying above the Yellow Limestone Group.

Figure 7 Main Subdivisions of White Limestone Group (Versey, 1957a), Clarendon Block



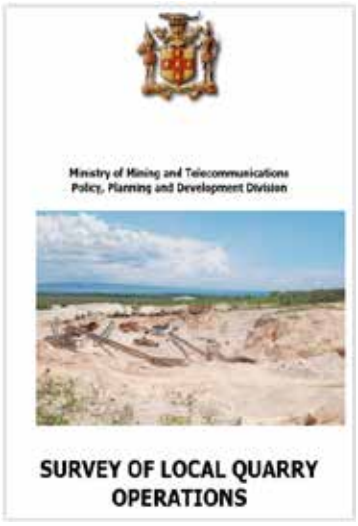
Middle Eocene to Oligocene Stratigraphy and Paleogeography of Jamaica: A Window on the Nicaragua Rise (IV annual Meeting of IGGP, July 1999)

In the Wagwater Belt (Figure 6), the White Limestone Group is mainly represented by *Montpelier Formation* (in St. Mary,) characterized by white, evenly bedded, micritic limestones. However, beds are often separated by dark brown, cherty laminae (silica rich).

Research into Geological Potential for Development Minerals

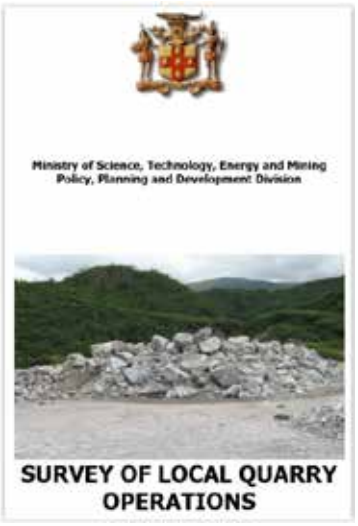
There have been many excellent research studies undertaken in the past four decades on the geological potential for exploitation of Development Minerals resources by various bodies in Jamaica. These include the following key documents (Figure 8):

Figure 8 Previous Research : Jamaican Development Minerals Sector

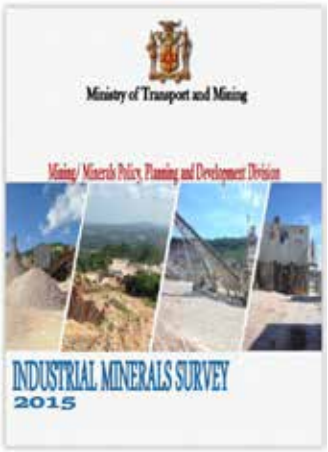


MMT 2008

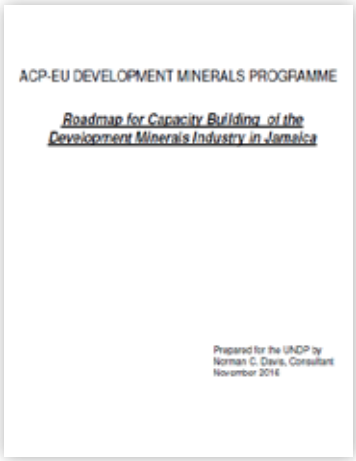
Conrad Douglas, JAMPRO 2013



MSTEM 2013



MTM 2016



UNDP 2016

GET 2005 - 2008

The programme entitled *Exploration and Development of Non-Metallic Minerals* (led by H.R. Busby on behalf of the UNDP, 1982-1989) encompassed extensive field research, analyses and assessment of the mineral potential of Jamaica, in association with the relevant government agencies. Unfortunately, many of these (pre-digital) data appear to have been lost and it was exceedingly difficult during the current assessment to locate a series of reports dating from 1982-1989. This underlines the need for appropriate data storage systems to ensure retrieval in future years.

A subsequent paper published by Busby (1990) was located by the team, which mapped the potential for a range of Development Minerals as part of the extended UNDP 1980s programme. A poor quality black and white map in the report highlighted potential for aggregates, ceramic clays,

dolomite, gypsum, limestone, river sands and gravel and silica sands. This map was re-produced as part of the current project, which is shown below in Figure 9.

Figure 9 Potentially High Quality Development Minerals Deposits, Jamaica

Source: after Busby 1990

Subsequently, other reports were produced including:

- Czech-GET joint project between the Czech Republic and Government of Jamaica, which provided project-specific priority zones in reports dating from 2002-2009;
- SEBRA – a report on the sedimentary basins and related mineral potential of Jamaica;
- JAMPRO study of limestone and their derivatives (2008), carried out by Conrad Douglas & Associates.
- Regular assessments by the MTM and MGD on mineral potential of various commodities, as well as quarry surveys based on statutory returns and field surveys.

Each of these reports has provided excellent baseline data to support institutional policy initiatives, and have made significant recommendations for the sustainable development of the sector. However, to date, rarely have the recommendations been activated, leading unfortunately to a level of cynicism among the industry operators.

The lack of implementation of key national recommendations for the Development Minerals sector reflects the structure of the sector and the inherent constraints faced by private sector operators, which are examined further in this report.

Economic Potential: Focal Geological Units

A review of these reports, combined with our team's local knowledge, suggests that key geological units influence the specific economic potential for mineral products (see Table 4):

Table 4 Geological Influence: Potential Mineral Products, Jamaica

ROCK UNIT	ROCK TYPE/ *POSSIBLE PRODUCTS*
Quaternary rocks	Alluvial / elluvial deposits; *sand & gravels, clays, silica sand*
Quaternary Coastal Group	Limestones – *coralline limestone as dimension stone (Dominican Republic)*
White Limestone Group	Shallow /deep water limestone; *limestones, marls and dolomites, (recrystallized) dimension stone*
Yellow Limestone Group	Limestones - *Mid Eocene*
Wagwater Group Richmond, Halberstad & Wagwater	Carbonates & clastics; rift deposits; *lavas and ignimbrites for aggregate and possible paving stones (areas of St. Andrew, St. Mary and Hanover)*
Cretaceous clastics	Sandstones, conglomerates, shales – sands, clays, sand & gravels
Cretaceous metamorphics	Schists, serpentinites, marbles - *dimension stones*
Volcanics (mixed ages)	basalts, *agates; recrystallized older rocks such as limestone/ marbles may be utilized as high quality aggregate and Dimension stones.*

Source: SLR Team geological experts

In reviewing these geological units, and based on a series of past reports, it is clear that the most economically viable are:

(A) **The Quaternary** deposits provide ready sources of:

- ***A1 Large scale sand and gravel deposits:***
    - Large potential south of May Pen in Rio Minho area;
    - Well rounded/smooth volcanic sand & gravel (70-75%) sediments (10-15 %), hard limestones (10%; only large pebbles), and
    - St. Elizabeth (Black River) – lower quality (less volcanics)

Volcanic gravel (70-75%) sediments (10-15 %), limestones (10%)

- ***A2- Finer grain river sand deposits (same composition of A1)***
    - Large potential in Wagwater River of St Mary's

- Rio Grande/ Spanish River and Buff Bay Rivers of Portland; and
- Yallahs and Morant rivers of St Thomas, among others.

Extensive lateral deposits of sand and gravels of the Morant River, in the Blue Mountain Valley of St Thomas

- ***A3 – Alluvial-Eluvial Clay Deposits***
  - Clarendon, St. Elizabeth (*under silica sand?),* Westmoreland;
  - Small deposits in St. Mary & St. Catherine

(B) **White Limestone Group**

The White Limestone carbonates include the Newport, Montpelier, Troy, Walderston-Brown'sTown, Claremont Formations and lateral equivalents. Some of the limestones in the Newport, Troy and Claremont units have been recrystallised.

A high proportion of Jamaica's limestone is considered 'high purity grade'. Most of the limestone output is used in the local construction industry as well as in the manufacture of calcined and hydrated lime for various applications, such as flocculants, fillers and agricultural purposes, and mostly (in the past) bauxite refinement.

Typical sample of 'white limestone' –

the purity of the limestone may be denoted by its whiteness and lack of impurities such as fine clastic silts or muds.

Based on geological assessments (current and past), the White Limestones provide the best potential formations for economic development of limestones, which include:

- **B1: Hard pure Limestones and weathered soft Limestones** ("Marl"), with high $CaCO_3$ (up to 99.4%), for high value-added products (high quality aggregate, whiting[21], chemical grade lime for many industries)
- **B2: Clay Marls** for cement / filling

[21] Currently, in Jamaica, only one Company (as well as a few minor spot exports) is successfully exporting value-added whiting material to USA, via Ocho Rios port.

- **B3: Dolomitic limestones** (with higher mechanical properties): for good quality aggregate, asphalt, etc.

These rocks are currently almost exclusively used for bauxite processing and for construction industry in bulk (as mined). They also have potential for:

- **Low-Medium Quality Aggregate** for:
  - Block making / Concrete / Filling (*noting that a number of small operators in St Andrews supply blocks and garden products for domestic purposes*);
  - Road base - both lower and upper base (*noting that* **«Marl» is** *also sold for this purpose*).

(C) **Wagwater Group**

- **C1 – Sands & Gravels**: the Wagwater Group is drained by a series of north-flowing rivers from the Blue Mountains, including the Wagwater River that flows through a fault graben, bringing large volumes of conglomeratic and volcanic-derived sands and gravels to the north coastal plains.
  - These S&G deposits are exploited along a rivers in St Mary's and Portland parishes.
- **C2 - Gypsum**: The Wagwater Group also includes the gypsum deposits that are exploited in the Bito area of St. Andrew.

(D) **Various units with economic potential:**

- Cretaceous Volcanic units – includes deposits such as **Pozzolan** mine in the Bito area of St. Andrew;
- Some un-altered **volcanics and granodiorites** (upper Cretaceous), outcropping in the central - eastern mountainous area may be suitable for **high quality aggregate**, if accessible;
- Marbles for **dimension stone** in the central Cretaceous units

(E) Particular attention must be paid to the potential for **Dimension Stones** (DS), mainly in the Troy and Newport Formations and in some other areas of recrystallized limestones ("marbles") within the same formations. However, the tectonic setting of the island of Jamaica leads to extensive fracturing of rock mass and it may be that DS is only suitable for small scale purposes such as tiles or domestic decorative stones. The potential for DS is further examined in Annexe 4.

From the 1990s until 2008, some local and international companies operated small-medium stone quarries in Jamaica (e.g. in Hellshire-St. Catherine, St Andrew and areas of St. Ann, St. Thomas) – see Table 5 below. They exploited block "marble" quarries in recrystallized rock mass, and two of them apparently invested in small processing facilities, equipped with marble multi-blade gang saws and other equipment to produce finished products (tiles and cut-to-size). Unfortunately, all of them closed down, due to market competition created by imported finished products from Europe and China.

Table 5 Dimension Stone Production in Jamaica (from Busby, 1990)

INVESTOR/COMPANY	COUNTRY	* APPARENT INTEREST LEVEL	RESOURCE	LOCATION PARISH	POTENTIAL PRODUCTION PER ANNUM M.T./M³
Maragh Quarry Co.	Jamaica	1	Marble	St. Catherine	500 m³
Commonwealth Limestone Co.	Canada	1	Limestone	St. Ann	50,000 m³
Commonwealth Marble Co.	Canada	2	Marble	Jamaica	500 m³
Marblehead Lime Co.	U.S.A.	2	Limestone	Western Jamaica	50,000 M.T.
Florida Rock Co.	U.S.A.	2	Dacite	St. Andrew	100,000 M.T.
D & I Marble Co.	Jamaica	2	Marble	St. Thomas	500 m³
Interkiln Corp.	U.S.A.	2	Clay*	St. Andrew	10,000 M.T.
Silverstone Corp.	Holland	2	Marble	Jamaica	500 m³
Hellshire Marble Co.	Jamaica	2	Marble	St. Catherine	500 m³
AAA Asphalt Co.	U.S.A.	3	Silica/Clays	Jamaica	5,000

Source: "Exploration and Development of Non-Metallic Minerals", H. R. Busby (1990) for UNDP

The Busby report highlighted potential for DS extraction in a number of parishes. A full assessment on the specifics of Dimension Stone potential in Jamaica was carried out under the current baseline assessment and is presented in Annexe 4.

(F) In considering the **potential for ceramic clays** for the minerals and artisan industries, a useful study completed by Bailey of the Jamaican Geological Survey Department (GSD) in 1970[22] characterized the potential for clay deposits across Jamaica in detail. The work was completed in association with Jamaican Industrial Development Corporation, the Worcester Royal Porcelain Company and Stanford Research Institute in California, thus comprehensively assessed the potential along the full value chain. The GSD estimated that there are 250 million long tons of fine (ranging from earthy, plastic, gritty) clay substances available for exploitation.

[22] Bailey, B.V. (1970). Jamaican Clay Deposits. Economic Geology Report No. 3. Geological Survey Department.

The descriptions of clay deposits (by parish) and their potential uses were tabulated (Table 6) and plotted (Source: *modified from Bailey, (1970)* during this baseline assessment. The final estimate of clay resources calculated by SLR from the deposits cited in GSD's report is 155,698,000 long tons, equating to approximately 158,000,000 metric tonnes (158 Mt - see Table 6).

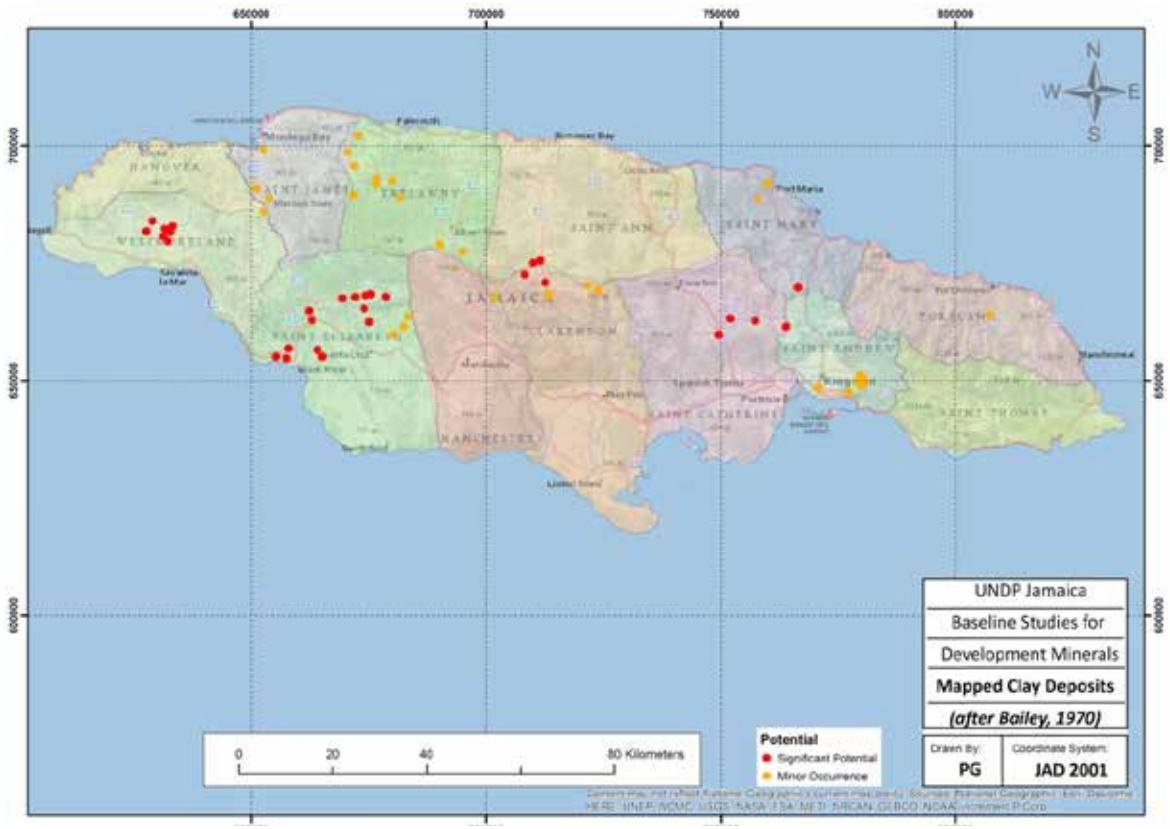
Table 6 Clay Deposits of Jamaica

PARISH	LOCALITY	MATERIAL	ESTIMATED VOL (long ton)	POTENTIAL END USES
St Andrew	Above Rocks	15% clay; 15% sand (33% montmorillonite, 66% halloysite)	160,000	Crude pottery Good quality bricks
St Catherine (Bog Walk)	Tulloch Cashew Walk	Red burning clays – light brown, blue (org frags)	119,000 40,000	High plasticity, good pottery clays for crockery / earthen stoneware
	Long Coconut/ Harkers Hall	Similar to material at Above Rocks ., St Andrews	2,000 1,000	
St Mary	Job's Hill 130m x 15m outcrop	Kandite – hydrothermal dickite clays along shear in Cretaceous andesitic lava	7,000	Ceramics (40% suitable) Refractory products / ornaments
Clarendon/ St. Ann	Cave Valley Big Hole	Quality clays in depressions in Yellow Limestone : from overlying weathered White Limestone Minor deps	114,000	Bricks, tiles, flowerpots, drain pipes May be suited to pottery – to be tested
	Thatch Walk		660,000	
	Greenvale, Santa Maria, MvNies			

St Elizabeth	Black River banks	Very pure alluvial clays and eroded limestone surfaces		
	Cow Market (*Big Tanker, Cranford Pen, Brampton Park*)	White clay under silica sands (3m thick)	600,000	
	Frenchman	Alluvial fine grained blue, white clays (<1m) under silica sands	30,000	Kaolinite, suited to dinnerware
	Holland Estate (S) Holland Estate (N)	White, pastel, red burning clays – *good ceramic qualities once red leached off*	167,000 83,000	Earthenware, bricks, drainpipes, flowerpots
	Appleton Estate (Nassau Valley)	Red, creamy, grey alluvial clays (6m thick)	1,500,000	Pottery, pipes, roof tiles, bricks
	Barton Isles	Variegated alluvial clays (5m thick)	500,000	Brick clays
	Oxford/ Balaclava	Alluvial clays on limestones, with sinkholes; clay columns (+/- 6m)	1,000,000	(*Likely*) pottery, tiles, bricks (*needs testing*)
	Slipe (Frenchman)	Light brown, cream, plastic transported clays (<2m thick over 70 acres)	210,000	Bricks, earthen pots, pipes etc
	N of Black River road; in Y.S. Valley	Light brown, plastic alluvial clays (3m thick, *locally silty, fossils*)	500,000	As above, crude pottery
Westmoreland	Frome (N of Savannah-la-mar	Variable good quality montmorillonite clays (3m), light brown, red, white, blue, mottled.	150,000,000	Pipes, tiles, bricks *Firing colour restricts use despite montmorillonite quality*
Total			155,693,000 long ton	= 158,000,000 t (metric tonne)
Other minor Clay deposits identified by Bailey (1970)	Clarendon St Andrew Portland St Catherine St Elizabeth St. James St Mary Trelawny	Cumberland, ***(No estimates made of volumes/ end uses)*** Liguanea, Cockburn Pen Golden Vale Knollis , Bog Walk, SpanishTown Elim, Two Mile, Bogue Cambridge, Shettlewood, Montpelier, Fairfield, Hampstead, Port Maria, Deeside, Duanvale, Fontabelle Queen of Spain Valley Orange Valley, Albert Town		

Source: Bailey (1970)

Figure 10 Map showing Clay Deposits of Jamaica



Source: modified from Bailey (1970)

Unfortunately, in relation to the indicative potential for clay exploitation for artisanal / ceramic production, it is estimated that up to 70% of these deposits are now overbuilt (as noted by the *UNDP Roadmap 2016, page 30;* and estimated at up to 70% sterilisation, *pers comm. Dr. AJS Geddes, former Director of the Geological Survey of Jamaica, 2017*) . However, clay production could provide cottage scale clay brick factories, animal feeding production plants, and public and private water or waste storage sealing projects e.g. in agriculture and mining.

Development Minerals: Resources & Production

Resource Estimates: Development Minerals

The most recently published estimate of resources for a range of Development Minerals was cited in the *National Minerals Policy 2017-2030,* as produced by the Mines & Geology Division (MGD) of the Ministry of Transport and Mining (MTM). These are based on internationally accepted definitions of mineral resources and reserves, and are reproduced.

These data illustrates the huge potential volumes of materials available. However, significant geological work is required to prove up these resources to define economically recoverable reserves.

Table 7 MTM Estimate of Mineral Resources, Jamaica

DEVELOPMENT MINERALS (MTM DATA)	RESOURCES *(estimates)* *Mt = million metric tonnes*	COMMENTS
Limestone (whiting grade)	1,115 Mt	Resources & reserves (c. 20% proven reserves)
Limestone (chemical, industrial, metallurgical grade)	5,750 Mt	Resources & reserves
Limestone (calc/ dolm)	2,700 Mt	Resources & reserves (c. 10-15% proven reserves)
Aggregate (skid resistant)	271 Mt 1,130 Mt	Proven reserves Probable reserves
Alluvial Sand & Gravel	600 Mt	Probable reserves
Gypsum (incl. 90%, 80%, 70% gyp & anhy)	29 Mt	33-38 years (+ anhydrite)
Clay	160 Mt	Reserves and estimates resources (c. 10% proven reserves)
Black Sands (incl. sand, iron, titanium oxide)	19 Mt	Estimated resources
METALLIC MINERALS		
Bauxite	1600 Mt	50-100 years life span (proven & probable reserves)
Precious & Base Metals	unknown	not published

Source: Mines & Geology Division, MTM (Draft National Minerals Policy 2017-2030)

Development Minerals: Production

Jamaica in the 1980s and 90s produced small amounts of cement, gypsum, lime, limestone, marble, marl and fill, salt, sand, gravel, and silica sand. With the exception of bauxite and alumina and lime, all mineral production declined in 1998. The Jamaican mining and quarrying sector was subsequently dominated from 2003 by the production of bauxite and alumina, which provided 97.2% of the mining sector's value. During the period 2008-2010, due to a marked decrease in bauxite demand and increased competition (e.g. by China) prior to and after the post-global financial crisis, the production of bauxite in Jamaica drastically reduced.

Prior to the crisis, the country ranked third in the production of bauxite, after Australia and Guinea, with 10.4% of total world production. It also ranked third in the production of alumina, after Australia and the United States, with 7.4% of total world production. Since 2012-2013, the trend has positively changed, as noted in the *Draft Roadmap for Capacity Building of the Development Minerals Industry in Jamaica*[23]*:*

[23] Norman Davis & Associates (2016). *Draft Roadmap for Capacity Building of the Development Minerals Industry in Jamaica (ACP-EU Develompent Minerals Programme), page 8.*

> "*In the last 3-4 years, the Jamaica Mining and Quarry Sector has been experiencing marginal improvements over recent years especially owing to performance of the bauxite and alumina subsector with the increase in production moving from 11,290,100 tonnes in 2013 to 11,493,400 in 2015 this represents an increase of 1.8%. Moreover the industry has contributed significantly to the economy of Jamaica, contributing 2.3% to the Gross Domestic Product (GDP). The export earnings for the sector averaged US$695,941,602 for the period 2013-2015, which accounted for more than half (57%) of the total domestic export during the period. The Mining and Quarry Sector is poised for significant growth over the upcoming years, particularly if the planned investment for the reopening of ALPART, the largest alumina plant in Jamaica, is fully realized".*

The Jamaican construction sector is 'fed' by locally sourced Development Minerals and products, such as cement, gypsum, lime, limestone, marble, marl and fill, salt, sand, gravel, and silica sand. Unfortunately, the construction sector endured slow growth and low productivity over the past ten years, leading to stagnation in the upstream minerals sector. There is a focus now on downstream Competitive Value Added Production (CVAP), which will complement the objectives of the ACP-EU Development Minerals Programme and Vision 2030.

The strong potential for Development Minerals in Jamaica is marked by recent studies and surveys prepared by the MGD; the Economic Profile Reports prepared by the Ministry of Transport & Mining (MTM) every three years; the 2013 *Market Assessment for the Diversification of the Jamaican Limestone Industry* (Conrad Douglas & Assoc. for JAMPRO) and latterly, the *UNDP Road Map* of 2016 (Norman Davis & Associates). Each emphasizes the huge potential of the sector, in particular with regards to limestones and possible value added products such as fine grain limestone aggregate and powders (e.g. Ground Calcium Carbonate-GCC and Precipitated Calcium Carbonate-PCC) for several industrial minerals industries.

The combined production of development (industrial) minerals in the period 2001-2006 showed a decline over the early part of the century, reducing from 10.4Mt of materials to 9.05Mt; after Rainford & Richards, 2008[24]). Crushed limestone, sand & gravel and marl production increased however, while marble and silica sand production ceased in the subsequent years (*see red graphic projections, right*). Small volumes of pozzolan continue to be produced by Jamaica Gypsum & Quarries which it supplies to its parent company, Carib Cement, for use in the manufacture of its cement[25].

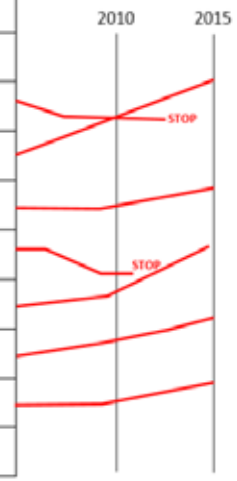
[24] Rainford, Oral B. and Richards, Rohan A. (2008). Sustainable Development and the Industrial Minerals Sector: Integrating the principles of Sustainable Development with Jamaica's Industrial Minerals Sector. Business, Finance & Economics in Emerging Economies V. 3 No. 1 2008

[25] Caribbean Cement Limited - Annual Report 2016.

Table 8 Production of Industrial Minerals 2001-2006 (000 t)

Production of Industrial minerals 2001-2006 ('000 Tonnes)

INDUSTRIAL MINERALS	PRODUCTION DATA, '000 Tonnes					
	2001	2002	2003	2004	2005	2006
Silica Sand	8.2	9.4	12.8	11.2	14.3	9.6
Crushed Limestone	2442	2430.0	2483.0	2500.0	2610.0	2801.0
Gypsum	320	165.0	249.0	283.0	302.10	364.4
Marble	0.15	0.16	0.16	0.12	0.12	0.1
Sand and Gravel	2205	2249	2316	2362	2392	2760
Marl & Fill	4322	5693	6376	5900	5310	3001
Pozzolan	0.0	0.0	0.0	0.0	79.0	149.3
TOTAL	10,397.35	10,546.56	11,436.96	11,056.32	10,707.52	9,085.4



Source: Rainford & Richards, 2008

The *Quarry Survey 2011* conducted by the Ministry of Science, Technology, Energy and Mining (MSTEM) recorded the production of industrial minerals (Development Minerals) by product type and by parish.

Limestone (42%), Marl & Fill (13%) and Sand & Gravel (34.5%) dominated production, with lesser quantities of Pozzolan (<3%), Shale (5%) and Gypsum (1.75%) in 2011 (see Table 9).

Table 9 Production of Industrial Minerals, Jamaica, 2011 (t)

Parish	Limestone	Marl & Fill	Gravel	Sand	Pozzolan	Shale	Gypsum	Total	%
Clarendon	326,228	157,892	451,405					935,525	20%
Hanover	30,160	4,698	0					34,858	1%
Manchester	113,113	50,966	4,002					168,081	4%
Portland	200	42,735	43,762					86,697	2%
St. Andrew	839,849	36,041	2,942		130,412	226,920	79,521	1,315,685	29%
St. Ann	273,458	15,468						288,926	6%
St. Catherine	34,312	71,962	9,980					116,254	3%
St. Elizabeth	223,268	56,999	25,605	13,965				319,837	7%
St. James	43,514	36,923						80,437	2%
St. Mary	225	5,195	279,827					285,247	6%
St. Thomas	4,314	2,406	762,189					768,909	17%
Trelawny	61,916	88,995	0					150,911	3%
Westmoreland	3,021	24,416	0					27,437	1%
TOTAL	1,953,578	594,696	1,579,712	13,965	130,412	226,920	79,521	4,578,804	100%
Percent	42.67%	12.99%	34.50%	0.30%	2.85%	4.96%	1.74%	100%	

Source: MSTEM Survey of Local Quarry Operations (2011)

The subsequent 2013 Quarry Survey conducted by the MSTEM reported a total of 376 licensed quarries, of which only 147 reported mineral production – see Table 10 below.

Table 10 Number of Quarry Operators by Parish; Production 2013

Parish	Number of Licensed Quarry	Percentage of Total Licensed Quarry	Number of Licensed Quarry Reported Production	Percentage Reported Production (%)
Clarendon	51	14%	16	31%
Hanover	12	3%	5	42%
Manchester	21	6%	11	52%
Portland	17	5%	7	41%
St. Andrew	28	7%	14	50%
St. Ann	23	6%	10	43%
St. Catherine	50	13%	21	42%
St. Elizabeth	30	8%	15	50%
St. James	17	5%	8	47%
St. Mary	27	7%	9	33%
St. Thomas	42	11%	16	38%
Trelawny	23	6%	6	26%
Westmoreland	35	9%	9	26%
Total	**376**	**100%**	**147**	**39%**

Source: MSTEM Survey of Local Quarry Operations (2013)

The *Industrial Minerals Survey of Jamaica* (2016) published by the MTM (Mining, Minerals Policy & Planning Division) based on 2015 data, provides up-to-date production data for the industry.

Production rates were recorded by parish, where limestone (30%), marl & fill (45%), sand & gravel (19%), silica sand (0.2%), pozzolan (1.4%), shale (3.2%) and gypsum (0.57%) are the principal minerals produced (see Table 11 below).

Table 11 Production of Industrial Minerals (tonnes), Jamaica, 2015

Parish	Limestone	Marl & Fill	Sand & Gravel	Silica Sand	Pozzolan	Shale	Gypsum	Total	%
Clarendon	426,567	100,705	391,006					918,278	12.21%
Hanover	0	14,745	0					14,745	0.20%
Manchester	70,046	10,456	0					80,502	1.07%
Portland	15,600	23,100	37,194					75,894	1.01%
St. Andrew	69,900	9,141	0					79,041	1.05%
St. Ann	229,815	17,250	0					247,065	3.29%
St. Catherine	5,883	3,171,343	18,192					3,195,418	42.49%
St. Elizabeth	370,015	33,525	5,640	15,554				424,734	5.65%
St. James	17,375	55,848	0					73,223	0.97%
St. Mary	616		331,561					332,177	4.42%
St. Thomas	993,707	0	657,003		107,778	240,507	42,883	2,041,878	27.15%
Trelawny	2,587	6,178	1,970					10,735	0.14%
Westmoreland	12,539	13,478	0					26,017	0.35%
TOTAL	2,214,650	3,455,769	1,442,566	15,554	107,778	240,507	42,883	7,519,707	100.00%
Per cent	29.45%	45.96%	19.18%	0.21%	1.43%	3.20%	0.57%	100.00%	

Source: MTM Industrial Minerals Survey of Jamaica (2016)

Comparisons of Table 9 and Table 11 show that in the five-year 2011-2015 span, limestone production has increased from 1.95 Mt in 2011 to 2.22 Mt in 2015, but has decreased to 30% of the total production. Marl & fill increased significantly from almost 0.6Mt in 2011 to 3.46 Mt by 2015, from 13% to 45% of total production. Sand & gravel production decreased from 1.58 Mt in 2011 to 1.44Mt in 2015, from 35% of the total to 19%. Gypsum, shale and pozzolan all decreased production within the period. These data reflect the challenging economic environment post-global financial crisis, while increased construction and hotel development demand in the 2016-17 period appear to be positive for the sector.

The total value of the 2015 production is significant in the Jamaican economy, as shown in **Table 12** below, equating to approximately J$ 7.16 billion (or ~ US$55.23 million).

Table 12 Value of Production of Industrial Minerals (J$) in 2015

Parish	Limestone	Marl & Fill	Sand & Gravel	Silica Sand	Pozzolan	Shale	Gypsum	Total	%
Clarendon	284,378,133	45,317,250	332,355,100					662,050,483	9.09%
Hanover	0	12,208,418	0					12,208,418	0.17%
Manchester	91,322,459	9,345,050	0					100,667,509	1.38%
Portland	21,666,840	5,197,500	36,264,150					63,128,490	0.87%
St. Andrew	45,435,000	5,941,650	0					51,376,650	0.71%
St. Ann	252,796,500	6,037,500	0					258,834,000	3.55%
St. Catherine	5,359,276	2,262,161,246	33,471,825					2,300,992,347	31.60%
St. Elizabeth	513,913,472	24,673,394	7,319,714	2,675,288				548,581,869	7.53%
St. James	30,023,421	29,896,738	0					59,920,158	0.82%
St. Mary	855562.4	0	390,403,131					391,258,693	5.37%
St. Thomas	1,371,256,038	0	967,502,618		155,200,320	210,963,120	78,904,720	2,783,826,816	38.23%
Trelawny	7,556,317	6,297,359	2,556,709					16,410,384	0.23%

Source: MTM Industrial Minerals Survey of Jamaica (2016)

In the seminal paper "*Transforming the Industrial Mineral Sector of Jamaica*", Rainford (p.1, 2008) noted:

> *Traditionally, the Industrial Minerals Sector has been limited to small-scale quarrying activities concerned primarily with excavating raw materials for 'low-end' uses in construction. Far greater attention should now be given to increasing the quantity and range of locally produced value-added products. This is vital since this is the level at which meaningful value is added to the economy through the significantly higher prices that these products command, the numerous and higher level linkages which are forged with other sectors of the economy and the improved quality of the human resources needed to drive this process. Note, however, that for the foreseeable future the overwhelming bulk of the sector's output will likely continue to be used for 'low-end' applications, mainly in concrete and fill for road construction.*

By increasing industrial value adding and creation of quality employment opportunities, the sector has the potential to contribute to Jamaica's stated economic and social targets as set out in Vision 2030, and the realisation of poverty reduction as articulated in the Sustainable Development Goals.

Range, Legality & Type of Businesses in the Sector

The comprehensive *Surveys of Local Quarry Operations* in 2013 *(MSTEM)* and 2015 (MTM 2016) provide interesting data. The 2013 survey reported **376** licensed quarries, with just 147 (39%) recording production during that year. By 2015, the number of licensees had reduced to **317** operations, with just 86 (27%) reporting production.

The parishes of St Catherine (with 45%), St. Thomas, St. Elizabeth, Clarendon and St. Andrew recorded the largest numbers of quarries with the highest production, likely reflecting their proximity to major urban markets.

The type and size of quarry operating in Jamaica varies widely, from small, simple operations to significant production units. The size of operations in 2015 varies according to production capacity with 80% being recorded as micro-operations (less than 50,000 tonnes per annum; (tpa)), 9% as medium (100,000 – 500,000 tpa) and 1% as large size (> 500,000 tpa); (MTM 2016)[26].

In the current study (2017), the number of licenced quarries had increased again to 330 operations, of which 120 (36%) are reportedly producing[27] – see Table 13 *(aggregated data from MGD website).*

Table 13 Number & Legality of Operating Quarries, by Mineral Type, MGD 2017

MINERAL/ MATERIAL BEING EXTRACTED	NUMBER OF 'CURRENT' LICENSED QUARRIES	AS % OF TOTAL CURRENT LICENSED QUARRIES
Andesite	1	1%
Clay	1	1%
Gypsum	2	2%
Limestone	75	63%
Marl	7	6%
Retired Sand & Gravel	3	3%
River Stones	1	1%
Sand	1	1%
Sand & Gravel	28	23%
Shale	1	1%
Total 'current' quarries (n)	120	100%

Challenges Faced by the Sector

In the *Survey of Local Quarry Operations* (2013)[28], the MSTEM authors provided an assessment of the 'major problems' facing the sector **(Table 14).**

These challenges, as reported by the quarry operators, largely focused on:

(i) declining demands for products,

(ii) lack of access to affordable credit,

[26] The details of the sampled quarries in the current study are presented in Section 5.4.3 and Table 20 below.
[27] http://mgd.gov.jm/licensed-quarries.html
[28] By Ministry of Science, Technology, Energy and Mining (Policy, Planning and Development Division)

(iii) lack of suitably trained personnel,

(iv) infrastructure,

(v) criminality, and

(vi) cost of energy.

Table 14 Challenges faced by Development Minerals Sector (MSTEM, 2013)

MAJOR PROBLEMS	NUMBER OF RESPONDENTS	DESCRIPTION
Fuel & energy costs	30	High fuel, electricity, lubricant costs
Inadequate finance to purchase equipment	14	Access to cheap credit to purchase equipment; use of other collateral besides equipment; high interest rates; lack of adequate financing to replace depreciated equipment
Sales & demand for materials	12	Low prices for aggregates; sluggish demand due to slowdown in construction; difficult to find new markets.
Trained human resources	4	Mechanics can only fix older equipment Difficult to find quality workers
Poor infrastructure	4	Poor road conditions; ITC
Extortion and high levels of criminality	4	Presence of extortionists attempting to direct where trucks can purchase aggregate; theft of equipment-
Local supply of spare parts	3	Spare parts must be secured for oveseas
More incentives required for sector	3	Removal of MOF incentives Provideincentive to import equipment
Licensing renewal	3	Takes a long time to renew (>6mth)
Squatting	2	Cane River area – major problem
Lack of adequate port facilities	2	Port handing facilities deficient
Implementation of weighbridge	2	Affecting sales
Exorbitant restoration bond	1	Restoration bond too high
GOJ projects not strict on material specification	1	GOJ projects should insist on material specs.
Limits for trucks	1	Limits to load trucks are too high
Short licensing period	1	Licensing period too short to obtain long term finance
Import duties & taxes	1	Duties are too high; shipping charges
Competition from unregistered operators	1	Illegal operators allowed to quarry without any penalty.

Source: Adapted from: Survey of Local Quarry Operations (MSTEM, 2013)

Discussion of Profile of the Development Minerals Sector

The Development Minerals sector in Jamaica is both regulated (Mines & Geology Division) and facilitated (Geological Survey Division) by the Ministry of Transport and Mining (MTM). There has been excellent research carried out by the Ministry over the past two decades, with significant divisional policy contributions on how best to realise the sector's socio-economic potential (Rainsford 2008; Rainford & Richards, 2008).

There has been **sound technical research** conducted on the geological potential of Development Minerals, particularly in supply side research by international development partners, including the UNDP in 1980s; British Geological Survey in the early 1990s; and the Jamaica-Czech Republic (GET) programme (2005-2008), among others. These research projects provide a very substantial geological understanding of the mineral endowment and economic potential of the country. Unfortunately, many of the older reports are lost and underline the need for improved digital data management systems within the various divisions of MTM. In latter years, the MTM has conducted a biannual series of '***Survey of Local Quarry Operations'*** of industrial minerals (Development Minerals), providing an understanding of the dynamics of production, market demand, operational constraints and the socio-economic contribution of the sector to Jamaica's development.

The inherent structure of the industry is that of micro-small-medium indigenous enterprises (MSME), producing a variety of high quality **construction materials** primarily for the local market, with some larger operators supplying higher value **industrial minerals** (e.g. whiting-grade limestone) to the regional and nearshore USA markets. There was shortlived production of **dimension stones** (DS) in the 1980s, but this did not continue once international investors ceased production. There may be geological limits on the size of DS blocks that can be produced due to natural tectonic process and consequent fracturing. There is a very weakly developed 'cottage' industry of **semi-precious stone** production, focused mainly on agate and alabaster for artisan craft workers, sold within the domestic tourism market.

The global economic downturn following 2009 impacted heavily on the demand for mineral products, most noticeably in Jamaica in the tourism construction industry. This has led to sluggish demand in the period to 2015, but there are signs of growth in construction which will feed demand for construction materials.

It is clear that there is a lack of availability of **product-specific demand side research**, both domestrically and regionally within the CARICOM grouping. This means that much of the current MSME production is opportunistic and unfocussed. Many public procurement contracts do not specify the grade of product required for project requirements, thus lessening the potential of producers to meet higher quality specifications (and consequent higher pricing).

Many of the issues identified in the profile of the sector are perennial problems facing Development Minerals operators across the ACP countries. Key challenges facing the Jamaican sector were identified in the MTM research, among them being the **high cost of fuels and energy** in a capital intensive industry. The **lack of access to affordable credit** for purchase of equipment is identified as a major impediment by industry players. The reasons for this will be explored further in the baseline assessment. Similarly a **shortage of a skilled/ semi-skilled cohort of workers** trained specifically for the industry has been identified in the MTM research, which is also examined further in the baseline assessment. Similarly, **infrastructure deficits in roads, ports and related**

handling facilities are impacting the cost base of already marginal producers and impeding the potential for export of higher value minerals.

The **licensing terms** for Development Minerals offer short term (typically 1-3 years, up to 10 years depending on the commodity), renewable licences. There is a lack of geological understanding of the Develoment Minerals' **reserve base** at site level by operators. **Weak management and quarry planning capacity** leads to unscheduled (opportunistic) production, with poor forecasting of cash flow. This accentuates the inability to raise finance as lenders require a **business plan** linked to planned production to reduce their risk exposure, whereas the licence term is frequently too short to allow long term verifiable production rates.

The quarrying of Development Minerals provides **significant employment in rural areas** across each parish of Jamaica and is also a **net contributor to many social enterprises**, such as schools, churches, agriculture and community development projects.

The policy reponse has been the development of the **Draft National Minerals Policy 2017-2030**[29], allied to the *National Development Plan: Vision 2030* which seeks to develop an integrated, multi-departmental approach to address these issues. Institutional alignment is proposed, together with proposals for a National Minerals Institute to address the skills shortages.

The NMP 2017-2030 sets out a full suite of recommendations to address the development challenges of the Development Minerals sector. It is clear from stakeholder consultations with key actors that a degree of frustration persists due to national inertia, and strategic action is now required to allow the sector to reach its full potential.

Given the positive growth recorded in the Jamaican economy in 2015-2016 and with related demand for construction and industrial minerals, the challenge now is to identify key implementable actions to advance the Development Minerals potential of Jamaica. This baseline assessment sets out to achieve this.

[29] The Draft National Minerals Policy 2017-2030 is currently under ministerial review and is due for publication later in 2017.

Component 2: Review of legal & policy framework for Development Minerals

The legal and policy framework for Development Minerals in Jamaica is reviewed below under Component 2 of the Terms of Reference (see Annex 1). The review was conducted by the SLR Team's mining legislative and policy expert, with decades of experience of working in ACP countries.

Methodology for Legal & Policy Review

This chapter provides a review of the current legal and policy framework for minerals in Jamaica, with particular reference to Development Minerals (effectively the non-metallic minerals sector, see Table 1 above for definitions).

The methodology used was to perform a desk study of the existing mining sector policies and programmes including: the *National Development Plan: Vision 2030*, and its related *Mining Sector Plan* and *Construction Sector Plan*, respectively; the *Draft National Minerals Development Policy 2017-2030*; and the the *Medium Term Socio-Economic Framework*. The legal framework for Development Minerals was reviewed as well as related amendments and regulations. A range of policies and legislation concerning mining health, safety and the environment was reviewed, particularly the role of environmental and planning acts in minerals development.

These desk studies were then used to develop a list of comments/questions to be used as a basis for meetings with the relevant authorities in Kingston. The key issues addressed included:

- The extent to which the legal and policy framework supports the formalization of the mining of Development Minerals.
- Environmental, health and safety, employment, community relations, individual and community rights, gender and conflict related issues.
- The workings of the licensing and tenure process in theory and practice.
- The treatment of different sized operations in law?
- The policies on incentives for the sector.
- Gender related issues.
- The relevance of Sustainable Development Goals (SDGs).

The review identified strengths, gaps and areas for legislative and policy improvements, based on international trends and best practice. Extensive field consultations were undertaken with key legal and regulatory mining, environmental and planning stakeholders in Kingston, Jamaica, to inform the baseline assessment.

The ownership of minerals and the extent to which licensing procedures inhibit or support the Development Minerals sector was assessed, and areas where this could be improved are suggested.

The various minerals policies and legislation were also assessed in terms of adequacy on gender related issues, based on international best practice. Finally, the extent to which legislative and policy framework can support the Sustainable Develoment Goals was assessed.

Legal and Regulatory Framework for Development Minerals

It would be more usual to review the policy before assessing the legal background, as the latter should conform with the former. However, the *National Mineral Policy 2017-2030* had not at the time of writing been adopted by Parliament and since the legal framework has been in place in one form or another since the 1940s, this will be reviewed in the context of current practice. Subsequently the Draft National Mineral Policy as it stands is reviewed and thereafter a possible future legal framework is discussed.

The key Laws regulating the minerals sector are:

- The Minerals (Vesting) Act 1947;
- The Mining Act 1947;
- The Quarries Control Act 1983

In each case amendments have been incorporated into the original Laws.

Other legislation, such as the *Natural Resources Conservation Authority Act 1991* and the *Natural Resources Conservation (Permits and Licences) (Amendments) Regulations 2015*, and planning through the application of the *Town and Country Planning Act 1987* were reviewed. In this context, the practice of zoning areas for development, which may preclude quarrying operations, affect the potential development of the sector. Although this study is focussing on Development Minerals and therefore relatively small-medium scale operations, the key factors that influence investors relating to the perception of the attractiveness of investing in a country should be understood, as these issues may influence the ease of access by operators to finance. These are summarised below and will be used to judge the attractiveness of Jamaica in terms of mineral investment (**Table 15**):

Table 15 Key Factors that influence Investment

Investment Review Factors
• The geological potential of the country or region.
• The stability of the political regime.
• The existence of a reliable and attractive Mining Code.
• The existence of a stable fisical regime.
• The existence of reliable and acceptable environmental legislation.
• Previous mining activity – by whom, and was it successful?
• Marketing & distribution networks.
• Infrastructure – roads, water, power distribution, port, etc.
• Labour – both skilled and unskilled with (preferably, but not essentially) a mining tradition.

Regulations specifically relevant to the sector include:

- The Mining Regulations, and
- The Mining Health and Safety Regulations.

Documents affecting the management of the sector operations also include:

- Guidelines for the Rehabilitation of Lands Disturbed for Limestone Quarrying,
- Guidelines for the Rehabilitation of Lands Mined Out for Bauxite Mining,
- The Environmental Code of Practice, (a self-regulating document drafted by the Mining and Quarrying Association of Jamaica).

The guidelines referred to above are meant to be a "best practices" list, as recommendations which are not binding. However, the aim is to ensure that operators cannot say they did not know what is required of them. They are overseen by a Restoration Committee which resides at the MGD and is chaired by the Commissioner of Mines. The Restoration Committee has representatives from all the bauxite mining companies, the three main tertiary institutions (UWI, UTech, NCU), as well as the MGD, JBI, Min. of Agriculture, and Forestry Dept. and covers both mining and quarrying.

Government policies that have a direct impact on the minerals sector include:

- Draft National Minerals Policy (2017-2030)
- Vision 2030: Construction Sector Plan; 2009 – 2030; Construction Task Force; June 2009
- Vision 2030: Mining and Quarrying Sector Plan 2009 – 2030; Mining and Quarrying Task Force; September 2009
- National Industrial Policy 1996 (although this mentions principally the bauxite/ alumina industry in its sections on mining, rather than Development Minerals).

Ownership of Minerals in Jamaica

All 'minerals' are the property of the Government of Jamaica, while 'quarry materials' are the property of the land owner. The policy concerning mineral ownership is that all minerals are the common heritage of the people of Jamaica. The ownership is therefore vested in the Government. In order to legally remove minerals from the land, one needs to obtain a Mining Lease from the Minister. The Mining Lease is a possessive right which transfers the ownership of the specified minerals from the Government to the mining lessee on the basis of the payment of a royalty. It also authorises the lessee to recover the mineral or minerals from the specified area of land.

In the case of quarry materials (Development Minerals), the operator requires a Quarry Licence which is a permissive right, authorising the land owner to excavate those materials from the specified area of his/her land. If the operator is not the owner of the land then s/he is not the owner of the quarry material and s/he first needs to obtain a land lease from the owner before s/he can be granted a Quarry Licence.

Minerals (Vesting) Act 1947

This Law declares that "all minerals being in, on, or under any land or water, whether territorial waters, river or inland sea, are vested in and subject to the control of the Crown". As a result, the winning of minerals is subject to the law and regulations governing mines and mining, or in other words under licence to the Government.

The Act states that royalties are payable to the Government and if the mine is on private land, a proportion (five percent (5%)) is payable to the land owner. However, the period of royalty payments to land owners appears to be limited and no royalties are payable in respect of precious metals or precious stones.

In respect of the consideration of Development Minerals, it is noted that the Act states that the definition of "minerals" excludes commodities such as gypsum and phosphates and "*materials such as clay, sandstone or other stone commonly used for the purpose of road making or for building or for the manufacture of any article used in the construction of buildings where such material does not contain any valuable mineral or precious stone in economically workable quantities*". However, an amendment dated 1994 states that the definition of minerals includes: "*other minerals, including those used for their abrasive or refractory qualities and asbestos, barytes, bauxite, china clay, fuller's earth, graphite, high purity limestone, other than that used in the construction industry, laterite, marble, mica, nitrate, pipeclay, pottery clay, potash, quartz crystals, salt, slate, soda, sulphur, talc and other substances of a similar nature to any of them*".

It is not immediately clear from this where, for example, dimension stone for cladding or flooring lies. However, the Quarries Control Act, through a 1994 amendment, specifically excludes Dimension Stones and so it would be assumed that these come under the Mining Legislation.

During discussions in Kingston with the MTM and the MGD, it was accepted that there is a lack of clarity in these definitions and that the final decision on a specific quarry/ mine might be made on the final product. However, a "quarry" might produce a mix of products.

From a stakeholder perspective, the importance of clarifying the definition of minerals is primarily to understand whether the development of a mine or quarry for such materials falls under the auspices of the Crown or the land owner, given that these are treated differently in law. Stakeholders must be aware of the legal status of the materials they wish to exploit, so that the licencing and royalty arrangements may be clear. An investor will need to know whether s/he is investing in a mine or a quarry.

The Mining Act 1947

The Mining Act regulates the sector related to mineral mining. Minerals are as defined in the Minerals (Vesting) Act. In general, an investor will seek the following assurances when considering a project in a country and the Mining Act and associated legislation/regulation will be reviewed against these issues:

- Secure Title to Mining Rights
- Satisfactory Fiscal Regime
- Stability of Fiscal Regime
- Foreign Exchange Retention (if an external investor)
- Right to Assign

- Right to Market Mine Product(s)
- Stability in Environmental Management
- International Arbitration (if an external investor)
- Freedom of Commercial Operation

The current Mining Act does provide security of tenure. It comes with an assurance that priority will be given to the first qualified applicant, where the application is received in order and in proper form for a specific licence[30] (based on the international principle of 'first come first served'). The '*Framework of Action for the Development of Mineral Resources in ACP Countries*' proposed under *Strategic Focus 1.9* that the introduction of innovative licensing schemes, particularly auctioning systems, can realise better value for minerals terrains and promote greater competition for mineral acreage. Such a protocol could be considered in future assessments of licence applications.

For transparency, the register of Mining titles (and also Quarry titles) should be readily available to the public and be updated at regular intervals. For this purpose, a formal Mining Cadastre would be an advantage[31]. The current practice is to register the licences and licensees. However, there is no formal centralised system to update the data in the register, so that many details are out of date, leading to inaccuracies and related inefficiencies in time management.

The right to assign also appears to be assured and the right to market products is also covered in the Act. This is appropriate in an international context.

The Commissioner of Mines has the direct responsibility under the Mining Act to exercise general supervision over all prospecting and mining operations in Jamaica. This includes inspections of all mines and refineries to ensure compliance with all aspects of the Legislation (which includes housekeeping, safety and health, mine engineering, restoration etc).

Environmental controls, including the submission of a restoration bond, apply to all scales of operation, small and large. Under Section 12 of the Quarries Control Act, every licensee is required to maintain on deposit, with the Commissioner, a restoration bond for rehabilitation of the land on which a quarry is located. This is essentially a performance bond held against any engineering or environmental breaches by the licensee. It is considered that it would be approporiate, based on clear definitions of mineral types as suggested above, to have different levels of controls for different types/scales of operation.

Quarries are inspected (on an established schedule) by the MGD Inspectorate under the current legislation for safety, environmental practice and rehabilitation, and mine engineering practices, to ensure that all Special Conditions of quarry licences are complied with. All quarry licences issued in the past five years include a provision for progressive restoration to be carried out by licensees. Quarry licences also carry conditions that operations may be suspended for breaches of the licence, particularly in cases of safety violations, where licences must correct the breaches within specified timeframes. In cases of recurring breaches of licence conditions or non-compliance, the licence is not renewed.

[30] Section 81 of the current Mining Act.

[31] See for example "Mining Rights Cadastre" a World Bank Publication authored by Enrique Ortega Girones, Alexandra Pugachevsky and Gotthard Walser; Extractive Industries for Development Series #4, June 2009

The site visits revealed that at all operations visited, a bank guarantee was the method used to apply the restoration bond. The visits also established that there is weak enforcement of environmental regulations (relating to dust, noise, acoustics, etc) in the Development Minerals sector[32]. Environmental management planning is a requirement of the Quarry Licence. However, none of 54 quarries visited (micro, small or large) demonstrated any evidence of advance planning or of having an Environmental Management Plan. Similarly, not one quarry visited had a Mine Closure Plan in place.

The Health and Safety regulations applicable to the metallic Mining Sector (bauxite and other metallic minerals) are the Mining (Safety and Health) Regulations 1977. They do not apply to Development Minerals. The version obtained by the Consultant includes amendments up to 1979. In this baseline assessment, only the internationally owned (three) of 54 quarries visited, demonstrated any evidence of having a Health & Safety Management system.

The development of new Quarry Regulations to strengthen health and safety management and performance under the ACP-EU Development Minerals Programme would be advantageous, with associated capacity building measures for both regulators and quarry operators/ managers.

The Safety and Health regulations are quite prescriptive especially as regards inspection of equipment before each shift and drilling and blasting. However, if the recommended drafting[33] of a new Mining Act is carried out, the exercise should include a revision of these regulations, which if appropriate could be adjusted to the actual practical cases of differing sizes of operation and risk. The Inspectorate should participate in an assessment of the realistic expectations of such a revision.

Some of the minerals to be developed, including Dimension Stones, will require to demonstrate conformity with standards and continuity of quality supply in order to be marketable. The comprehension of these issues will be encouraged by an improved understanding of the markets, which will be helped by the Commodity Reports recommended below.

The Quarries Control Act 1983, amended in 2015

For the extraction of Development Minerals, the operator requires a Quarry Licence, which is a permissive right, authorising the land owner or lessee to excavate those materials from the specific area of land.

The Quarries Control Act regulates the exploitation of materials which are not classed as Minerals. The Act has been amended in 2015 and the Quarries Control (Amendment) Act 2015:

- Provides realistic penalties that are a deterrent to the practice of illicit quarrying
- Requires quarry operators to issue receipts and dispatch vouchers for quarry material
- or quarry mineral removed from quarries

[32] There is however, effective environmental regulation of the bauxite sector with penalties for breach of the terms of the licence.

[33] Key recommendation of this baseline assessment (June 2017).

- Requires persons transporting or purchasing quarry material or quarry mineral to show proof of source of purchase upon request
- Requires persons employed in the management of certain quarries to be certified by the Commissioner of Mines after satisfactorily competing a prescribed course of study
- Increases generally the penalties for breaches of the Act to more realistic levels

In considering the duration and the regulation of quarries, quarrying activities may generally be considered as:

- Permanent Quarries which have a life of many years, and
- Temporary Quarries – used for example on a road building contract, but closed afterwards.

A key issue arising during consultations on site with operators, as well as lenders, appears to be the duration of the quarry licence, which is not specified in the legislation (see also register of concern by operators in Table 14).

In actuality, the period granted for Quarry Licences varies depended on a number of factors. These include the type and availability of the resource material, the business plan and quarry plan. Thus:

- River operations are given a maximum of one (1) year (renewal).
- Marl operations are given a maximum of three (3) years (depending on the nature of the operation, these are usually based on projects such as road rehabilitation/ construction).
- Larger limestone operations that are better capitalized (plant, equipment) are granted up to a maximum of ten (10) years (renewable).

In practice, the field visits identified four key groups of quarries in Jamaica:

1. *Non-operational, small* **:** generally owned by individuals or owners with other activities
    1a. *Loc al-community Cooperatives* **-** micro, low capacity
2. *Small-sporadic-opportunistic- «pop up»* **:** with very low production capacity; temporary activity
3. *Medium-size full time:* with production and/or processing capacity
4. *Large full time***:** with relatively large production and/or processing capacity

Groups 2-4 are considered in the following analysis.

Permanent quarries may typically have a life of many years and may require significant capital expenditure on excavation equipment, crushers and sizing plant. Current feedback from Jamaican operators indicates that due to the short duration of the quarrying title (one to three year periods were mentioned repeatedly) and the lack of understanding by lending banks of the quarrying industry, obtaining finance for long term quarry activities is difficult. Temporary quarries are often

developed by contractors which have inadequate equipment and require less short-term capital expenditure.

Feedback from the Commissioner of Mines indicates that in practice the period granted for quarry licences varies and is based on a number of factors, including the availability of the resource/material and the business plan/quarry plan. For example – all river operations are given a maximum of one (1) year (renewal). Marl operations are given a maximum of three (3) years (depending on the nature of the operation, these are usually based on projects such as road rehabilitation/construction). The larger limestone operations that are better capitalized (plant, equipment) are granted up to a maximum of ten (10) years (renewable). However, this is not clear in the current legislation.

Certainly a contribution to resolving the perceived problem would be to allow licence durations more applicable to the likely duration of the quarrying activity and to clarify this in the legislation. This would then require that the quarry company be capable of (i) preparing and presenting a business plan comprising a solid definition of the resources/reserves of material available, (ii) an understanding of the market, (iii) a consequent quarry production plan over the life of quarry and (iv) a financial model that demonstrates the viability of the operation. This would inevitably necessitate training of the operators or of consultant geologists and engineers who could carry out Feasibility Studies to a bankable standard.

The new *National Minerals Policy* has identified the need for new institutions, including a ***National Minerals Institute (NMI)*** which would support an improved educational/vocational training of sector professionals.

A further important issue with the original Quarries Control Act was that quarry licences were not transferable. This was repealed in the 2015 Amendment to the Act. This amendment now provides the quarry licence holder with the possibility of transferring some ownership to an investor, or indeed assigning it to an entity which may be more capable of developing the business.

The 2015 Amendment provides for quarries exceeding "the prescribed size" to be managed by a person holding a quarry management certificate. However, to date the "prescribed size" has not been defined and there are appears to be no written list of qualifications

Questioned on the qualifications required to approve a Quarry Manager (required for large quarries), the MGD said they are looking for a programme, not an institution. The Quarry Manager would be expected to show competences in:

- Health & Safety
- Environmental management
- Business skills
- Maintenance
- And other relevant skills.

However, the analysis has shown that there is currently no formal institution in Jamaica that offers certified training in Quarry Management (see Chapter 5.5.2) below for further discussion of training availability).

Current Legislative Framework & Reforms; Alignment of Legislation & Regulations

The current legal framework is not fit for purpose and should be revised as a comprehensive Code to incorporate both quarrying and mining and to clarify which commodities are subject to the control of the Crown and which are not.

A modern law should better address the environmental and community relations aspects of quarrying `and it should also provide guidelines to prevent or minimise conflict situations. Health and safety regulations exist and any revision of the legal framework should take account of these and ensure they are appropriate, realistic and as necessary, might be calibrated to different types of mining and quarrying. A proposed structure for a new mining law is provided in Appendix 5 as a guide. This structure is based upon over 20 years' experience of drafting and using mineral laws. It would also be useful for the drafting team to review the AMLA (African Mining Legislation Atlas) Guiding Template[34]. The latter provides a generalised indication of subjects for inclusion in a legal framework be it in primary legislation (law, code or act) or secondary legislation (rules, regulations). The AMLA template provides useful approaches to all aspects of legal and regulatory control of Development Minerals, including environment, health & safety, labour and community, including procurement of local goods and services, labour rights and community engagement processes, based on current international practice. Interestingly, it does not make specific reference to gender issues or human rights.

The team responsible for drafting a new law in Jamaica should review the proposed structure and make recommendations after consultations with relevant stakeholders.

Mining Cadastre

In Jamaica, there is not a modern mining cadastral system for mining and quarry titles registration and management. The current practice is to register the licences and licensees without a formal centralised system. A mining cadastre is the principal public institution that manages mining titles in a country. Such a cadastre, when well developed and backed by capable public mining sector institutions, integrates the regulatory, institutional, and technological aspects of mineral rights administration and forms the cornerstone of good mineral resource management in a country.

It is recommended that Jamaica improves its management of the mineral sector by implementing a modern Mining Cadastre. The objectives of a project to set up such a Cadastre would be to set up the responsibilities, organization and procedures of the structure of the Mining Cadastre as a 'one-stop-shop' as appropriate and to implement a database of the mining titles. A key activity would be to define the mode of collaboration between the Mining Cadastre and other structures of the mineral sector, including a GIS system at the MGD and zoning prerogatives. Access to these databases and the mining cadastral data should be well defined and codified in order to define levels of confidentiality.

In summary, a Mining Cadastre:

- Formally captures applications for various types of mineral licenses (that is, prospecting, exploration, mine development);

[34] www.a-mla.org/guidingtemplate - developed in partnership with the World Bank, African Union Commission, the African Legal Support Facility, UNDP and the ACP-EU Development Minerals Programme.

- Registers changes and updates to mineral titles any time a title is granted or an owner changed;
- Checks license applications for possible overlaps with earlier claims or other impediments;
- Advises the granting authority on whether a license application is technically admissible or not;
- Ensures compliance with payment of fees and other requirements to keep a mining title valid;
- Advises the granting authority when mining titles should be cancelled.

Jamaica requires the development of such a Cadastre to improve accuracy and administrative efficiencies, while increasing transparency and confidence in the registration system.

Policy Context for Development Minerals

Policy Focus

Multilateral institutional instruments to support and develop the mining sector in emerging economies in past decades focused on large scale, high impact mining operations. The small to medium local quarrying sector ('Development Minerals') was rarely supported, as it was perceived not to have the economic potential of larger operations. Some support tools for the SME private minerals sector in Jamaica were launched including various targeted programmes by EU-ACP *Centre for Development of Enterprise* (CDE) in the 2000s and the UNDP in the 1980s, with varying degrees of local success.

The meeting of ACP Ministers responsible for the minerals resource industry, held in Brussels in 2010, led to the adoption of recommendations for the long-term development of the ACP mineral sector, and directly to the *Brussels Declaration* on the sustainable development and management of the mineral resources industry of the ACP states. This initiative ultimately led to the adoption of the *ACP-EU Roadmap for Capacity Building of the Development Minerals Industry in Jamaica (2016).* Thus the current project presents a new opportunity for focused supports to the MSME mining and quarrying sector in Jamaica.

The extraction, processing and marketing/ sales of Development Minerals along the value chain should underpin a broad approach to rural and socio-economic development in Jamaica. It is clear that a well-functioning and responsible quarrying industry can contribute to sustainable jobs, labour and gender equality, while adding value in the rural hinterlands of Jamaica's towns and cities.

Several UNDP country specific documents underpin the current assignment, and were reviewed and reported in the Inception period, namely:

- UN Multi-Country Sustainable Development Framework (UNMSDF)
- UNDP Country Programme Document 2017-2021
- Roadmap for Capacity Building of the Development Minerals Industry in Jamaica, 2016

- Review of Portfolio of Projects – UNDP Jamaica Country Office. Climate & Disaster Resilience, Sustainable Development, Democratic Governance. Final Report - Gender Strategy Consultancy 2015-2016 (Vassell, L. 2016)

Each of these documents makes the link from sustainable management of resources to building governance and regulatory capacity, to underpin human rights and gender equality, as well as resilience to climate change and necessary adaptations. They are linked to the *Vision 2030 Jamaica: National Development Plan,* all of which are aligned with the SDGs, with full bipartisan support of the UNDP.

National Policy & Vision; Alignment of Development Minerals Sector with Economic and Social Objectives

The *Vision 2030 Jamaica National Development Plan*, published in 2009 is a key document which sets the medium to long term objectives for the development of the economy of Jamaica. The minerals sector is recognised as being one of the pillars of the development objectives. A list of key strategies and actions for the early years (2009 – 2012) of the Plan provides clear goals to improve the sector and some of the key objectives have been met. Of particular interest in this context are the actions to "c*omplete and promulgate the National Minerals Policy, including provisions for development of non-metallic minerals sub-sector"* and to *"Establish National Minerals Institute"*. Other actions include the establishment of a restoration committee for quarrying operations, the strengthening of the institutional capacity of regulatory agencies and the establishment of community-based monitoring committees, especially in sensitive areas, in order to deepen collaborative mechanisms with mining and quarrying stakeholders.

As part of the integration of the development of mineral resources with overall land use planning and zoning, the preparation of updated geological maps of the entire island including location of mineral resources was proposed.

It has been noted that a restoration committee exists for the bauxite industry, so the model may be adapted to the quarrying and Development Minerals sectors.

The proposed establishment of community-based monitoring committees may be a positive objective. However, such committees require skills which may not be readily available. The drafting of a new Mining Law, recommended in this present report, could incorporate a section on public participation and social engagement which could set the framework for monitoring the activities of the operators.

Vision 2030: Mining and Quarrying Task Force

Sector Task Forces were set up to provide input to the Vision 2030 framework. One of these was the Mining and Quarrying Task Force, which drafted a *Sector Plan for Mining and Quarrying*, one of the thirty-one sector plans that form the foundation for Vision 2030 Jamaica and a strategic priority area.

The long-term strategic vision for the Mining and Quarrying Sector in Jamaica, as described in the Sector Plan, is built on a number of fundamental elements for the Mining & Quarrying Sector that:

i. Uses the mineral resources of Jamaica sustainably to contribute to the long-term economic and social development of the nation;

ii. Is driven by private sector investment within a policy and regulatory framework that fosters competition and transparency;

iii. Is developed in harmony with other uses of land resources;

iv. Is environmentally sustainable with minimal harmful environmental impacts;

v. Increases the value of the nation's mineral resources by developing higher value production;

vi. Ensures the health and safety of communities and workers.

Three main goals and associated outcomes were defined in the Mining and Quarrying Sector Plan (see **Source: Sector Plan for Mining & Quarrying – Vision 2030, Jamaica** below):

Table 16 Goals and Outcomes of the Mining and Quarrying Sector Plan

GOALS	OUTCOMES	Achieved by 2017
An economically viable and globally competitive sector based on value added products	An enabling policy and regulatory environment	Partly
	Long-term development of minerals sector integrated into the overall land use planning and management objectives of the country	NO
	Increased value of bauxite extraction and processing	Partly
	A developed and economically feasible non-metallic mineral sub-sector	NO
	Provision of competitive infrastructure and technology	NO
	Adequate supply of human resources with internationally competitive levels of labour productivity	NO
	Increased exploitation of other mineral resources	Partly
	Strengthened hazard mitigation mechanisms in the sector	NO
A socially responsible sector	Sustainable mining communities	Partly
	Harmonious relationships between communities and mining and quarrying entities	Partly/ improved efforts
	Adoption of a holistic approach to the wellness of sector employees	NO
Minimum negative environmental consequences from mining and quarrying	Effective control of negative environmental occurrences	NO
	Adequately rehabilitated mined-out mineral bearing lands	Partly, not in quarrying

Source: Sector Plan for Mining & Quarrying – Vision 2030, Jamaica

With the exception of the issue related to the increased value of bauxite extraction and processing, each of the goals and outcomes identified is relevant to this study. The Mining and Quarry Sector Plan includes an extensive list of strategies and actions, with responsible agencies and stakeholders assigned to each action. No prioritisation of the actions has been stated and the site visits have demonstrated that few of the Goals have been addressed effectively to date (*see assessment in 'Achieved by 2017' column above*).

National Minerals Policy 2017-2030

The *National Minerals Policy 2017-2030*[35] is understood to be awaiting approval by the legislature. The document is the result of an in-depth review of the sector, augmenting the goals articulated in the *National Development Plan: Vision 2030*, and is a valuable policy document for planning the future of the sector.

The SWOT Analysis provided of current policy and legislation governing the mining sector is of particular interest and specific points in the categories of STRENGTHS and WEAKNESSES related to the ongoing development of Development Minerals are further analysed in the context of this project hereunder. However, the order of the points in the Policy report has been adjusted to enable comments to be provided in context, with comments provided (*references to metallic minerals have been omitted for clarity*) – **see Table 17** below.

Table 17 SWOT Analysis of Jamaica's Development Mineral Sector (National Minerals Policy 2017-2030)

STRENGTHS	COMMENTS
• Significant quantities and excellent grade of mineral resources, namely bauxite, limestone and hard volcanic rocks. • Substantial reserves of high-quality non-metallic minerals, particularly limestone (approximately 150 billion tonnes) and hard volcanic materials • The mineralogical and metallurgical properties of Jamaica's minerals, including limestone (where the exceptional purity, brightness, and amorphous, non-crystalline characteristics are highly regarded). • High quality lime, cement, alumina and several other value-added mineral products being produced.	• A comprehensive geological map required to include Development Minerals occurrences and the capacity if calculating resources/ reserves. • Opportunity to promote the use of limestone: consistency of supply is essential.
• Mineral deposits of limestone and hard volcanic rocks lie on, or close to the surface making them easier and less expensive to mine. • Proximity of some mineral deposits to port facilities. • Several successful quarry operators, as well as local and foreign investors with strong interest in expanding operations and targeting niche markets overseas. • Favourable geographical location, proximity and timely logistical access to the markets of the Caribbean, USA and South America. • Public institutions with qualified personnel, years of research and regulatory experience. • Access to mineral resources via road network, and rail, in some instances. • Highly skilled and trainable workforce. • Availability of information/data. The country is mapped, and there are drill and other technical data on various mineral deposits and mineral resources.	• Quarrying techniques are appropriate for small to medium enterprises. • Export opportunities if port facilities have the capacity. However, see "Weaknesses": Non-existent marine transport for the minerals sector and rail is exclusively used for the bauxite and alumina industry. • But capacity building for regulation and M&E is required. • But see downside in "Weaknesses": used for bauxite industry • But see "Weaknesses": paucity of skills.

[35] Ministry of Transport and Mining: *The National Minerals Policy 2017 – 2030; Fostering Sustainability in Jamaica's Minerals Sector: 2017*

WEAKNESSES	COMMENTS
• Dependence of industrial minerals industry on expensive imported energy. • An overwhelming and expensive reliance on road transport for cross-country movement of bulk industrial minerals and industrial mineral products. • Non-existent marine transport for the minerals sector and rail is exclusively used for the bauxite and alumina industry. • Insufficient focus on the rehabilitation of mined-out non-metallic minerals-bearing lands. • Absence of dedicated training and research institutions for the minerals sector. • Limited spatial planning. • Limited use of new and innovative technologies for improving the output of value-added mineral products. • High levels of environmental impact. • Lack of and in most cases non-use of renewable energy technologies • Limited energy efficient and energy conservation practices • Low levels of reinvestment of proceeds into the sector, and strategic investment in host communities and the wider economy. • Poor coordination among stakeholders. • Absence of developed closure plans. • Illegal activities in the minerals sector.	• Less of a handicap than for the bauxite industry, but energy is often a major cost item. • Infrastructure improvements in areas of quarrying /mining of Development Minerals should be encouraged. • See comment under “Strengths”. • Important to regulate restoration and require “after-mine” planning. • Important issue for this study. • Planning issues to be addressed. • Capacity building and evaluation of appropriate technologies.

The Non-Metallic Minerals Sub-sector:
• 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.
• Limited exposure of mining-related human resources: a paucity of mining engineering, mineral processing, minerals marketing and related skills.
• Low levels of exports, low ratio of exports to total annual production and the need for improved coordination of marketing strategies.
• 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 penetration of 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 duties and taxes.
• Limited access to bulk-handling ports and loading facilities to accommodate exportation together with the high capital intensity that is associated with making the needed improvements.
• High costs associated with using existing ports for the export of quarry materials.
• High cost of inputs, including electricity, fuel and lubricants, plant and equipment.
• Informal and planned residential settlements in declared Quarry Zones: an outflow of poor national planning resulting in sterilization and conflict with other land users.
• Low value of restoration bonds.
• Many limestone quarries are located outside approved Quarry Zones, thus increasing the possibility for conflict with other land-users.
	• All of these items were reviewed during the visits to the sites and are dealt with in this report. The list is comprehensive and comprises important issues such as:
	  • Requirements of Capacity Building at all levels of quarry and small mines operators and local communities.
	  • Need to understand better the markets for commodities available in Jamaica.
	  • Planning shortcomings.
	  • Lack of finance due both to lack of skills to prepare bankable business plans and (for quarries) short tenures of the leases.
	  • Infrastructure shortcomings.
	  • High energy costs.

Taken as a whole, the SWOT analysis (**Table 17),** as it impacts the Development Minerals sector, indicates a strong need for ***integrated planning procedures*** so that there is clarity on which lands are available and zoned for quarrying or mining operations. In addition, the importance of planning for, and implementing, ***restoration of the lands used for exploitation*** has also been stressed. This aspect is particularly important in a relatively small island, which may well in the future see development stress as housing of the population may become an increasing priority. In fact, the visits to quarries around the country as part of the baseline assessment has shown that such problems are already emerging in some peri-urban areas.

Appendix I of the Policy provides a lengthy and detailed list of Actions building upon those presented in the Sector Plan for Mining and Quarrying. However, the lack of prioritisation of the actions and the nomination of numerous agencies to implement them (rather than a well-defined responsibility) would lead to a lack of focus.

One key recommendation in the Policy is the formation of a ***National Minerals Institute*** (NMI), a body which could be charged with the management of the National Minerals Policy and initially with prioritising the Actions required to meet the goals of the Policy, following some of the recommendations of this current report. In order for this to be effective, the NMI should comprise respected senior executives who are able to call upon inputs from experts in all the issues relating to the sector and be capable of presenting their findings to the Administration.

Since there are already numerous entities with some responsibility for the minerals sector, the NMI should integrate some of the functions of these other entities and indeed the National Mineral Policy intends that: *"It will subsume the functions of the Jamaica Bauxite Institute (JBI) and the Geological Survey and research functions of the current Mines and Geology Division (MGD)".*

A possible structure of the Government entities in the control and support of the sector is provided in Section 1.1 below.

Potential and Efficacy of Current (Future) Legal & Policy Framework to match Societal Expectations and Obligations.

The National Minerals Policy makes no specific reference to gender issues. This is in line with international mineral policy norms, as gender policy is generally dealt with through social policy and related measures to address gender imbalances or inequities where they may exist.

Strong and effective environmental regulation is a key issue for citizens and non-governmental organisations spoken to during the research (although communities immediately adjacent to quarries in rural areas appear to value the employment/ enterprise more than the environment).

All quarries surveyed are providing developmental assistance to their local communities (see **Table 31;**), but this is not a policy or legal requirement. As well as *Environmental Impact Assessment*, there is an increasing trend internationally towards national (e.g. Greenland, Canada) and regional (e.g. Queensland, Australia) Governments seeking *Social Impact Assessments* for large scale extractives operations. Such an SIA mechanism could be considered for larger Development Minerals operations in Jamaica.

Jamaica should consider membership of the *Extractive Industries Transparency Initiative*[36], which provides increased internationally accredited assurance to Civil Society (and to investors) that payments by mineral developers to the Government are correctly recorded. This in turn provides the possibility of the citizenry to ask the Government to account for the expenditure of such receipts.

Assess Potential for Interventions, Incentivisation of the Sector

It is understood that the bauxite industry has previously received incentives, such as GCT tax allowances on fuel, capital goods and equipment and tax holidays[37]. These incentives were mentioned in meetings with Development Minerals stakeholders during the analysis in contrast with the lack of such incentives to the domestic quarrying industry. However, the former incentives are being phased out and, under WTO 2015 rules, will no longer be available to any sector.

Given that financial incentives will not be available and consistent with international experience, it is considered that the best incentive to the sector is the provision of supportive policy, definitive spatial zoning, clarity of tenure and transparent and effective regulation, all of which should be included in the recommended new Mining Act.

However, 'soft' incentives could also be considered, such as:

i. Business planning support to facilitate improved access to credit,

ii. Quarry planning and management for optimal and selective production,

iii. Targeted capacity building for environmental planning, management and restoration,

iv. Health & Safety Management for quarries, and related topics,

v. Targeted gender/ youth supports for training and apprenticeships in quarrying.

These measures, allied to wider Capacity Building should incentivise the sector more effectively than unsustainable (and soon to be non-allowable) financial incentives.

Development Minerals' Policy and Gender Issues

The *Draft National Minerals Development Policy 2017-2030* does not make specific reference to gender in mining issues. This is largely in line with international mineral policies across the ACP and in Europe, where gender equality issues are largely dealt with through social and labour policies.

The Vassell (2016) review of the UNDP Jamaica's portfolio of projects, undertaken in 2015-2016, assessed the extent of gender mainstreaming and the gender seal[38] in issues pertaining to community resilience to disaster and climate change, as well as in governance and natural

[36] https://eiti.org/

[37] The Bauxite and Alumina Industries (Encouragement) Act, 1950, with amendments up to 1999.

[38] UNDP Gender Marker: Tracking Gender-Related Investments and Expenditures in Atlas. *Guidance Note for UNDP Staff*. United Nations Development Programme, Bureau of Policy and Programme Support, Gender Team, 2016.

resources management[39]. It reviewed the ACP-EU Development Minerals Programme under the 'Sustainable Development Project' Framework. The Development Minerals Programme, at the country level, was rated with a gender equality seal marker 'Gen 1', based on the Programme's capacity to contribute at the project scale to gender equality, e.g. some of its activities are expected to promote gender equality in improved systems and transparent procedures in the public service; or may be promoted by select training to share information with women organizations[40]. Further the Vassell (2016) study did not interview the staff of the programme responsible for gender matters, which may have contributed to a limited understanding of the programme's potential impact.

The Vassell review noted that the "*<<Development Minerals>> project (in Jamaica) will seek to enhance the participation of women, identification of areas of greatest potential for women's employment and providing opportunities in accessing training and tools created by the project*"**.**

Vassell was particularly concerned with the 'dire' social and environmental impacts of mining on women. Based on the SLR Team's national and international experience, women are not as severely impacted by the quarrying of Development Minerals in Jamaica as by mining of metallic minerals, because the physico-chemical and thus environmental impacts of quarrying are naturally more benign. Based on both stakeholder consultations and field observations, women are largely not working (physically/ manually) in Development Minerals at the extractive level, rather they are working in regulation, management, accounting, administration, sales and marketing within the sector. Women and children in surrounding communities may be susceptible to the environmental impacts of quarrying, particularly from dust and noise of heavy transport trucks. To overcome such issues and to increase women's participation in decision making, a community forum for environmental management, should be established. Within the representative Forum, to include quarry operators and women and men from the surrounding communities, issues of consultation, dialogue and planning to minimise impacts could be discussed and agreed. This woud enhance the participation of women on issues directly affecting them and their families and would also contribute to building the Gender Seal rating.

The role of women as managers and business entrepreneurs is important, particularly in terms of leadership and proactive empowerment for the future development of the sector. A small but strong cohort of women in Jamaica is currently empowered to work in quarry management, largely through inherited resources from their parents, although in some instances the women have founded their own quarry business. Such women may be agents of change and could be targeted directly as part of the ACP-EU project for empowerment and organisational strengthening. As well as women in business roles in the Development Minerals sector, there may be additional roles for leadership in environmental governance and through women in mining/ SME associations such as the Mining and Quarrying Association of Jamaica (MQAJ). These issues are explored further.

[39] Vassell, Linnette (2016). *Review of Portfolio of Projects UNDP Jamaica Country Office. Climate and Disaster Resilience Sustainable Development Democratic Governance - Final Report* - Gender Strategy Consultancy 2015-2016.

[40] *UNDP Staff*. United Nations Development Programme, Bureau of Policy and Programme Support, Gender Team.

Responses to Component 2 Questions in TOR

The following comments (**Table 18**) may be made in response to specific questions pertaining to *Component 2 Legal and Policy Framework* in the Terms of Reference:

Table 18 Summary Responses to Component 2 Questions

To what extent do the legal and policy framework support the formalization of the mining of Development Minerals?	The National Minerals Policy document does provide a number of useful recommendations to support the Development Minerals sector and recognises the current shortcomings. However, it has not yet been adopted and needs to have a well-defined prioritisation of the required actions and named responsibilities to follow through the recommendations once it is adopted. **The legal framework should be revised and a modern Mineral Law drafted to provide an improved overall framework for the sector.**
How does the legal and policy framework address environmental, health and safety, employment, community relations, individual and community rights, gender and conflict related issues?	The legal framework is not fit for purpose today and should be revised to address better the environmental and social/ community relations aspects. It should also provide guidelines to prevent or minimise conflict situations. The establishment of community forums for Development Minerals could provide improved means of communications for address and redress of grievances. Health and safety regulations exist and any revision of the legal framework should take account of these and ensure they are appropriate, realistic and as necessary, might be calibrated to different types of mining and quarrying. A proposed structure for a new mining law is provided in Appendix 5 as a guide. The team responsible for drafting the law should review this and make recommendations after consultations with all stakeholders.
How does the licensing and tenure process work in theory and practice?	The licencing process for mines and quarries is set out in the current legislation and the procedures are clear. However, there does not appear to be a centralised digital database of licensees with their contact details, nor is there a centralised database proving oversight of the status of reporting and payment of fees etc. **It is recommended that a modern Geo-data / GIS system is introduced forthwith, within the context of a modern mining cadastre – *see also Section · below for details proposals.***
How are different sized operations treated by the law?	The laws distinguish between mines and quarries. However, there is incomplete definition of how it would apply to large or small operations and this aspect should be addressed in drafting a modern comprehensive Mining Law.
What is the policy on incentives for the sector?	The provision of incentives to the sector appears to be constrained by CARICOM and WTO 2015 agreements. As a result, it is perceived that the large bauxite operations qualify for more support than smaller operations or quarries, although tax incentives for large operations are now being withdrawn under WTO rules. Incentives related to energy costs are seen to be required in order to assist small operators to become competitive. Again this may best be addressed within broader energy policy, with efforts to reduce reliance on oil imports by switching to gas, and greater emphasis placed on renewable energy sources. **Supportive training in key areas of business planning (to access credit) and all aspects of quarry management should be considered to stimulate the sector.**

Does the policy and regulatory framework adequately address gender related issues?	Gender issues are not addressed within the National Minerals Policy, as is the international norm. It is considered that gender is best dealt with in social and labour policy, with related measures to address gender issues and inequalities as they arise, supported by employment and equality legislation, rather than in specific mining laws and regulations.
How can the policy and regulatory framework accommodate the mainstreaming of relevant Sustainable Development Goals (SDGs)?	Appendix VI of the National Minerals Policy states the set of sustainable development principles adopted by the International Council on Mining and Metals (ICMM)3 and which are to be applied to the industry in Jamaica. Referring to the UN SDGs, the policy and regulatory framework must be updated to encourage the development of Small Scale Enterprises (SMEs) in the quarrying and Development Minerals sectors in order to stimulate the economies across the island. This stimulation should lead to a decrease in poverty and thus lead to improved diet and better health. The recommendations in this report for the improvement of capacity building across the skills needed to develop the sector will also strengthen the educational establishment and the availability of jobs for the working age population should decrease the pressure on youth to seek work instead of education. **The analysis has not identified significant gender equality issues, except that teenage girls are more likely to embrace education than teenage boys and thus largely access higher skilled office-based jobs, while boys work in unskilled/ semi-skilled jobs in the Development Minerals sector.** The National Minerals Policy and this present report have identified environmental and social impact management as a priority and thus it should follow that the risk of pollution to water sources and rivers should be reduced. Most of the current electrical energy in Jamaica derives from imported diesel fuel. Encouragement of renewable energy resources for mining and quarrying would move the country towards cleaner energy and at the same time contribute to climate action. The investment required in infrastructure is reviewed in Chapter 6.5.6 (economic linkages) below and in addition to incentivising the development of resources that would benefit other sections of the economy. This report has taken some of the recommendations of the National Minerals Policy and made suggestions towards strengthening the relevant institutions and promoting transparency. **Following this review, it is believed that appropriate implementation of the actions in the National Minerals Policy and the recommendations in this report would go a long way to integrating the objectives of the UN SDGs into the regulatory framework of Jamaica.**

Photo 3 Pavement Limestone provides extensive resources of high quality calcareous Development Minerals

Source: SLR Consulting 2017

Component 3: Assessment of institutional & technical operating context

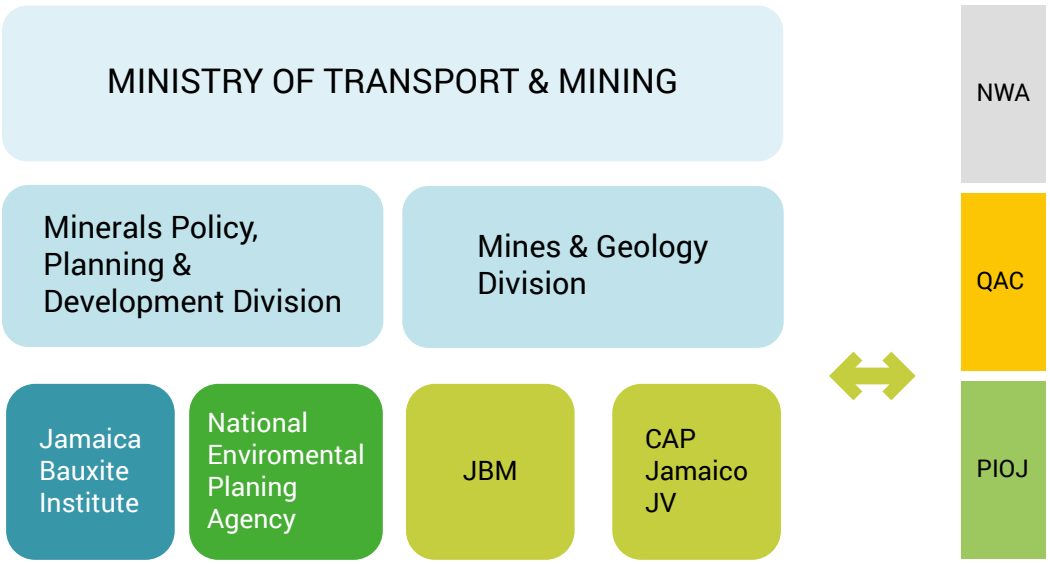
C3 (A) Baseline Assessment of Institutional Context

The baseline assessment of the institutional context was undertaken through extensive desk research followed by in-depth consultations with key stakeholders across the Jamaican Development Minerals institutional network.

Review of Institutional Roles

The ***Ministry of Transport & Mining*** (MTM) is the central institution in Jamaica for policy, management, promotion and regulation of the mining and Development Minerals sector. The regulatory role is currently performed by the ***Mines & Geology Division*** (MGD), an agency of the MTM, where the *Geology Division* of the MGD is responsible for mapping and geological data management (Figure 11).

Figure 11 Current Institutional Structure governing Minerals Development



Policy and promotion of the sector is carried out at the MTM through the staff of the Principal Director, Mining and Minerals.

Other governmental agencies are involved in key aspects of national minerals development and regulation, including the ***Jamaica Bauxite Institute*** (JBI), and in joint ventures for exploitation/ processing, including ***Jamaica Bauxite Mining Limited*** (JBM) and ***Clarendon Alumina Production Limited*** (CAP), which latter manages the joint venture, Jamalco, on behalf of the government.

Other institutions responsible for aspects of the sector are:

- ***National Environmental Planning Agency*** (NEPA) has responsibility for environmental regulation in relation to mining;
- ***National Works Agency*** (NWA) governs transport of minerals from quarries on public roads;
- ***Water Resources Authority*** (WRA) governing water usage in mining;
- ***National Land Agency*** (NLA) governing land use;
- ***Natural Resources Conservation Authority*** (NRCA) that grants environmental permits for development activities;
- ***Planning Institute of Jamaica*** (PIOJ) is responsible for aspects of national economic planning and policy that influence mining.
- The public-private representative body, the ***Quarry Advisory Committee*** (QAC) advises the Minister on quarry licencing and grants of QLs for this core activity.
- ***Parish Councils*** are involved in local planning decisions within parish administrations.

It is arguable that there are too many agencies involved in the administration and regulation of minerals licensing, exploitation and rehabilitation. It has been recommended in the new National Minerals Policy (*pp.40-41*) to subsume MGD and JBI into a single ***National Minerals Institute*** to manage the research and development of all of the country's minerals wealth, excepting oil, gas and water. Any moves to improve administrative efficacy, promotion and regulatory standards while reducing the level of institutional bureaucracy for minerals development would be advantageous, based on international best practice.

Once the National Minerals Policy is adopted, and in accordance with the proposed structure of MinDAC proposed above a detailed institutional study should be carried out to determine the optimum structure for the development of policy, promotion and regulation of the Mining sector, while ensuring that the functions of a Geological Survey, as a geo-mapping agent and an efficient national repository of geological and minerals data, are also optimised. From experience, the functions of promotion and services (e.g. the Geological Survey) and those of regulation should be separated, so as to prevent conflicts of interest. Investors and operators tend to be uncomfortable if they are dealing with an agency that is at once promoter, assisting with investment opportunities, and regulator. In the following paragraphs, the current structure of an inspectorate within the MGD is accepted.

Quarry Licence Administration Process

Applications for Quarry Licences are submitted to MGD with associated fees and prescribed documents:

- Completed Application Form
- Articles & Memorandum of Association of the applicant company (where applies)
- Map of 1: 12,500 scale showing licence application area
- Proof of land ownership or land agreement, signed by affidavit (Justice of the Peace)

- Quarry Plan
- Resource Evaluation Report, completed by a mining professional, of quality, quantity, and attributes of the mineral to be exploited
- Fee of J$10,000

Site Inspection requests may be sent to the *Mining, Quarrying and Safety Inspectorate* (MQSI) by an applicant for a Quarry Licence, who then may consult the following in relation to that site and who may make joint inspections:

- NEPA
- Parish Council
- National Works Agency
- Ministry of Health (Environmental Control Division)
- Ministry of Agriculture (Rural Physical Planning Division), and in particular cases, to the
- National Water Resources Authority (WRA).

Each of these agencies may make a report to the MQSI, which collates all reports to a single Inspection Report. The latter is submitted to the *Quarries Advisory Committee* (QAC), an advisory body whose members are appointed by the Minister, which includes a member of each public environmental, water and land management agency, respectively, as well as private sector representatives. NEPA is a critical member and each Parish has a Development Order which must be taken into account in the decision making process. The QAC meets monthly and recommends/ rejects approval of the licence application, or may seek additional information prior to issuing a recommendation to the Minister. Licences may be issued for a period of one to 10 years, based on the assessment of the QAC.

The licence will only be issued once a Restoration Bond (set at J$678,000 / hectare) has been put in place by the applicant. This may take the form of cash, Bank Guarantee or a Manager's Cheque issued in the name of the Commissioner of Mines. The Bond should be accompanied by a Tax Registration Number and a Tax Clearance Certificate.

Upon granting of a licence, all Quarry Operators are obliged to make quarterly production and sales returns under legislative requirements. Failure to do so attracts a fine of J$15,000. Quarry operations are taxed at 3.5% of sales, which was payable until 2017 to the Commissioner of Mines.

Restoration

All areas quarried are required to be restored '*after quarrying is completed*', under Section 12 of the Quarries Control Act. Theoretically, the original Quarry Plan with its related Closure Plan, submitted with application, should demonstrate how this will be achieved to meet the planned end use. Quarry areas are required to be reshaped and 'greened' to prevent scarring, particularly in limestone quarries.

However, one operator commented that "no quarry ever closed in Jamaica" reflecting the lack of strong regulation in relation to quarry closure and allowance for re-opening of the operation at any time.

Roles of Regulatory Bodies

The roles of the regulatory bodies are complex, with the following bodies involved in aspects of licence granting, regulation and monitoring of Development Minerals operations.

- MGD (Mining, Quarrying and Safety Inspectorate - MQSI)
- NEPA
- Parish Council
- National Works Agency
- National Lands Agency
- Ministry of Health (Environmental Control Division)
- Ministry of Agriculture (Rural Physical Planning Division)
- National Water Resources Authority (WRA)

The role of these agencies in the licence assessment and granting process has been reviewed above (Section 5.1). The role of the MQSI is clear in that it provides the *operational regulation* and conducts regular visits to quarries. Of the 54 operations reviewed in the course of this assessment, interviewees reported that they had regular (up to twice yearly) visits from the inspectorate. Many reported that the inspectors provide welcome advice and guidance on their operations, thus acting in a 'facilitatory' as well as regulatory role.

Environmental Regulation is provided by the NEPA, the chief regulatory arm of Government through the Ministry of Lands, which is responsible for air, land, water and pollution control. NEPA sets out clearly the environmental obligations of any prospector or mining applicant with regards to exploration and extraction of mineral resources[41].

The draft new Environmental Regulations with regards to mining/ quarrying have two main categories:

(i) Metallic and non-Metallic minerals - terrestrial/ riverine, marine impacts

(ii) Exploration and Extraction

In terms of Development Minerals, only those operations of >3ha requires an environmental permit. NEPA screens to see if further Environmental Impact Assessment (EIA) is required at the time of application. Under the new Quarry Act, however, fines of up to J$0.5 million may be applied if the regulations are breached and if not redressed, the licence may be revoked.

[41] http://nepa.gov.jm/Development-Invest-Man/Volume%201%20-%20Planning%20and%20Development/Section%204%20-%20Mining%20&%20Quarrying.pdf

NEPA officers focus strongly on environmental / conservation/ ecological and biodiversity issues and are a permanent representative on the Quarry Advisory Committee. In terms of minerals, NEPA also monitors and regulates aspects of quarries and mines, and is increasingly concerned about the visual, habitats and biodiversity impacts. Issues of groundwater, runoff and erosion, sedimentation and the impacts on offshore marine habitats also feature highly in their concerns regarding extractive industries. The structural integrity of lands close to mining is of concern, particularly in karstified areas, as well as the need for stronger closure and restoration measures.

Operators reported cordial relations with NEPA, who appear to take a pragmatic approach on the ground to environmental issues. Based on the assessment of the technical operating context, however, it is apparent that most quarry operators do not have any formal environmental management plans or processes in place, and issues of visual impacts, dust and noise, reported as key issues among community respondents, are not reprimanded or penalised.

NEPA is responsible for urban and rural local development plans, as well as forward planning and management. It was noted that development plans are now in place for 13 of 14 parishes. This should help to balance both environmental and mineral supply concerns, provided that they are linked to national strategic plans.

Land Use & Spatial Planning: The National Lands Agency[42] is responsible for the core land information functions of Land Titles; Surveys & Mapping; Land Valuation and Estate (Crown Land) Management. It provides a modern national land (spatial) information system to support sustainable development and decision making.

The Planning Division of NEPA is responsible for spatial planning, informed by the NLA's land information systems. The effective spatial management of lands is critical to achieve a balance among competing needs for housing, agriculture, forestry, biodiversity, tourism and minerals development.

Spatial planning and the potential for conflict in minerals development was a recurring issue in discussions with the regulatory bodies. Areas designated as protected zones for environmental or conservation reasons are perceived by NEPA to be threatened by extraction, while the mining (bauxite) sector would argue that their mining licences were issued prior to the environmental designations. This is a potential and almost inevitable source of conflict unless the strategic spatial planning function is strengthened.

Consultations with various stakeholders identified an ongoing ***tension in relation to spatial zoning for minerals*** due to increasing competition for lands. It was commented by many that political interference overrides appropriate zoning in many cases, leading to areas of high minerals potential being sterilized by e.g. housing, forestry or environmental designations.

Water Quality is regulated by the WRA[43] in Jamaica. Groundwater is the primary source of water

[42] http://www.nla.gov.jm/
[43] www.wra.gov.jm

for the country, representing about 70% of supply. The aquifers tend to be in limestone where much of the (bauxite) mining and (Development Minerals) quarrying occurs. Some of the rivers are sustained by groundwater, except in the east; therefore, any pollution of the water resource or interference of the flow monitoring network is of prime concern.

Any influence on groundwater by mining thus requires stringent monitoring and regulation, although historically the WRA has focused on bauxite mining. Abstraction licences are granted and require twice a year quality testing from the utilities. If drilling is required, it must have an advance licence from the WRA and the drilling activity is monitored.

As climate changes become more marked for coastal areas of Jamaica, the WRA will have the mandate for flood monitoring and modelling. This will potentially impact on spatial planning as many areas along the coast may be impacted by rising sea levels, which will certainly impact on existing port facilities, as well as coastal quarries. Currently, the WRA do not have groundwater modelling capacity in-house.

Occupational Health & Safety: The Occupational Safety and Health (OSH) Department in the Ministry of Labour and Social Security (MLSS) is the responsible body to monitor and enforce the OSH requirements of the Factories Act, the main OSH Act in Jamaica, and its accompanying Regulations (Factories Regulations 1961; Building Operations and Works of Engineering Construction 1968; Ship and Docks Regulations 1968). The Mining Act 1947 provides specific OSH protections for workers engaged in mining and quarrying activities. The Inspectorate section of the MGD are responsible for the field regulation, monitoring and OSH compliance in the Development Minerals sector under the mining regulations, while JBI is responsible for this role in relation to the bauxite industry.

At the time of writing, the MLSS is in the process of introducing new legislation entitled the Occupational Safety and Health Act 2017 which is intended to be more far reaching in its jurisdiction than the present Act. The evidence of weak field regulation of OSH in the Quarry sector is considered further below.

Social Impact Assessment/ Community Engagement: there is no formal requirement under the current Development Minerals licensing regime to undertake social impact assessment or proactive community engagement. Nonetheless, all operators encountered during the baseline assessment were cognisant of the need for positive community relations and unilaterally engage with their community neighbours.

(Proposed) Role of Institutions in Technical / Vocational Capacity Supports

The Draft National Minerals Policy 2017-2030 identified various institutions which could (*in the future*) provide support or advice to the sector. Rather than "re-invent the wheel", some of the possible ways in which such institutions could provide support are explored herein. Where there appears to be overlap in the mandates of the institutions, recommendations are provided on the attributions of the activities.

It must be noted that the following institutions have not yet been enacted, but their recommended structures have been reviewed as a central part of Jamaica's draft National Minerals Policy.

The Minerals Development Advisory Council (MinDAC)

MinDAC is the key institution proposed in the National Minerals Policy, according to which:

> *MinDAC will work closely with the Ministry responsible for the minerals portfolio and will assist in providing guidance to the Minister and institutions on matters relating to the development of the minerals sector. Its purview will include policy integration, mineral promotion, marketing, mineral exploitation, exportation, product development, the management of mineral resources and mineral-bearing lands, and strategic sector development*

It is understood that MinDAC came into being as a private/public agency – but has not been carried forward. The composition of this institution has not been defined in the Policy. However, the concept of a private/public agency is reasonable, as long as it has a small and strong executive cell that can be effective in progressing its mandate.

Considering the other entities proposed in the Policy, it may be that the National Minerals Institute (NMI) would fulfil that role as the executive arm of the MinDAC, the latter therefore acting in the role of an Oversight or Advisory Board.

The mandate of the NMI is summarised below:

> *The National Minerals Institute (NMI) will lead research and pilot the management and development of all the country's minerals wealth, excluding oil and gas, and water. It will subsume the functions of the Jamaica Bauxite Institute (JBI) and the Geological Survey and research functions of the current Mines and Geology Division (MGD), which will be incorporated into the new institute, bringing with it important experience and knowledge from the Bauxite and Alumina Sub-sector, the Industrial Minerals Sub-sector and the Metallic Minerals Sub-sector.*
>
> *The NMI will facilitate the minerals sector's transformation into a multi-minerals and predominantly value-added entity integrated into the wider economy. This includes the development of an integrated industrial minerals, metallic minerals, bauxite and alumina and rare earth metals sector.*
>
> *The NMI will become the central entity responsible for managing Jamaica's mineral resources and developing its minerals sector. It will have no regulatory functions. All such functions will be remitted to the MGD.*

The following paragraphs consider specifically the mandates set out as in the purview of the MinDAC.

The establishment of the NMI in itself will not provide a panacea for the development of the country's minerals. The NMI must be equipped with the requisite resources (human, financial, equipment etc.) to ensure that its goals and objectives are realized. Prior to its establishment, an integrated institutional review of the existing institutions (MGD, JBI and Jampro) should be carried out to examine their functions and identify any strengths or challenges that influenced their ability to deliver some of the outcomes that the NMI will be expected to successfully deliver. Such a review should be carried out within the Government's overall transformation strategy for the public sector.

Policy Integration

In this context, one of the key issues is to ensure that mineral policies, environmental and social/ gender policies are well integrated and in tune with the overall objectives of the Government of Jamaica to diversify the economy. It will be particularly important to confirm the policy to encourage the exploitation of Development Minerals in line with the stated objectives by the Economic Growth Council[44] of a Gross Domestic Product (GDP) growth rate of 5% over the next four years. The key question is whether the Jamaican Development Minerals industry is positioned and ready for this challenge.

Mineral Promotion

Dedicated promotion of the mineral sector appears to be required both within and without Jamaica, in that the importance of the Development Minerals sector should be underlined in the country and investment from both sources should be encouraged.

A **strategy for mineral promotion** in Jamaica should be developed as a priority. This is not intended to conflict with the work of JAMPRO, which covers all business sectors, rather it would provide a dedicated focal unit for minerals promotion and attendance at dedicated Development Minerals fairs, trade shows and conferences. The unit could continue to liaise with JAMPRO for particular market insights.

Some of the principles to be adopted could be as described below:

I. *Key Principles*

- A lead mineral investment promoter should be nominated. This should preferably be within the NMI and a Minerals Investment Promotion Unit should be established within it with specific responsibilities for the promotional effort and the extent of assistance from the MGD, the Ministry of Transport and Mining JAMPRO and the Jamaica Business Development Corporation defined.
- The Unit should assist in identifying and targeting partners for national promoters/projects and service providers.
- Increase the use of Embassies and High Commissions to identify potential investors around the world.

[44] mfaft.gov.jm/wp/wp-content/uploads/2017/01/EGC-Initiatives.pdf

II. Mineral Sector Promotion

The promotion of the mineral sector should be considered at various levels:

- Confidence in the investment environment of the country
    - Demonstrate the stability and security of investment in Jamaica
    - Clarification of the specific mineral industry investment environment
- Provision of the geological and geophysical data available from the Geological Survey
    - Geological coverage and its extent
    - Airborne geophysical coverage and availability of raw data
    - Library of previous reports.
- Understanding of the requirements of the potential investors
    - Prepare a prospectivity study to define likely mineralised structures,
    - Only emphasise mineral prospects which have a high likelihood of being of interest to investors
- Information on specific projects in association with private sector operators (as applicable)
    - Specific project opportunity presentations for distribution to potential technical and/or financial partners.

III. Promotional Actions

- Prepare a business plan for the Minerals Investment Promotion Unit and identify resources and initial priorities.
- Prepare updated promotional materials:
    - Investment brochure on mining, which should include information on the aspects outlined in II above
    - Use website to reflect the same information, with continuous updates.
- Disseminate Minerals Affairs Annual reports which summarise mining activities in the country, including exploration and production data and any developments in the Minerals Investment legislation.
- Support and interact with representative industry associations, such as the MQAJ.
- Prioritise, plan and implement actions, such as:
    - Drafting and submission of articles for publication in trade periodicals (such as Mining Journal) by the MTM, MGD and/or private sector operators
    - Meet with existing local operators to identify specific needs for technical/financial partners and review target companies/markets.
    - Circulate targeted information to Embassies and High Commissions world-wide with requests to provide feedback on potential investors

- Attendance at some international conferences only if a clear plan of promotion with specific objectives can be put forward
- Targeted missions, either in association with JAMPRO activities or following target identification, to encourage meetings between Batswana suppliers and foreign partners.

Marketing

With rare exceptions, there is a lack of understanding of the markets for Development Minerals in Jamaica. Meetings with some of the key institutions in Kingston provided some background, seen from the Administration and funding entities:

- Meetings at the MTM indicated that there is a lack of operational understanding of where the markets are. MTM hoped that this study would result in a definition of markets, including a better understanding of mineral reserves (which implies an understanding of costs and market prices).
- JAMPRO itself is trying to understand the international markets and they are intending to carry out a value chain analysis.
- The Development Bank of Jamaica BDJ) also emphasised that business planning needs to improve and this also implies an improved understanding of markets. The DBJ can offer some financial support to prepare business plans.
- The EXIM Bank's mandate is broader than just exports and imports – they can fund along the value chain. In relation to developing markets, the coffee industry was put forward as an example where large players buy from small producers and thus become de facto regulators of quality.
- The Mining and Quarrying Association of Jamaica (MQAJ) is concerned about the transparency of markets inside the country, as 70% of quarrying sector contracts are stated to be public sector contracts. The MQAJ concurs that smaller quarry operators are not good at preparing business plans and thus accessing funds.

Less than 5% of the quarries visited demonstrated any market knowledge either of domestic or regional markets: most produce raw materials and sell them ex-works at the quarry gate. One major exception is for limestone and its derivatives (Conrad Douglas, 2013)[45]. The Minerals Investment Promotion Unit, or equivalent, should take this report and use it to prioritise its promotional activities in this sector. However, other minerals also need to be understood.

The prospectivity study recommended in (*II) Mineral Sector Promotion* above should be used to identify potentially economic commodities. Individual **Commodity Reports** for these minerals should be prepared by the Minerals Investment Promotion Unit. A suggested *Table of Contents* for such reports is presented in Appendix 6.

[45] Market Assessment and Design and Implementation of a Marketing Initiative for Limestone and its Derivatives; Conrad Douglas & Associates Limited, November 27, 2013 for JAMPRO/ CDE..

These marketing reports should be presented and discussed in seminars with the private sector and in events such as the annual National Minerals Week (being held in November 2017) and at Trade and Investment conferences.

Mineral Exploitation

The inclusion of Mineral Exploitation in the purview of the MinDAC presumably does not relate to the institution actually participating in exploitation, but it should have a mandate to ensure that exploitation methods are as far as possible "State of Practice". As such it should keep updated on developments in the small scale or quarrying sectors, so that it may guide the Development Minerals operators. MinDAC should thus participate in the preparation of curriculum for apprenticeships and capacity building of young technicians and mining professionals, to ensure that exploitation methods are well covered.

Minerals Exportation

The mandate to encourage exportation should be implemented by MinDAC holding files on the potential targets for exporting commodities (enhanced by the Commodity Reports described above), tariffs on commodities exported to CARICOM countries and others, infrastructure aspects (facilities and bottlenecks). Infrastructure requirements for export are discussed in full below. The proposed promotional strategy will also assist in identifying export targets.

Product Development

The purview of Product Development should represent relations with the private sector, using data from the proposed *prospectivity study*, commodity reports and targets from the understanding of export markets. Where potential markets for new products and potential Jamaican producers are identified, support and incentives available to the producers should be sourced, for example through the Development Bank of Jamaica (DBJ). The DBJ considers that the mining industry does not have a strong lobby group and needs to strengthen its organisation. This is one aspect that MinDAC could encourage, possibly by asking the DBJ to provide a "voucher" to bring a lobby group up to scratch. It is understood that that the DBJ can provide funding for up to 70% of the cost of preparing a Business Plan up to J$300,000. The Jamaica Business Development Corporation (JBDC) can provide hands-on training in development of robust Business Plans to support more effective Development Minerals business planning.

Management of Mineral Resources and Mineral-Bearing Lands

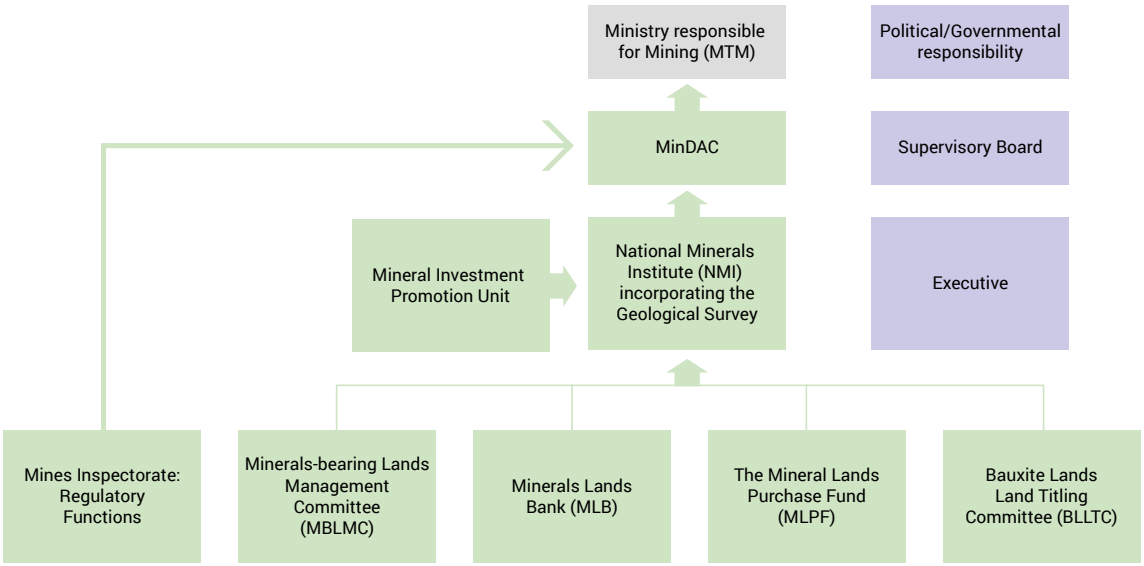
The management of Jamaica's mineral resources is within the mandate of the proposed NMI. The NMI would use the prospectivity and commodity reports to register the in-country resources and this should be linked to the proposed Mining Cadastre database. The NMI should clarify both to explorers and developers in Jamaica and to potential investors the international definitions of "resources" and "reserves" so that the country register is consistent with such understandings. Since "reserves" must be economically viable, it is likely that most of the register will consist of "resources", so it will also be important to sub-classify these robustly and ensure that the work performed and the interpretations of such work are made readily available to potential investors, unless these are confidential.

The ***National Minerals Policy*** document defines the following entities regarding the management of mineral-bearing lands:

- *Minerals-bearing Lands Management Committee* (MBLMC), which would oversee the efficient management of mineral-bearing lands. It would subsume the responsibilities of the Bauxite Lands Management Committee (BLMC).
- *Mineral Lands Bank (MLB)* to hold mineral-bearing lands and to facilitate the exchanging of said lands for non-mineral bearing lands or mined out mineral bearing lands by entities that would otherwise effect sterilizing developments on mineral-bearing lands.
- The *Mineral Lands Purchase Fund (MLPF*) would allow for the purchasing of mineral bearing lands from persons who wish to effect developments on said lands that would sterilize the minerals on and within said lands.
- *Bauxite Lands Land Titling Committee (BLLTC*): a multi-sectoral public/private sector committee, which would focus on the bauxite mining companies providing land titles to persons who they have resettled.

If the NMI is to be the executive entity of the Jamaican minerals sector, these entities should report to it initially. The NMI would then be responsible to MinDAC for the overall management of these entities and should ensure that all transactions are transparent. The structure of the various entities proposed (in the National Minerals Policy) might thus look as follows (Figure 12):

Figure 12 Proposed Structure of MinDAC and related Responsibilities



Source: Modified from Draft National Minerals Policy 2017-2030

There may be strong political and institutional resistance to the merging of existing institutions to create this central coordinating body.

Strategic Sectoral Development

Once the Draft National Minerals Policy has been adopted by Parliament, MinDAC should ensure that clear SMART strategies (*sustainable, measurable, achievable, realistic, timeframed*) are developed to meet the many objectives and goals defined in that document. The results and conclusions of this present report should provide project priorities to be used to define those strategies.

Capacity Building

The Draft National Minerals Policy 2017-2030, as well as the UNDP Roadmap 2017, has recognised the need for building capacity in the minerals sector across all the requisite skills. It therefore recommended the establishment of a "Minerals School" or similar resource training programme, to be pursued within a framework of close cooperation with appropriate local and foreign entities.

The NMI, under the direction of MinDAC, should identify the institutions in Jamaica which can provide training in the range of skills required for the mining and quarrying industry. This will be considered further in below.

Some work has been done on this by the MTM and the current thinking is to define modules with a curriculum for the range of skills required in the sector, from e.g. drilling and blasting through to geology, mining, environmental management and company/financial management. The University of Technology has been approached, but unsuccessfully to date. The University of the West Indies could not help. However, the newest university: the Caribbean Maritime University, is interested, as is the Northern Caribbean University at Mandeville.

MinDAC/NMI should consult on the range of skills required by the private sector and as appropriate approach overseas centres of excellence to assemble a comprehensive range of syllabuses. The bauxite mines should be approached to ascertain whether they have facilities that could be used for external training, especially in some of the practical mining skills. It is understood that at least one operator has found that they can recruit well-skilled operatives who had received training in bauxite mines (that had subsequently closed).

Key Findings: Assessment of the Institutional Context

- Given the small size of the country, ***there are arguably too many agencies involved in the administration and regulation of Development Minerals*** activities in Jamaica. An alignment of agencies has been proposed (see Figure 12) in the Draft National Minerals Policy 2017-2030 for advancement by Government.
- ***Improved MGD environmental regulation*** in environmental planning and management, rehabilitation, restoration and quarry closure is required.
- ***Improved regulation of occupational health and geotechnical safety*** in quarry sites by MGD is urgently required.
- ***Integrated national spatial planning and zoning*** for Development Minerals is essential to avoid conflict of interest among different groups of land users.
    - A national dialogue among key regulators (minerals, lands, planning, environment, forestry, water, agriculture) is required to emphasise the importance of minerals

in Jamaica's economy, to ensure that all regulators understand this need. This would ensure that, where possible, strategic industrial minerals (high value limestones, clays, dolomite, marbles etc.) are not sterilized by other economic activities (agriculture, forestry, housing, tourism).

- The potential impacts of rising sea-level on coastal / low-lying Development Minerals quarries and requisite infrastructure have not yet been considered in planning terms.
- The MGD GIS system is not integrated with other national (e.g. NEPA, Water Resources) GIS systems. A modern GIS-based Mining Cadastre would facilitate zoning decisions where mineral development may be prohibited, such as in National Parks or nature reserves, and prevent conflict.

- ***Social impact assessment*** is not carried at any scale for quarry developments. This is increasingly becoming a requirement internationally for mineral resource developments of scale.

Availability & Accessibility of Geo-Data

SLR worked with Mines and Geology Division (MGD) staff to establish its baseline resources and capacities in relation to data generation, availability and accessibility of geo-data, through a series of consultative meetings with groups and individuals.

The MGD combines the roles of national geological survey and regulator to the extractive industry. It has not always been the case that the two roles were combined and there remain some legacy issues regarding how well geological data (geo-data) are shared between the two functions. There are four departments within MGD:

- Economic Geology;
- Evaluation and Revenue;
- Mining, Quarrying and Safety; and
- Research and Mapping
- MGD staff members within each of these departments were consulted to establish the baseline.

Economic Geology Department

The Economic Geology department is responsible for mapping mineral deposits in Jamaica. The department often supplements field mapping with sampling and drilling, to better understand and define the deposits. The information gathered by the Economic Geology section is included in the most recent versions of the MGD's 1:50,000 series of regional geology maps. The section is also working on the production of a series of mineral deposits maps, at 1:50,000 scale.

The section does not consistently combine its site-specific data with the geological data gathered by the Mapping Department. It also appears that the section does not consistently utilise the data produced by the Evaluation and Revenue Section of the Mining section.

The department has one senior geologist, two geologists and one technician nominally dedicated to 'industrial minerals' in the quarry sector (Development Minerals). There are nominally enough staff members to support the almost continuous nature of the mapping activities, but in practice, staff members are often temporarily assigned to other duties. There is no dedicated GIS expert, although the geologists do have specific GIS skills.

Regarding resources for dealing with geo-data, the ICT resources are barely adequate. Each user has a dedicated PC, with a single screen. The general geo-data/ICT challenges within MGD are common to all sections, and are described in Section 5.2.4 below.

Economic Geology Department – Geo-Data Recommendations

It is likely that significant value could be added to the information produced by the section if it also included information derived from other sections within the MGD. Possible outputs could include:

- production data linked to specific geological units;
- mineral deposit quality and size, related to specific geological units;
- accredited quality assured laboratory analyses, quality control (QC) data and physical properties of key geological target formations, and at site-specific level;
- recommendations regarding the highest value products likely to be extracted from specific geological units; and
- while the production of the printed series of maps is important, it would also be useful and timely if data were published online as soon as they are verified, rather than waiting for the printed maps to be produced.

Mining, Quarrying & Safety Department

The MQS Department is essentially the regulator of the extractive industry in Jamaica. It has two sections (i) the Evaluation and Revenue Section (ERS), and (ii) the Inspectorate Section, respectively. The ERS evaluates the taxes and charges due to the state from the individual operations, including fines due to non-compliance. The Inspectorate carries out the site inspections to ensure compliance, particularly with regard to environment, health and safety.

The MQS has a very good grasp of the quarrying industry in Jamaica, with up-to-date information and good working relations with most quarries. The data are not organised in a systematic way, and many of the more recent details (including contact and ownership information) are stored on individual computers and phones, rather than in a central database. The implementation of a modern ***Mining Cadastre*** would help to resolve these issues.

Detailed production data are available for all licensed quarries in Jamaica, but it is clear that these data are not being combined with geological data. Combining the data from the Geology Department and the Mining Department could potentially result in extremely useful information for the Development Minerals sector in Jamaica.

Additionally, many of the data are stored in MS Excel worksheets. Storage of data in MS Access would be more effective and more secure. A proper database would also allow the export in various different formats to suit the needs of the user, as well as automatically generated exports

for specific time periods. The latter would be particularly useful for issuing summary reports on forthcoming deadlines for the rehabilitation of depleting/ exhausted mine and quarry sites.

Mining, Quarrying & Safety Department: Geo-Data Recommendations

There are high quality data produced and summarised by MQS, but they are not combined with the spatial data from the Geology branch. Recommendations include:

- migrate databases from MS Excel to MS Access for cost-effective, secure data storage that is easily exported to GIS formats. All geo-data can be stored within and can be easily exported for different purposes (e.g. technical, statistics, accounting);
- creation of scheduled reports in the MS Access database;
- inclusion of all up-to-date data, including contact data, in the database;
- generation of multiple output types, based on the needs of the various users. The Revenue and Evaluation Section requires summary spreadsheets based on various time periods, and these could be automated in MS Access. Similarly, the production data for all quarries could be summarised in a format suitable for use by GIS users and that could also be automated.
- Occupational H&S data and reporting statistics could similarly be uploaded to GIS and spatial / temporal trends monitored.

Research and Mapping Department

Research and Mapping carries out both field-based geological mapping, and laboratory-based analysis of rocks. The analysis tends to be focussed on geotechnical characteristics. From a mapping standpoint, the section is compiling a new series of geological maps at 1:50,000 scale. The maps are generated using ArcGIS, and print-ready outputs are then created using a graphics software package. The maps are of a high standard, based on very good mapping and an excellent understanding of the island's geology. The GIS linework (creation of geological polygons and lines) is done for each map sheet, rather than on a country-scale. The inevitable outcome of this approach to GIS linework is that the polygons do not match up perfectly and combining them is likely to be a time-consuming exercise that could have been easily avoided.

As with the Economic Geology section, the Research and Mapping section tends not to utilise the data gathered by the other sections within MGD. It would likely be of advantage to the extractive industry in Jamaica were it do so.

Research and Mapping Department – Geo-Data Recommendations

The Research and Mapping section produces high quality data and clearly has a thorough understanding of the geology of Jamaica. Skillsets tend to be quite focussed and individuals tend to remain concentrated on the specific task of the section, rather than the overall mission of the MGD. Management should work to integrate MGD's corporate vision to develop clarity of purpose among staff.

Recommendations for improvement include:

- broad GIS training;
- generation of maps on a country-basis, rather than for specific sheets within a map series;
- inclusion of some economics attributes in the GIS data for the various geological units. Such an addition would make the production of economically-focussed maps a straightforward exercise; and
- publishing of new geological data online, with a particular focus on information generated from combining geological and economic data. One project that could be achieved in a relatively short time frame would be to create a geological map of Jamaica, colour-coded by economic potential or production, rather than geological units and their respective ages.

Overall ICT & GIS Capability

MGD's IT resources are stretched. The IT section is doing an excellent job of keeping the functions operational, but MGD is exposed to risk, in that the IT infrastructure as it currently stands is not robust, and would be seriously compromised in the event of server failure. MGD has an ArcGIS server licence, which is appropriate for such an organisation, but the existing hardware is not capable of running the software. Many of the client computers (individual PCs) are inadequate for running ArcGIS and need to be upgraded to optimise efficiency.

ICT Recommendations

ICT is an integral part of the MGD and provides the backbone for the implementation of all of its projects. In order for ICT to function successfully, there are some minimum requirements:

- an additional server is required for ArcGIS Server. The minimum specification is Intel Xeon, 32GB of RAM, running Microsoft Server 2012 Standard R2, with a minimum hard drive of 8TB;
- Network Attached Storage Device (NAS) for at least eight drives with storage capacity of 20TB or more. The NAS will provide backup and redundancy for GIS data;
- a flat-bed scanner capable of scanning slides. The scanner should have a minimum resolution of 9600 x 6400dpi, and will be used to scan archived material;
- a rack server cabinet to safely and securely house individual servers;
- update client computers to Windows 10 from Windows 7;
- the use of dual monitors for regular GIS users; dual monitors have been shown to considerable increase efficiency for users of software such as GIS and graphics packages;
- a professional offsite backup service for the server, preferably cloud-based, for real-time backup of critical data; and
- upgraded internet access, preferably from 7 Mbps to 14 Mbps, at a minimum;

- data mining software might be necessary, but it recommended that a strict, robust folder structure and a metadata protocol be implemented first.

At least one staff member splits their time between ICT and some GIS functions. Much of the GIS work is taken up with producing simple maps for outside agencies, using MGD's geological data. While the work is straightforward, it is time-consuming and is not an efficient use of the staff member's abilities.

The folder and server structure is not well-organised, and is a major contributing factor in the lack of cross-sectional sharing of data. Personal knowledge of the various folders is required and some folder or file paths include individuals' names and that is not appropriate for a systematic file and folder-naming protocol. Such a protocol has already been recommended to MGD.

GIS Recommendations

GIS ability within the division is widespread, although sporadic and task-focussed. There is a lack of awareness of best practises in the management of spatial data. Recommendations for the overall improvement of GIS capability within MGD are:

- systematic training for GIS users. Training should initially cover broad topics, so that the users become familiar with best practises in GIS. It should be feasible to externally train one person to a high level, and have that person deliver training on site. It would be necessary to ensure that the individual receiving the external training was capable of transferring his/her skills to the rest of the staff;
- development of a protocol regarding the generation and dissemination of GIS data; such a protocol should include:
    - the use of metadata;
    - the correct use of coordinate systems (many of the GIS files in MGD do not have a spatial reference included, making them difficult to use if the user is not already aware of the reference system that was used);
    - the development of an online presence, using ArcGIS Online, or a similar resource. This would allow MGD to disseminate its data in a timely manner, and in such a way that they can be utilised by potential investors in other countries; and
- increased contact with GIS users in other Jamaican Government agencies and such organisations as the Mona Geoinformatics Institute.

Geo-Data Review: Key Findings

- Folder structure and lack of data sharing are major obstacles for a better-functioning division;
- MGD is a at risk of significant data loss in the event of server failure or damage;
- MGD produces high quality data, but they are not combined to produce similarly high quality information;
- existing ICT equipment is inadequate for the efficient functioning of the division,

particularly for the GIS users;

- training is required for all GIS users and some method of continuous training would be ideal;
- there is capacity in Jamaica to use the data provided by MGD to help investment decision making, particularly within external providers of geo-data at the Mona Geoinformatics Institute;
- the high quality data generated by MGD could be quickly disseminated to a wide audience using ArcGIS Online, although training and clear guidelines would be required first.
- All of the above constraints combine to prohibit easy accessibility to data by external users.

Geo-Data Review: SWOT Analysis

The above assessment may be summarised through a SWOT analysis (**Table 19)**:

Table 19 SWOT Analysis of Geo-Data and GIS Capabilities at MGD

Strengths	Weaknesses
• Highly competent staff • Excellent quality data • GIS ability and experience throughout the organisation • Recognition of need to improve some aspects • Enthusiasm for learning and implementing best practices • Genuine desire for enhanced cooperation between sections • Very good personal knowledge of data/ folders/drives	• Lack of structure in data management • Server/network hardware is insufficient • No file/folder naming protocol • Useful data are not shared easily between sections • GIS skills are very task-oriented; no broad skills base • Data stored in inappropriate formats (Excel rather than Access) • Most skilled GIS user has much of his time taken up with basic tasks for outside agencies • Outdated website & data provision • Difficulty in accessing Geo-Data for investors/ users

Opportunities

- Use the integration of data as a means of creating greater cooperation among sections
- Make data freely available online, giving end-users flexibility and freeing up MGD staff
- Combine data to add significant value to existing products and develop new products
- To produce world-class information which helps to drive Jamaica's economy
- Unlock hidden value by properly organising data
- Upskill staff with broader software skills
- Use standard software to greatly enhance data security and improve workflow efficiency

Threats

- Significant data loss due to server failure
- Opportunities to turn data into high quality information are lost – other organisations may take those opportunities and reduce the relevance of MGD
- Incipient data loss due to lack of data management protocols
- Inaccuracies creep in to dataset and are not corrected or recognised
- Lack of a well-defined folder structure means that MGD is reliant on personal knowledge, rather than institutional knowledge
- MGD would struggle to pass a rigorous data quality audit if carried out across government divisions
- Loss of potential investment through poor and inappropriate geo-data availability

Promotional Activity and Initiatives

Promotional activities for the mining sector are primarily undertaken by the ***Mines & Geology Division*** (MGD), in addition to its regulatory role. The *Mines Division* promotes the sector for investment, largely through its website and production of promotional brochures (Figure 13). The *Geological Survey Division* provides geological maps and information to support investment decision making. However, this service requires significant digital upgrading (see Chapter 5.2.5 above). As recommended above the promotional activities may in future become the responsibility of MinDAC/NMI as per the recommendations of the Draft National Minerals Policy. The following comments thus reflect the current situation.

The main promotional tool is the MGD website *www.mgd.gov.jm*, which provides high level information on legislation, geology and mineral potential. Many of the publications are not available digitally and require mail order to purchase classic texts dating from the 1980-1990s. The MGD also produces a limited number of online brochures on specific commodities e.g. marble, limestone and skid resistant aggregates, as downloadable .pdf flyers (http://mgd.gov.jm/projects/brochures.html). These provide summary information on locations and chemical and physical properties for such commodities but are very outdated. There are no detailed handbooks for investors available, with comprehensive technical information.

National Minerals Week is a key promotional event for the sector, which includes geological conferences, talks and promotes responsible minerals development, while showcasing good practice during field trips.

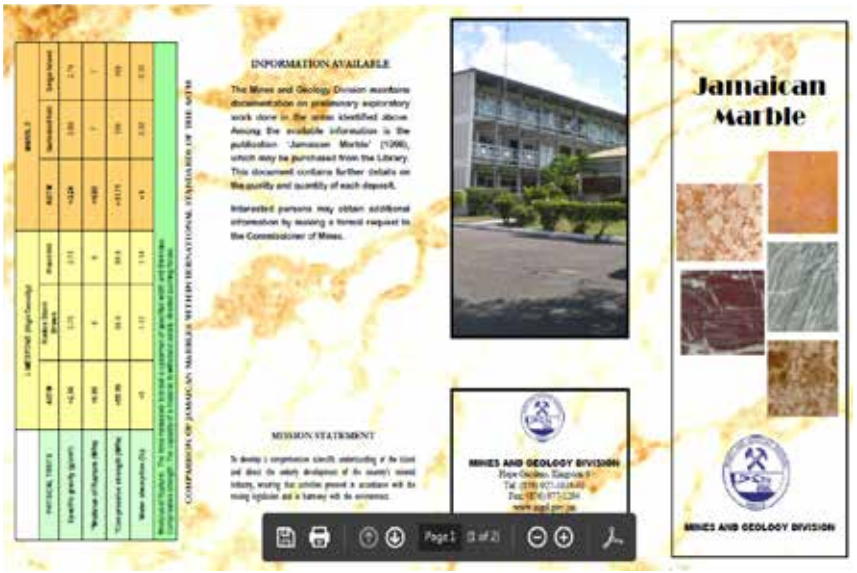
The MGD provides a range of chemical and physical *laboratory test services*[46] for Development Minerals industry and the general public, but these laboratories are not accredited to international

[46] http://mgd.gov.jm/services/products/analytical-lab-services.html

standards, as would be expected in the commercial operating environment. During the quarry licence application process, significant chemical lab tests are submitted to MGD. These data should be collated and anonymised to provide *key technical (chemical and physical properties) data* to potential investors, freely online.

The MGD tracks *minerals production*, with each operator reporting key metrics such a minerals produced (or not) and sales on a monthly basis. However, the MGD does not produce demand-side data for mineral products, which is carried out by MTM.

Figure 13 MGD Promotional Flyer for Jamaican Marble



Individual members of MGD attend regional trade conferences, but there are no data available about these excursions on the website.

Mineral policy development for the sector is undertaken by the ***Ministry of Transport and Mining*** (MTM) supported by the *Minerals Economics section*, which collects data on production, supply and pricing; and also makes demand-side projections and regional outlooks, based on forecast project pipelines.

The *Minerals Policy section* of MTM collect and monitor data on policy impacts, community engagement by the industry and have started to collect primary data on impacts of quarrying.

The MTM is highly focused on the value adding potential of Development Minerals, in particular where import substitution can be economically delivered. Improved vertical and horizontal linkages are required between industrial mineral producers and mineral consumers such as paint manufacturers.

In developing the new National Minerals Policy, the MTM clearly articulates that the Government of Jamaica is strongly supportive of the extractives industry.

The ***Statistics Institute of Jamaica*** (STATIN) also tracks minerals imports and exports and provides detailed reports on commodity trends for Jamaica, the CARICOM region and specific export destinations.

The Jamaican Investment Promotion Agency (JAMPRO) is responsible at a national level for investment promotion and inward investment in particular. Regarding minerals, JAMPRO is aware that the bauxite industry is undergoing significant change and they are aggressively looking at alternative uses for limestone products. In the past it has commissioned minerals-specific research, with an emphasis on limestone and its derivative products (Conrad Douglas 2008) and intends to update this research in the near future. However, the agency does not provide market intelligence to the indigenous sector in terms of regional or international demand for the types of minerals that Jamaica can supply. They have an internal road map on minerals and they have identified five (5) potential companies, all in limestone/cement it seems.

JAMPRO recognises that currently the export market is limited and in part due to unavailability of suitable port handling facilities and are trying to attract companies to utilise limestone products in-country e.g. a number of small companies sell limestone derivatives to paint and soap companies in Jamaica. Other specific issues include the need to understand the specific clay potential in the country and the potential market for these products. JAMPRO recognise that there are marble dimension stone resources in Jamaica, but although some small production continued into the 1990s, they are poorly mapped and understood (see Figure 9 (Busby map) and Annexe 4 for further discussion on this issue).

JAMPRO recognises that currently the *export market* is limited and in part due to unavailability of suitable port facilities and are trying to attract companies to utilise limestone products in-country. It also recognises that the supply and cost of energy is a key issue for Development Minerals operators. They are encouraging the use of renewable energy sources, where a company can get a licence to deliver 100kW. The possibility of using LNG is increasingly of interest and they would hope that small operators could use it to generate power. On renewable energy, the DBJ is working with the World Bank in consideration of various models of guarantees, a semi-venture fund and 'public-private-partnership' (PPP) approaches.

JAMPRO has secured funds from the Commonwealth Secretariat to research the minerals market and wish to undertake a comprehensive value chain analysis. In an attempt to understand the international market, they will attend the Houston petroleum industry fair later this year and the MTM will present a paper on the use of limestone products in the oil industry.

JAMPRO will be present at the *National Minerals Week* key event in November 2017 to promote its services to the sector.

The ***Jamaican Business Development Corporation (JBDC),*** although not primarily concerned with the upstream Development Minerals sector, provides a critical function for downstream business development, promotion and marketing of mineral products such as jewellery and ceramics. The JBDC also provides crucial incubation services and training in business planning and management. Senior officers in JBDC emphasise the need to encourage clustering to provide critical mass, capacity building and value chain management.

The JBDC is a critical partner for the capacity building elements of the ACP-EU Development Minerals Programme to enhance the business planning and development skills of commercial quarry operations. It has been centrally involved in providing capacity support to artists who use mineral products in their creative designs. This is discussed further below.

It is clear from the above review that the level of promotional activity and initiatives to provide information to a potential investor or quarry operator is very limited.

Significant improvements can be achieved through an aggressive strategy to provide digitally available information and promotional materials, as well as key technical and quality data to investors, operators and the public at large.

C3 (B) Baseline Assessment of Technical Operational Context

Assessment of Quarry Skills & Competence of Operators

The following presents the results of the baseline assessment of the technical operations, following extensive field and desk research. Much of the raw field data were presented in *SLR's Field Study Report* (Deliverable 2, May 2017 – see Annexe 2), but are expanded as relevant below.

Following the methodology outlined in Deliverable 2 above, two SLR field teams, comprising geological, geotechnical, environmental and social expertise, visited 54 quarries during the baseline assessment **(Figure 14).** This involved pre-arranged site visits, structured interviews with quarry owners and operatives, and observational analyses based on the teams' national and international experience.

All data were compiled to an excel database with quantitative and qualitative data fields. These were analysed to generate the graphics and maps included in this report to illustrate key points.

Licensed Operations (2017)

Minerals exploitation in Jamaica is regulated by the Mines & Geology Division (MGD) of the Ministry of Transport and Mining.

The MGD website[47] lists a total c. 330 licensed quarries for Development Minerals, many of which have 'expired' (*accessed April 2017*). The data shows that 120 quarries are 'current' for extraction of ten (10) Development Minerals, 63% of which are limestone and 23% of which are 'sand and gravel' (see above), supplying the domestic bauxite mining and construction sectors.

According to the MTM, only about 50 quarries are producing at any one time, with only c. 15 quarries with constant output (*pers. comm*. Mr. O. Rainford, in consultation, March 2017). During the last 10 years, the licensed producing quarries in Jamaica drastically reduced in number, from around 200 in the 2008 to 120 in 2017, reflecting the economic decline post-2008.

Unlicensed / Informal Operations

Informal mining is a response to poverty in many ACP countries; where impoverished men and women have scarce access to land, capital or resources, excavated minerals become form of income. Unfortunately, informal mining may becomes a source of environmental degradation, social disruption and unregulated income. It is a challenging area for national policy makers and regulators given the complexity of social, environmental and economic problems involved. In many countries, mostly where high value minerals such as gold, precious stones, diamonds, or

[47] http://www.mgd.gov.jm/licensed-quarries.html

rare metals such as columbite and tantalum (coltan) occur naturally, informal mining may be a source of smuggling and conflict.

In Jamaica, the use of Development Minerals for such purposes is very rare given the bulk nature of the minerals, lack of precious stones, coltan or diamonds, and the island's insular geography. The MGD has long recognised the problems of illicit quarrying, however, and have alluded to resulting destruction of habitats and prime agricultural lands; distortion of topography; flooding risk and damage to civil structures. The Ministry takes the view that Illegal mining in Jamaica requires the allocation of scarce public resources to combat the activity and requires much stricter enforcement and penalties when offenders are caught[48] to discourage the practice.

The field surveys for the current baseline assessment focused on legal, registered quarry operations for Development Minerals. Although informal (illegal) operations are active in Jamaica, they form a small proportion of extractive Development Minerals operations and work only sporadically. No significantly sized illegal operations were visited during the field assessments, although artisanal micro-scale extraction of river gravels was observed once from the roadside.

Photo 4 Remnants of illegal river excavation, Portland parish

Source: Dario Barazzuol, SLR Team 2017

Figure 14 Quarries Visited (May 2017) by Product and Size

[48] Thompson, C. (2003). http://nepa.gov.jm/symposia_03/Papers/minquardocCThompson.pdf

Types of Businesses

The SLR consultants categorised the quarries visited by capacity as well as production volumes. The two SLR field teams identified five (5) types of quarries, based on operationality, size and production (Table 20):

1. **Non-operational**, small : generally owned by individuals or owners engaged in other business activities;
2. **Small-sporadic-opportunistic**- «*pop up*» **:** with very low production capacity;
3. **Medium-size full time**: with relative medium (300-700 t/day) production and/or processing capacity;
4. **Large full time**: with relatively large production (general > 600-700 t/day) and/or processing capacity.
5. **Community Cooperatives** - micro, low capacity; requiring support (*one only, not operating 2017*).

The four principal quarry types (Groups 1-4) produce the following ranges of mineral materials (Table 20):

Table 20 Quarry Types by Minerals Produced

MINERALS	Group 1	Group 2	Group 3	Group 4	Total
Limestone	5	7	6	8	26
Marl/Lim.	1	5	2	1	9
Sand & Gravel	4 + 1(*)	2	4	4	15
Clay	n/a	n/a	n/a	1	1
Pozzolan	n/a	n/a	n/a	1	1
Gypsum	n/a	n/a	n/a	1	1
Andesite	1	n/a	n/a	n/a	1
Total	12	15	14	17	54

As can be expected from the quarries that are licensed (**Table 13)**, limestone and marl/limestone operations dominate production in Jamaica, followed by sand and gravel operations. A limited number of clay, pozzolan, gypsum and andesite quarries are in current operation (see also MTM data in **Table 13)**.

Operational Management & Capacity

Of those surveyed, most quarry operators (96%), frequently in business for many years, have no formal training in any aspect of mine management, including technical, environmental, health and safety or marketing and export access. For most Group 2 operators (>90%), quarrying is a "pop up" opportunity to fill fluctuating local demand in roads or housing/ hotel construction, with rare exceptions. Many Group 3 managers also fall into this category, with irregular business opportunities.

- Most (mainly in Group 2, some Group 3) are involved in other businesses, such as agriculture, construction, tourism development etc.
- c. 40 % of owners/managers (Groups 3, 4) are focused on the quarrying/processing business only and are fully committed to the development of the company.

In Group 4, the Managing Director and/or Quarry Manager may have some quarrying skills, learnt 'on-the-job'. Circa five quarry managers have a mining background either through their family or by previous employment experience.

However, even large companies were observed to employ basic mining methodologies, with rudimentary extraction by ripping and pushing of mined material from the top of the quarry downslope, with lack of properly engineered benching. Very few (2-3) multi-bench mining operations were observed, and among them only one is selectively designing their mine extraction to fulfil the market requirements.

There is no systematic planning of lay-out to increase operational efficiencies, reflecting a lack of medium term mining planning. Extraction in Group 2 and many Group 3 quarries is effectively randomised, with many operational faces open at any given time. This has negative implications for environmental management and prevents any potential for rolling rehabilitation of operations.

The standard of quarry planning and operational lay-out observed was considered to be very poor overall. This can only be addressed through an integrated programme of capacity building and training actions for quarry managers on this specific issue.

With rare exceptions, Quarry owners (>95%) have no market/ marketing knowledge and sell their product directly ex-works to the local market (20km radius). Most have no idea of mineral demand profiles for specific commodities or of the pipeline of projects within Jamaica or the broader Caribbean region that might create demand.

Most quarry owners/ managers have no idea how to improve their market for added value products, and surprisingly few have any knowledge of the quality of the material they are mining (see below), a critical element of marketing. The potential of limestones and clays depends wholly on their chemical-mineralogical composition. Thus improved quality control and assurance are crucial to plan and invest in value added production and sales.

It is important that the ACP-EU Development Minerals Programme (executed by UNDP on a short term basis) and MGD (on a longer term) supports quarry operators to improve their knowledge of the quality of materials held. This could be initiated by (i) collating geo-referenced laboratory results (mainly chemical-mineralogical) submitted for licence applications to a central database at MGD and (ii) by supporting more regular and detailed sampling and laboratory testing at regulated quarry operations.

Product Quality Assurance

All applicants for a Quarry Licence (QL) are required to submit chemical analyses of the product which they propose to extract to the MGD, in order to acquire the licence (see Table 21 for a typical analysis of high quality limestone).

The evaluation of material quality and assurance (QAQC) in (i) geological target areas and (ii) during mining operations are key issues that must be considered both by private investors/ operators and the regulatory / facilitatory institutions. The optimal approach to this issue represents the fundamental basis for the development of the Development Minerals sector in Jamaica.

Understanding the different quality of materials, prior to extraction, will allow quarry owners to:

- plan an optimal mine layout and scheduling scheme;
- invest in the optimal performing equipment and mining methodologies;
- immediately verify if the mineral body, or part of it, is suitable for the production of value added product and for export; and to identify which possible end-use industry could be approached;
- plan targeted Market Analysis and Marketing actions
- prepare a strategic medium-long term investment-development plan and, possibly, a feasibility study with business plan, to be used in approaching financial institutions and/or potential business partners.

Table 21 Typical Chemical Analysis of high quality Limestone

Indicator	Unit	RG 001 C 143	RG 002 C 144	RG 003 C 145	RG 004 C 146	RG 005 C 147	RG 006 C 148	RG 007 C 149	RG 008 C 150	RG 009 C 151	RG 010 C 152	RG 012 C 154	RG 013 C 155	RG 014 C 156	RG 015 C 157
SiO_2	%	0,20	0,23	0,22	0,59	0,10	0,14	0,14	0,28	0,27	0,24	0,59	0,12	0,33	0,39
Al_2O_3	%	0,28	0,22	0,23	0,27	0,07	0,11	0,10	0,29	0,27	0,38	0,55	0,14	0,24	0,30
Fe_2O_3	%	0,04	0,03	0,03	0,04	0,02	0,02	0,04	0,05	0,05	0,04	0,05	0,03	0,04	0,04
TiO_2	%	0,01	0,02	0,01	0,02	0,01	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,03	0,02
MnO	%	0,00	0,01	0,01	0,01	0,01	0,00	0,02	0,00	0,00	0,00	0,00	0,01	0,00	0,00
CaO	%	55,22	55,18	54,89	54,82	55,81	55,31	54,39	55,56	54,41	54,87	54,91	55,18	55,07	54,85
MgO	%	0,23	0,28	0,37	0,22	0,16	0,22	0,45	0,31	0,30	0,27	0,31	0,31	0,29	0,33
K_2O	%	0,00	0,01	0,00	0,02	0,00	0,01	0,00	0,02	0,00	0,01	0,02	0,00	0,01	0,01
Na_2O	%	0,00	0,26	0,05	0,05	0,00	0,00	0,00	0,03	0,05	0,04	0,03	0,00	0,08	0,00
P_2O_5	%	0,04	0,05	0,05	0,05	0,04	0,05	0,05	0,04	0,04	0,04	0,04	0,05	0,04	0,06
SO_3	%	0,02	0,02	0,03	0,02	0,00	0,00	0,03	0,00	0,00	0,00	0,00	0,02	0,02	0,02
SrO	%	0,02	0,02	0,02	0,02	0,02	0,02	0,04	0,04	0,02	0,03	0,04	0,02	0,02	0,04
Loss on ignition	%	43,78	43,57	43,99	43,74	43,80	44,00	44,63	43,27	44,48	43,97	43,35	44,00	43,77	43,84
$CaCO_3$ (calculation)	%	**98,57**	**98,50**	**97,98**	**97,85**	**99,62**	**98,73**	**97,09**	**99,17**	**97,12**	**97,84**	**98,01**	**98,50**	**98,30**	**97,91**
Moisture	%	0,4	0,4	0,4	0,2	0,0	0,4	0,0	0,0	0,0	0,0	0,0	0,5	0,4	0,4
Whiteness	R457nm%	**83,5**	**83,0**	**81,9**	**82,4**	**88,6**	**88,1**	**82,5**	**87,0**	**82,2**	**82,7**	**82,1**	**84,9**	**85,5**	**82,6**
Chromaticity a		0,53	0,58	0,73	0,52	0,30	0,21	0,62	0,39	0,81	0,42	0,72	0,51	0,54	0,68
Chromaticity b		3,42	3,30	3,86	3,62	2,44	2,31	3,61	2,64	3,82	3,57	3,64	3,31	3,20	3,72
RY	%	87,88	87,15	86,82	86,61	91,76	91,13	87,06	90,41	87,03	87,16	86,69	89,16	89,03	87,33
L		95,11	94,8	94,66	94,66	96,72	96,46	94,77	96,17	94,75	94,81	94,61	95,65	95,84	94,88
x		0,3205	0,3204	0,3216	0,3207	0,3184	0,3181	0,3210	0,3189	0,3216	0,3209	0,3212	0,3203	0,3201	0,3213
y		0,3370	0,3367	0,3376	0,3372	0,3352	0,3351	0,3372	0,3356	0,3375	0,3373	0,3372	0,3367	0,3365	0,3374
Oil number	g/100g	22,5	20,1	19,4	16,6	20,3	22,5	23,2	18,5	24,7	16,0	19,8	20,1	23,4	21,1
x50 laser	µm	1,61	1,66	1,55	1,67	1,70	1,66	1,52	2,38	1,60	1,68	1,68	1,58	1,62	1,61
x90 laser	µm	5,52	6,88	6,22	6,63	6,48	6,39	5,72	8,37	4,81	6,50	6,51	5,64	5,73	6,49
x99 laser	µm	10,19	11,10	10,72	10,94	10,86	10,75	10,26	12,47	9,98	10,84	10,95	10,21	10,11	10,88

The contents of particular oxides and of moisture are shown in weight percent (wt. %)

Implementing Quality Control & Assurance

Following an initial exploration-evaluation phase, with partial support from institutions (UNDP, MGD, others), a regular quality control policy should be put in place for continuous mining operations.

A professional quality assurance system should include:

- the presence of skilled trained management and staff;
- regular sampling (of representative samples) and testing of the material, before and after extraction;
- capacity to stockpile mined material in separate areas according to different qualities and end uses; and
- regular recording of all data on a digital platform, that can be used to inform market approaches.

Requirements for Accreditation

Since 2015, it has been a requirement to have quarry materials tested and certified before the MGD/ QAC can agree to granting a licence. Quarry producers thus require access to specialist lab analyses, including multi-element ICP-MS and also XRD to characterize various clay resources. Thus they need accredited laboratories to carry out appropriate (to the material) tests according to International Standards (ASTM, EU-CEN, etc[49]). The lab must analyse the samples to the highest precision, with repeatable test results, to allow the operator to approach the international export market.

The laboratory function to date has been carried out by Government laboratories in Jamaica, which operators regard as slow and costly. At MGD, expenditure of J$10 million has been approved for the purchase of an ICP. However, there is only one geotechnical lab in Jamaica which can test physical properties.

Based on international experience, the SLR team advises that the private sector can provide high quality, cost effective laboratory sampling and analyses, with rapid turn-around times, to the highest international accredited standards. Investors in the sector, as well as financing institutions, will require such assurance and reliability prior to financing any operations.

QAQC -Field Observations

During the field assessment, the teams observed poor Quality Control in the quarry operations (with three exceptions) and also in the downstream crushing/ screening plants.

Operators supply the original analyses to the MGD at the point of licence application, but largely fail to sample their product ever again, despite the fact that the first item a buyer will seek is a certificate of certified analyses and evidence of quality control throughout the extractive process. This is due to the fact that demand is highly localised, and is driven by price versus quality. This in turn leads to local price wars and a competitive 'race to the bottom' for many Group 2 and 3 operators.

[49] For instance, in the case of ASTM Standard, accredited geotechnical testing laboratories are required to meet the precise criteria found in ISO/IEC 17025:2005 *General Requirements for the Accreditation of Testing and Calibration Laboratories (see form A2LA).*

Quality Assurance: Case Study in 'Sharp Practice': In one instance, a Group 3 quarry operator who scrupulously carries out routine testing of the limestone quality in the quarry (Quarry 1), was horrified to find that a building contractor who sought evidence of the chemical quality of the limestone product, was then sourcing inferior and cheaper product from a Group 2 operator (Quarry 2), while using Quarry 1's chemical analyses to assure the contractor's end-Client.

Similarly, very few companies surveyed (<3) have skilled management to conduct any evaluation of possible value adding products. Occasionally, higher value products are sold for lower value due to a lack of understanding of the basic physical characteristics of the product *e.g.* softer limestones are often sold as "marl", even though the product is low in clay (and thus of higher quality).

Up to three larger companies (Group 3, 4) surveyed have a reasonable standard of quality assurance and routinely sample their materials, prior to leaving the site. One Group 4 operation samples the production of high grade whiting on a 3-hour cycle, using both their own internal laboratory and externally accredited laboratories.

Definition of Resources and Reserves

With a few notable exceptions, > 98% of quarry operators have no concept of basic estimation of 'resources' and 'reserves' of minerals within their quarry licence area. The internationally recognised definitions of these concepts for the production of mineral and metals are as follows (as demanded by CRIRSCO members[50]: European PERC, Canadian CIM and Australian JORC standards):

RESOURCES are defined as follows:

- A '***Measured Resource***' is one which has been intersected and tested by drill holes and/or other sampling-evaluation procedures at locations which are close enough to confirm continuity and where geology and scientific data are reliably known.
- An '***Indicated Resource***' is one which has been sampled by drill holes or other sampling-evaluation procedures at locations too widely spaced to ensure continuity, but close enough to give a reasonable indication of continuity and where geology and scientific data are known with a reasonable level of reliability.
- An '***Inferred Resource***' is one where geology and scientific evidence from drill holes or other sampling-evaluation procedures is such that continuity cannot be predicted with confidence and where information or data may not be known with a reasonable level of reliability.

[50] http://www.crirsco.com/members.asp

RESERVES are defined as:

- An '***Ore Reserve***' is defined as that part of a Measured or Indicated Resource which could be mined and from which valuable or useful minerals and materials could be recovered economically under conditions reasonably assumed at the time of reporting.
- In the case of Dimension Stones, the "Ore Reserve" is the volume of stone that can be sold, generally in blocks and other products, in the market, giving actual economic value to the project.
- '***Proven***' **and '*Probable*' ore reserves** are based on *Measured* and *Indicated Mineral Resources* respectively, and are estimated by considering and subtracting the Modifying Factors identified by an accurate deposit evaluation.

Most operators in the field reported that they have *X* acres of land, with *Y* years of production remaining, without any reference to standardised resource or reserves definitions. This has profoundly negative implications for quarry operators when they seek access to credit, as banks will first wish to know about:

(i) economically recoverable reserves;

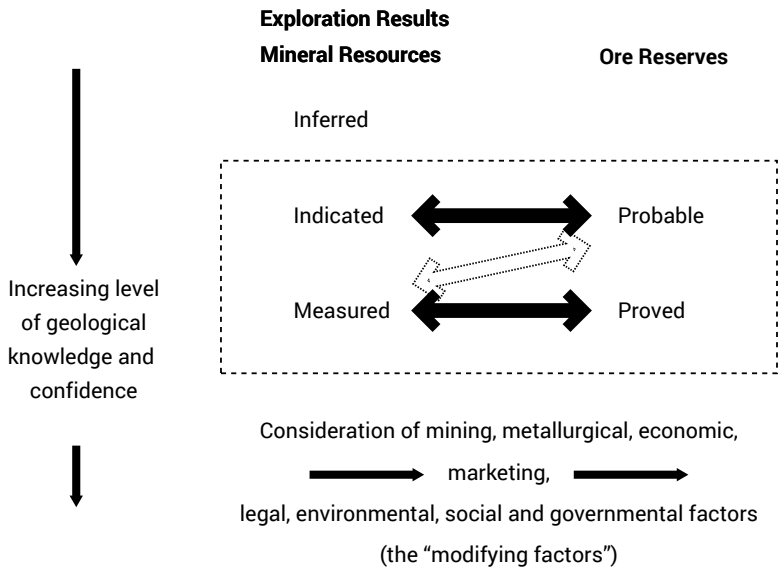
(ii) the planned production schedule of those reserves, and appraisal of new resources; and

(iii) projected market demand for and sales of those reserves. The latter will inform the design of the loan repayment terms.

Without items (i – iii), then it is impossible to secure a loan for investment or recapitalisation.

Resource and reserve estimation with annual updates by specialist economic geologists are required across the sector, with training for quarry operators in reporting the site relationships of resources and reserves to international standards (Figure 15).

Figure 15 Mineral Resources and Reserves and their Relationships



It was also observed that institutional regulators and commercial/ development banks have a poor understanding of these international reporting standards of resources and reserves. Capacity building and sensitisation of these players is also required to ensure they fully understand these key definitions.

Access & Infrastructure

Road access to quarries surveyed is on average good and quarries are generally close to the public, asphalted road network (or medium quality haul roads). Access to ports for export is a challenge however.

In general, away from the main coastal routes and new highways, the average condition of the road network in Jamaica is poor, relying on narrow country or mountainous roads. Average road travel time is 30-50 Km/h.

Office infrastructure and standards at quarry sites are mixed. Most of Group 2/3 quarries do not have any office or workers' canteen/ rest rooms, while all of Group 4 sites have these facilities.

In terms of **electrical utilities** and infrastructure, 50% of quarries (mainly Group 4) are connected to the public network (JPS), while more than 50% of operators are off-grid, using their own diesel-powered generators. The latter is highly contentious, with many Group 2/3 operators complaining of the standing charges for connection to the grid.

Photo 5 Good staff facilities at Group 4 quarry, Trelawny Parish

Cost of Energy: One Group 3 operation with crushing plant, reported that JPS charges up to J$400,000/month in standing charges, prior to the cost of electricity used, estimated at J$70,000 month (approx. US$3,600/ month in total, or US$164/day/22 day month). However, another Group 3 operator reported that it costs J$22,000 per day (US$170/d) while running his crushing plant using his own generator. Another Group 2 operator complained that even when not producing, he has to pay monthly standing charges, which makes it completely cost ineffective; thus such operators go off-grid. The cost:benefit analysis of public vs. private energy supply is thus highly dependent on operational efficiencies.

Access to **water** is an issue for many solid mineral operators, with up to 80% using a water tank for storage and a further 20 % reliant on a well or river pumping. Just the Group 4 quarry operators have a recirculation washing plant for aggregates.

For **telecommunications**, all rural operators rely on the mobile telephony network for ITC/

communications/ email, which, apart from inefficiencies, is a key issue for those who wish to conduct effective online market research or marketing.

Transport & haulage: 98% of the quarries surveyed do not transport their own materials to the client site. Most Group 2/3 operators (99%) sell almost exclusively sell from the quarry gate (ex-works) directly to either contract hauliers or to customer trucks. In many Group 2 instances, the clients send their own trucks to pick up the material directly from the quarry.

One large Group 4 quarry, which produces blocks on-site, retains a few haulage trucks which are used if the contract hauliers are considered to be too expensive ("*keeps them honest*"). Another large Group 4 operator reported that they sub-contract all transport to a number of haulage contractors and '*spread the work around*' to ensure that they are not '*held to ransom*' by a single large haulier.

Internal material handling is made by front end loaders mainly. Internationally owned Group 4 aggregate operators have fleets of their own trucks (e.g. Jamaica Aggregates). A few operators, among the Group 3/ 4 quarries, have their own internal haulage trucks used within the operating site (Photo 6).

Photo 6 Group 3 operator with own internal haulage truck – River Sand & Gravel, St Thomas

Quarry Equipment and Utilisation

In terms of equipment, excavators are uncommon and are generally utilized in Group 3 & 4 operations. In Group 2/3 sand and gravel (S&G) alluvial quarries, a front-end loader and/or a ripper-bulldozer are almost exclusively utilized. In larger Group 4 S&G quarries, excavation is more highly mechanised, with loaders, dozers, (few) excavators, and trucks used within the quarry operations to deliver raw materials to the on-site crushing plant. In all Group 2/ 3 quarries surveyed, a front-end loader is utilised to upload the material onto the transporting truck.

Up to 80% of visited quarries have no more than 2-3 earth moving machines and rely heavily on contracting of equipment during busy periods. Only large Group 4 operations have a sufficient number of in-house machines for their needs and at least two such operations have recapitalised significantly (up to US$3 million) with machinery/ plant upgrades in the past two years.

SLR found that the condition of earth-moving equipment within quarries is generally good (see Photo 7).

Photo 7 Condition of Earth-Moving Equipment is generally good

Mining Methods

Mineral extraction is generally conducted in very basic and frequently irregular ways, by ripping relatively soft rock (70%) and drill &blast of harder materials (30%).

Lower capacity quarries (Type 2 and some Type 3) are exploited by either:

(i) Ripping and digging of material by bulldozer and front-end loaders, at the top of the quarry, and then pushing the mined rock mass ("*tout venant*") downslope with a bulldozer or excavator to the toe of the quarry face. The slope face was often observed by the teams to have very steep, irregular and unstable gradients.

(ii) using a bulldozer / excavator to rip target materials at the base of the quarry face and using a front-end loader to handle the extracted material.

Very few (almost none) of Group 2/3 quarries utilize Drilling & Blasting Method, which is very expensive (450-650 J$/foot = 1500 J$/linear meter).

In all of Group 2/3 quarries, there is no evidence of selective mining at the quarry face. Preliminary gravitational selection is made only by rolling the mined mass by front-end loaders to separate the coarser stone and "dust" from the rest of the material.

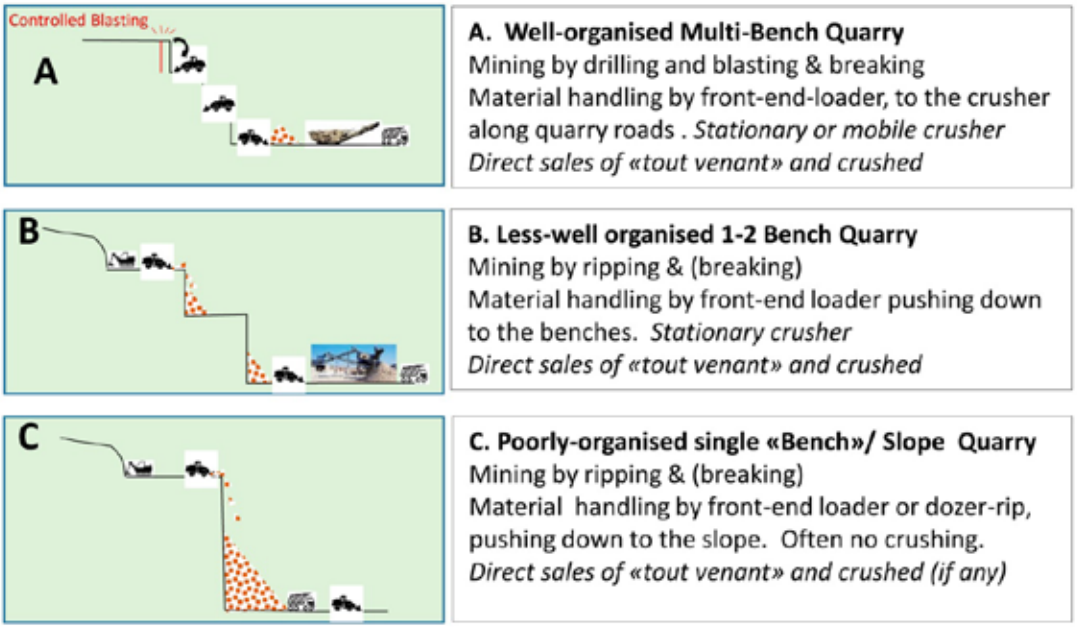
Very few quarries utilize appropriate drilling & blasting or multi-benching methodology (< 5%, in Group 3-4), while 95% operate with just one single upward irregular face (non-benched) – see Photo 8 below.

Photo 8 Examples of Benching Observed in Quarries, Jamaica, 2017

This is essentially a rudimentary and inefficient method of mining, which creates very poor health and safety (H&S) conditions within the quarry. At the same time, it does not allow for selective mining to keep production at the highest quality and consistent standards of materials, based on demand.

It is considered that practical on-site training and instruction for Quarry Operators in design of benching, safety benefits and the optimisation of production would be highly fruitful (see Figure 16). Poor benching strategy leads to non-selective, sub-optimal production and creates a very significant safety hazard.

Figure 16 Methods of Benching for Quarrying



None (100%) of the quarries surveyed followed a defined Mining Plan with related restoration and reclamation plans.

Production

The rates of production of minerals reported from the surveyed quarries were highly variable. Depending on the type (Group 1 (5), 2, 3, 4) of quarry, the rates of production may be classified broadly as follows:

Group 1: / Group 5: Zero production at time of survey (April-May 2017)

Group2: 30-200 t/day – sporadic (*up to 2 months per annum*)

Group 3: 200-800 t/day

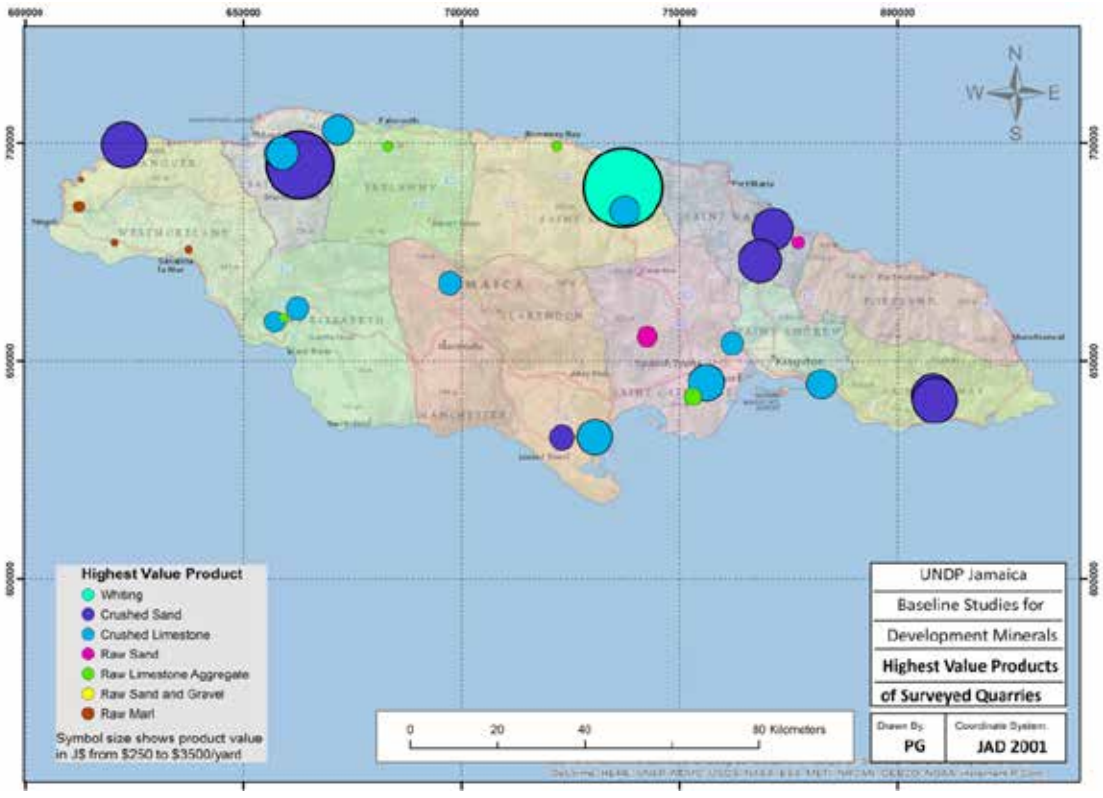
Group 4: >800 to 2000-3000 t/day

Most of the surveyed quarries hold no stock and sell as they produce at the quarry gate.

These trends can be mapped spatially in relation to product and size of operation (Figure 14 above). Many of the larger operations are close to urban areas and/or main road networks.

The quarries visited were also assessed in terms of the relative value of products sold (Figure 17). It is evident that the higher the value adding capacity and quality assurance of the quarry in e.g. whiting and washed & crushed river sands, the higher the price that can be commanded.

Figure 17 Development Minerals Quarries visited, sorted by Highest Value Products



Based on latest Quarry Survey in 2015 by the MTM (2016), and which is confirmed by the SLR Survey, quarry production is approximately distributed as follows:

- 10 % of companies produced 85% of minerals and materials;
- 80-85 % of quarries produced less than 80,000 tons/year;
- 15% > 400,000 t/year; and
- 2% > 1,500,000 t/year.

With a single exception, all processing plant is located within the footprint of the quarry site. This is positive in that it reduces the transport costs to an external processing plant and confines the environmental footprint within the quarry, but is also means that the finished product has farther to travel to market.

Waste Management

Most of the producing quarries surveyed (limestone, marls, S&G, etc.) reported that they have almost zero waste, as almost all extracted materials are sold. Thus, most (>95%) quarries do not have any problem with regards to waste management and none of those surveyed factored waste management into their cost base.

In a small number of operations in the South, close to highways and inhabited areas/towns, mineral production is lower than (local) demand. In one such instance, a clay quarry produces 20-30 % waste. This is stored within the quarry footprint and is largely benign, argillaceous material with zero potential for leachate or downstream contamination.

The field teams concluded that Waste Management for the majority of quarries visited is not a major environmental issue, as the volumes of waste produced are minimal.

Processing of Development Minerals

Seven main types of processing plants (***a-g*** below) were visited:

a. *Large complete* crushing plants (10 %),
b. *Medium size* crushing plants (20-30%)
c. *Small size* crushing plants (60-70 %)

These were producing a full range of product sizes, including ¼", ½" 3/8", 3/4" sands/ gravels/ aggregates. Note that all processed materials are quoted in imperial measures (inches).

Up to 92% of the quarries surveyed were equipped with a single primary crusher (generally impact/ jaws) - *Type 2, some Type 3.* The condition of much of this equipment was considered to be poor, being old and in need of upgrade (Photo 9). This confirms the findings of the recent MSTEM Quarry Survey (2013).

Photo 9 Old Conveyor Equipment Requiring Upgrade, St. James

Field Observation: Many smaller operators work assiduously to maintain old equipment and crushing plant, but are increasingly anxious to purchase new and more efficient equipment. However, they cannot secure the requisite finance. For example, the sum cited for purchase of a cone (jaw) crusher in one Type 3 sand & gravel operation was J$4-5 million (approx. US$35,000). Another operator commented that as this equipment depreciates (without replacement due to high costs of capital) the older operators will leave the industry with resultant loss of skills.

The condition of the plant in larger (Type 3/ 4) operations was considered to be relatively fair to good, while in Type 2 maintenance and state of equipment are actually much lower. Type 1 operations usually do not have any plant and sell raw material as it is mined.

d. *Limestone and cement blocks* (10-20% of cement content) - Small plants producing various sizes, commonly in demand in the local market; larger plants supplying an island-wide market (John's Hall and Braco - 4% of the total quarries visited). In one case, the company also runs a semi-manual kerbstone production plant (*Marjoblac Ltd. in Manchester*) – see Photo 10.

e. *Interlock* production (3 small plants, of which one really semi-manual: 3-5 % of the companies visited)

f. *Asphalt plant* – one only (*S&G Road Servicing Ltd, in Mandeville*)

g. *Whiting plant/ high purity limestone* – one only; high grade pharma and food quality (*Lydford Mining* – see Photo 11).

Photo 10 Value Adding for Development Minerals – On-Site Quarries

Photo 11 Lydford Mining Company, St. Ann : Whiting processing plant on-site

Only three (c. 5%) of visited quarries produce limestone value-added products for export.

In total, forty plants (74%) of the 54 quarries visited are adding value to some degree, by crushing of limestone/ marl aggregates (50%); crushing / washing of sands & gravels (18.5%), or through production of pozzolan, gypsum or andesite – see Table 22.

Table 22 Crushing/Processing Plants visited

MATERIAL	Group 1	Group 2	Group 3	Group 4	Total
Limestone	n/a	1	6	17	24
Marl/Lim.	n/a	n/a	3	n/a	3
Sand & Gravel	2	1	3	4	10
Clay	n/a	n/a	n/a	n/a	n/a
Pozzolan	n/a	n/a	n/a	1	1
Gypsum	n/a	n/a	n/a	1	1
Andesite	1	n/a	n/a	n/a	1
Total	3	2	12	23	40

With the exceptions of the large crushing-washing plant of Group 4 operators (e.g. Hodges in St. Elizabeth; Shagoury Aggregates in Clarendon; Lydford Mining and Shaws Quarry in St Ann, Kents, Braco and John's Hall Aggregates in Trelawny; Jamaica Aggregates in St Mary and St Thomas, and Earth Rocks in St Thomas, plants are mostly run by 1 - 3 workers, trained on job by the quarry manager/owner. Due to the very small size of the latter operations, there are rarely any formally skilled plant managers in these quarries.

Development Minerals /Products

Based on the field assessment, the following key Development Minerals products are currently produced in Jamaica (Table 23):

Table 23 Key Development Mineral Products produced in Jamaica (2017)

MINERAL PRODUCTS	KEY PRODUCTS	USES
CONSTRUCTION MATERIALS		
Raw mined aggregate	limestone, marl, sand, gravel, (andesite)	filling, road base, construction in general, lime (*) etc.
Raw clay	fine grained, argillaceous clay (often smectite, illite)	mainly for sealing Bauxite waste facilities ('red ponds')
Crushed material	limestone, sand, gravel, andesite - in various sizes as demanded in domestic market	block making, concrete, (cement: see CCC), high quality road base, etc.
Limestone	Cement, construction blocks and rare kerbstones in various sizes	building construction
Limestone-cement Interlocks	Paving stones	external paving

Limestone blocks	Large irregular/raw/ hard limestone Blocks	for coastal / port protection; crushing for block manufacture
INDUSTRIAL MINERALS		
Gypsum by Caribbean Cement Company	Crushed gypsum	for cement → 5% (*see CCC below*). Spot export to Trinidad.
Crushed Pozzolan	Produced by Caribbean Cement Co. (CCC)	for cement → 2-4 %)
Whiting/ other industrial purposes	High quality, fine grade limestone – Lydford Quarry, St Ann	For export, high purity for food and pharmaceutical processing
High quality, fine-grain crushed limestone	High quality materials for export, Hodges in St. Elizabeth	export
Semi-Precious Stones		
Semi-Precious Stones	Agates (raw) – artisanal, very small production, sporadic	mainly for jewellery for local artists/ tourist shops
DIMENSION STONE	*(Potential)*	
Dimension Stone	Large regular Dimension Stone Blocks – was produced in 1980s, *currently not produced in commercial volumes, but potential has been mapped (Busby 1990)*	high quality housing/ hotels construction & architectural design (*See Figure 9 above*)

There are currently no commercially operating dimension stone operations in Jamaica, largely related to the young and dynamic tectonic setting and consequent high level of fracturing of potential rock sources.

Photo 12 Example of well-planned Dimension Stone Bench Quarry, Italy

Source: Marco Cosi - AlpiConsult

However, some potential areas exist (see hard massive limestones of White Limestone Group and hydrothermally recrystallized limestones known as "marble"). This potential is examined further in Annexe 4 of this study as a preliminary overview.

Conclusions: Technical Operational Context

- Weak quarry planning & management skills means that optimisation of production is lacking.
- Stronger regulation is required (MGD/ NEPA) with linked penalties for breaches of Licence terms
- Capacity needs to be built at every level, for both operators and regulators.
- The future development focus must be on quality, value adding and marketing of Developent Minerals for domestic/ regional and international export.

Support Services/ Training for Miners and Quarry Workers

Industry Organisations

The role of Miners Organisations in Jamaica is largely confined to the Mining & Quarrying Association of Jamaica (MQAJ). It is a private company acting as a key business association between quarry operators and the Government. The MQAJ has 30-40 member companies (estimate c. 10% of total registered quarry operators of c. 300), but is likely to represent 90% of all production.

The MQAJ has recently focused on civil, social and environmental responsibilities and have developed a brief, voluntary *Environmental Code of Practice* to which its members signed up. This Code will require upgrading to reflect international norms of increasing environmental responsibilities of the extractive industry.

In discussion, the main concerns of MQAJ's membership relate to:

1. **Survival of their businesses:** 70-80% of production goes to public sector procurement, which creates anxiety due to lack of transparent procedures governing this.
2. **Access to credit/ finance** – operators record exorbitant costs, including fuel, oil, electricity and cannot access working capital or credit for recapitalisation of equipment;
3. **Lack of Incentives** to develop processing facilities; for example, capital allowances on imports of plant or GCT waiver for quarry operators (to be admin by JAMPRO). This was seemingly attempted in 1997 at Cabinet, but the IMF entry in 2008 ended all subsidies to private industry under the WTO rules (including phasing out of subsidies to the bauxite industry).
4. **Lack of Training facilities** for quarry managers and operatives, in particular lack of suitable apprenticeships dedicated to quarrying skills.

According to the MQAJ, the Jamaican Development Minerals sector is aiming to be globally competitive and thus needs:

- **Improved resource & reserve definition**, and information on the working resources at site/quarry level;
- **Access to accredited laboratories** for quality control and assurance (QA/QC) of products;
- **Vertical integration** into the value adding process;
- **Marketing of products to targeted export markets** – members feel that Jamaica could be a minerals hub in the Caribbean region; this could include a ***National Database*** of all quality assured products, so that external buyers can clearly access this information to source key Development Minerals products.
- **Expertise in implementation of best practice** in quarry management, mining, environmental control, etc.
- "How can we rehabilitate when we don't have the funds or the people who know how to do it? We need expertise – only 10-12 geologists in Jamaica are trained specifically for the sector".
- **Engagement with neighbouring communities** is recognised as critically important. However, MQAJ members noted that "*CSR programmes are in place, but it is difficult to deliver due to time and costs for struggling business"*.

Many members of MQAJ are also members of the Jamaica Micro-Small Medium Enterprises Alliance (MSMEA). It is clear that other sectors also need access to finance; vocational training facilities and market research and regional positioning. However, the SLR team detected a certain weariness that these are "*decades old demands"* which are falling on deaf ears politically - "*Government does not understand the industry and sidelines it – thus it is very difficult to move forward*".

MQAJ -Capacity Assessment

A functioning industry requires a well-structured and strong representative Association; however, many of the operators interviewed consider that the MQAJ is not a strong representative association. The MQAJ is headed by a long-serving and loyal President, supported by a committee of representatives of the quarrying and mining sector. It is represented on the Quarry Advisory Committee (QAC) and theACP-EU Development Minerals Programme Jamaican Country Working Group by the President.

There is a recognised need within the executive of the MQAJ that is needs 'young blood' and reinvigoration of its organisational capacity. While the MQAJ acts as a lobby group, it does not commission independent e.g. market research. The MQAJ does not have a website or any social media presence, relying on email and person-to-person contacts. It requires support to build its IT and communications strategy.

The Development Bank of Jamaica (see Section 5.6.1 below) noted that the "mining industry does not have a strong lobby group" and suggested that the DBJ could provide support to strengthen the representative lobby group.

Unlike other ACP countries, particularly in Africa, women do not have a separate representative organisation, but are members of the MQAJ. A focus group of women working in quarrying industry, as part of the baseline assessment asserted that they would like to form an active chapter within MQAJ, to focus on their specific aims and needs. This is a positive development and could be supported under the ACP-EU Programme.

Training: Institutional / Apprenticeships

In the overview of Jamaica's industrial minerals sector (Rainford et al, 2011)[51], training was recognised a major need within the industry buy government and operators alike:

The training of personnel to assist in developing the sector must be seen as a priority issue. It may not be very difficult or expensive, but will require that existing institutions such as the University of Technology and the Human Employment and Resource Training / National Training Agency (HEART/ NTA) establish the necessary training courses.

With the exception of the Mona campus of the University of the West Indies, which trains geologists, there is currently no local or regional institution which prepares mining and minerals-related professionals for the minerals industry. In fact, the industry does not need the number of geologists being trained. Instead, it requires mining engineers, minerals economists, practical mining geologists, mine surveyors, and other professionals in the applied sciences and engineering fields

It was confirmed by the MTM[52] that little had changed in the intervening years to 2015, commenting that "*Despite Jamaica's minerals industry having been a major contributor to the economy for the last 55 years, there are no formal training facilities available locally …..the current deficiency in the number of formally trained personnel in the quarrying sub-sector is disturbing as a trained workforce is critical to the success of any enterprise operating in the global economy".*

During the current field assessments, it was generally observed by the SLR teams that quarry supervisory and operative skills are low to very low. Frequently, the owner/manager is the only person in a position to run the operation with sufficient oversight, but technical quarry planning and management skills are also lacking.

In every quarry surveyed (100%), there is a complete lack of formal vocational training for semi-skilled operatives or skilled tradespeople. All interviewees, from managers, to supervisors to operatives, report learning 'on-the-job', relying on informal mentoring by older or more experienced colleagues.

[51] Rainford, Rohan & Richards (2011), *Overview of Jamaica's Industrial Minerals Sector*. MSTEM.
[52] Survey of Industrial Minerals in 2015 (MTM, 2016 - p. 16)

Some of the Group 3, 4 quarries in St. Ann in the central uplands reported having recruited skilled workers, that had previously worked in the bauxite industry.

On the upside, > 80% of quarry operators interviewed would like to have access to bespoke training for their employees. In particular, there is a clear need for dedicated and certified apprenticeships in quarry design and management, mechanics, welding, heavy equipment maintenance and increasingly electronics.

There is a particular gendered aspect to training and apprenticeships in that young males in Jamaica are dropping out of formal second-level education and are under-represented in university courses by a factor of 4:1. Providing structured and accredited apprenticeships in quarry trades for young people (both male and female) may provide a valid career path and good employment opportunities in rural areas.

A short review of courses available on the National Training Agency (HEART) website was undertaken. Of a possible 183 courses, less than 14 would be applicable to quarrying of Development Minerals and most are likely to be too generalised to be useful in practical terms.

Business & Administration / Marketing Courses

1. Business Management & Administration (3 levels)
2. Entrepreneurship (3 levels)
3. Front Office Agent & Supervision (2 levels)
4. Management of Energy Levels (5 levels)
5. Marketing & Promotions (2 levels)

Technical / Trades Courses

6. Construction Site Management
7. Electrical Installation (4 levels)
8. Mechanical Maintenance (3 levels)
9. Motor Vehicle Repairs (Car, Light Truck) – 5 levels
10. Motor Vehicles – Heavy Duty Equipment Maintenance (2 levels)
11. Plumbing (3 levels)
12. Steel Fixing (2 levels)
13. Tractor Operation & Maintenance (1)
14. Welding (3 levels).

This issue of training and apprenticeships will require considerable follow-through as part of the overall capacity building aims of the ACP-EU Development Minerals Programme, in concert with the NTA and related authorities such as Ministry of Labour and Education respectively.

Rainford et al. (2011) reported that "*the MTM (Minerals Policy and Development Division (MPDD) and the MGD have had ongoing discussions with the University of Technology (UTech) and the HEART/ NTA regarding the possibility of instituting training courses aimed at developing the sector's human resources. The discussions with UTECH failed as it could not accommodate such courses. A similar situation occurred with HEART/NTA. It is an opportune time to resume these discussions*".

The National Minerals Policy 2017-2030 explicitly aims to establish a ***National Minerals Institute***, whereby modular training to address the quarry sectors needs could be achieved across a range of training/ educational institutions. This will require careful planning and management, but is to be welcomed. The Ministers of Mining/ Education/ Labour must engage in these discussions.

Advocacy and Workers Interests and Right

Most of the Group 2 and 3 operations have no workers representative associations. Trade unions were only recorded as being present in five of the Group 4 (large) operations surveyed, advocating for improved wages, conditions and provision of ancillary services such as canteens.

Availability & Accessibility of Finance

Review of Key Lending Institutions

The principal lending institutions for the Development Minerals sector are commercial banks such as Scotia Bank; the Development Bank of Jamaica (DBJ); the Export-Import Bank (EXIM) and Credit Unions.

Development Bank of Jamaica (DBJ):

The DBJ is keen to engage with the Development Minerals sector and is 'open for business'. Their guarantee programme runs up to J$515 million (US$4 million approximately) and they have supported some quarry operations, but only through commercial lenders, with related criteria.

Quarries/ mines tend to be capital intensive, seeking larger loans (for equipment and plant) than other SMEs, which makes it very challenging to issue loans. Many are poorly prepared without basic business plans, CAPEX/ OPEX projections; resource definition or production schedules. DBJ maintains that many small producers have not the technical, financial or management capacity to meet standard loan criteria, but actually provides capacity building and training in financial planning for SMEs[53]. DBJ is willing to work to finance the SME quarry sector as bauxite declines, but suggest that operators must work within the lending norms.

DBJ Loan Profiles: DBJ will support some micro-enterprises, but largely focus on SMEs, as most micros are below the scale that DBJ works at. There may be future consideration of leasing plant and of factoring to assist in cashflow for SMEs.

[53] The Development Bank of Jamaica offers modules in capacity building and financial planning for targeted MSMEs who match specific criteria - http://dbankjm.com/services/business-support-services/450-2/

DBJ loans of up to US$300,000 – $400,000 are given a credit card to use. In these cases, charges are high, but if the lender demonstrates an ability to manage the card with payment records, they will qualify for higher loan support. DBJ will loan up to US$5 million max. for SMEs in general in minerals, agriculture and tourism enterprises, with the vast majority of these borrowing less than US$5 million. They will lend up to US$100 million, but that would be exceptional case.

DBJ offers a partial guarantee scheme ('CEF') on loans of up to $50 million. They are working to increase the funding to the CEF, with a corresponding increase in the percentage guarantee via the *"Access to Finance"* scheme.

- 50% >$6.25 million
- 80% <$6.25 million

The DBJ is working to harmonise these terms, while reducing the collateral required, with World Bank. Many quarry operators have never participated in such a scheme but DBJ is open to applicants and would like to see more 'value adding' at the downstream end of spectrum as well as primary production.

Minimum Standards required for DBJ loan approval:

- **Environmental aspects of mining/ quarrying are critical for DBJ** – seek high standards of management, which is often lacking at sites, as many quarries just ignore the terms of their licences once operative. There is a need for stronger regulation to ensure compliance.
- **DBJ works with commercial banks** which must approve any loans. DBJ do not finance the loans directly: the relationship is between the borrower and the commercial bank.
- Commercial banks/ DBJ use risk assessment (high-med-low) to justify loans > cannot finance if in the H-M category in environmental and financial terms. Operators must demonstrate the viability of the enterprise, with no adverse impacts on workers, communities or water resources.
- **Occupational Health & Safety**: this is an area of concern and DBJ feels there needs to be a change of culture to improve standards.
- Biggest issue is having **collateral, business plan and cash flow management**. It seems that many commercial banks do not recognize the mine resource, plant or lease as collateral.

The DBJ has a Strategic Services Division which works on capacity building through NGOs. It was suggested that the encouragement of associations or cooperatives to improve the mineral sector's management capacities may be a positive development, and mentioned that the DBJ could provide funding for up to 70% of the cost of preparing a Business Plan (to J$300,000 max.). On environmental matters, DBJ can work with companies to meet the requirements of their environmental.

Export-Import (EXIM) Bank:

EXIM's mandate is broader than just exports and imports; they can fund projects all along the value chain. In principle, they could provide direct or indirect funding for non-bauxite minerals.

Investments in the mineral sector have tended to be capital intensive and long term, and the bank had had some negative experiences. EXIM feel that for them to contribute to the sector with a major impact, they could target Foreign Direct Investment (FDI). EXIM Bank commented in discussion that local capital could be harnessed to support the sector, but that international expertise/ FDI may be required to get projects up and running.

Environmental impacts are a cause of concern when assessing minerals projects, but they are amenable to funding a robust project proposal.

In discussion of building cooperatives to enhance business and environmental competence of smaller quarry operators, EXIM felt there may be cultural barriers associated with such a proposal. However, the coffee industry was put forward as an example where the large players buy from small producers and thus are forced to become regulators of quality. Self-regulation is clearly seen as a positive factor in raising quality of products.

EXIM expressed interest in engaging with the Development Minerals sector as part of the ACP-EU Programme and would be open to holding seminars on what they seek with quarry operators.

The team met the ***National Commercial Bank*** to understand a typical commercial bank's views of the Development Minerals industry. As expected, the bank can fund SMEs, but they need a Business Plan, estimate of duration and scheduling of operations, cashflow projections etc. It is difficult for a commercial bank to fund start-ups, unless the quarry developer was well experienced with a good track record in the sector.

During the loan application process, the bank will work with the company or individual to assess their books and financial statements if available. NCB stated that collateral is generally the last thing they would fall back on to assure the loan. The NCB off-lends through the Development Bank of Jamaica.

The ***Jamaica Cooperative Credit Union League***[54] has 34 member credit unions, with 920,200 members holding reserves of $50.8 million and total assets worth $716.5 million. There are credit unions located across the island of Jamaica, many of which are employment based (education, police, etc.), offering a range of services, including low interest long-term loans, to their members. However, the Development Minerals sector apparently does not generally access credit from the credit union movement. This is likely due to the levels of credit required for quarry equipment and machinery, which exceeds the typical loan profile of a credit union member. However, the Credit Unions could finance smaller loans for e.g. studies, development of quarry plans, environmental plans etc.

In discussion with JAMPRO in relation to the difficulties of small operators obtaining finance and thus equipment /plant, the issue of encouraging a renting or leasing facility was raised. They reported that there is a 'public –private-partnership' (PPP) policy on the table with the World Bank which may provide a way forward.

[54] https://creditunionsofjamaica.com

All lending agencies consulted during the baseline assessment state that they are '*open for business*' with quarrying operations. However, the lenders apply basic standards in reviewing loan applications and require '*de minimis*' a business plan, assessment of mineral reserves, production schedule, market assessment and assurance of longevity of operations to inform risk analysis. Increasingly, they are seeking evidence of responsible environmental and social management (Management Plans, Mine Closure plans etc). The development banks offer 'softer' loans than commercial entities; however, they apply standard commercial risk principles to loan analysis.

Access & Availability of Finance

Quarrying of is a very specific business that can only be conducted where the resources are economically recoverable. It thus differs from other small-to-medium enterprises (SMEs) that may locate their business close to markets. There is a number of inter-weaving factors which are inhibiting Development Minerals SMEs, primarily as quarry operators, in terms of access to finance (credit).

- Many small-to-medium-sized Development Minerals operations have difficulty in accessing credit from banks due to lack of business planning skills.
- Failure to define mineral resources and reserves to recognised international standards;
- Lack of credible environmental and social management plans;
- Lack of awareness of market opportunities and trends.
- The current Jamaican practice of granting quarry licences by MGD for a period of only three years. A large industrial quarrying business, particularly one which might envisage significant value adding of processed products, may be capital intensive and require many years to reach profitability.
- Levels of collateral required – quarry machinery /equipment is not considered as collateral.

The key lending institutions all state that they are '*open for business*' with quarrying operations. However, all those bank officials interviewed stated that many quarry operators fail to develop viable business plans, with credible resource estimations and linked production schedules. These data are required to structure loans and realistic payment schedules. Additionally, the lack of realistic environmental management and mine closure plans means that the lenders are reluctant to finance potential corporate risk.

On the other hand, the quarry operators allege that the banks do not understand their sector. The cost of credit is universally perceived to be too high and the collateral required is prohibitive. The level of bureaucracy, particularly in DBJ, is also considered by many operators to be off-putting. The licence terms (3 years for small-medium operators), although renewable, are too short to provide security of tenure for the bankers.

However, despite this lack of trust / understanding among operators, it was observed that:

- Almost 40 % received a loan from, or have regular credit relationships with, a local commercial bank (e.g. *Scotia, EXIM, other*);
- Many smaller operators avoid taking loans to recapitalise equipment as they consider loan terms to be "unrealistic" (citing: *collateral, cost of credit, interest rates, guarantees required);*
- All complain of high interest rates (9-10 %) and excessive paperwork (especially from Development Bank Jam and EXIM*) – (the 'paperwork' may refer to the basic requirement for a Business Plan);*
- Investment Loans and also the legally required Quarry Rehabilitation Bond are covered by personal or company financial bank guarantees;
- Some larger operators (Group 4) have sought loans from international private financiers or through external family connections (Group 3, mainly in USA and Canada). One Group 4 operator stated that the bureaucracy at DBJ is such that he has found it to be more cost effective to seek standard commercial loans in order to recapitalise, given the time and productivity gained.

There is no evidence of gender bias in relation to accessing loans or capital. In a focus group held with women working in quarrying on 11th May 2017 in Kingston, the women confirmed that it is difficult to access the requisite development capital irrespective of gender.

The JBDC has good links with the EXIM Bank, the DBJ and some commercial banks (Scotia Bank has a development programme), and could provide development support to quarry entities who are seeking access to credit.

Access to Finance - Conclusions

- All of the above factors combine to prohibit quarry operators' ability to access credit with which to finance their operations, either for working capital or capital investment.
- There is a real need for capacity building in
  - (i) Business planning in order for quarry operators to be able to prepare credible business plans;
  - (ii) Understanding of markets, technical specifications and demand;
  - (iii) Training in resources and reserves estimation to international standards, and
  - (iv) Environmental management and planning to meet banking requirements of demonstrable socio-environmental responsibilities.
- Evidence of quarry management training could be considered as a requirement by regulation to acquire a Quarry Licence.

- There is a need for sensitisation of the lending institutions to the very considerable challenges facing Development Minerals operations. These businesses are not standard SMEs and require tailored financial products.

Research & Development

There are weak linkages from the educational and research institutes to the technical operational Development Minerals environment. This is reflected in the lack of formal training provision in the first instance and the lack of research resources for such activity in the second.

With the exception of a small number (<5) of Group 4 quarries, the culture of continuous improvement through R&D and use of ITC is weak throughout the sector.

This must be addressed if value adding is to become an integral part of the minerals value chain in Jamaica.

The proposal for the National Minerals Institute (Section 1.1) would be a positive step in promotion of research and development linkages, as well as training and continuous improvement linkages in critical 'softer' areas such as business management and planning for quarry operators.

The SLR team is aware that there are ongoing discussions among the MTM, MGD and the University of West Indies (UWI Sustainable Development Unit), as well as other key stakeholders, to develop a programme of training and research linked directly to the Development Minerals sector.

Component 4A: Assessment of environmental, health & safety, and economic impacts

The baseline assessment of the environmental, health and safety, social and economic impacts associated with quarrying and beneficiation of Development Minerals in Jamaica was undertaken to provide an analysis of the current status of these issues in an operational and community context (see Annex 1 for terms of reference). In each of the quarries visited, an informed assessment was made as to the current environmental, safety, health and socio-economic performance, as well as management of risks and impacts posed by the sector for workers and communities. This performance was assessed in relation to local community expectations and how these expectations are managed.

As the field assessments were undertaken within the specified study timeframe, by necessity they provide just a 'snapshot' in time, given that typically such analyses would be undertaken over a longer timeframe to monitor seasonal environmental and social/ customary changes.

The assessment was used to frame recommendations for future attention under the ACP-EU Development Minerals Programme.

For ease of reference, the Environmental, Health & Safety and Economic impacts of quarrying for Development Minerals are presented in this chapter as Component 4a while the Social, Gender & Youth impacts are presented in the subsequent chapter entitled Component 4b.

Field Methodological Approach

The methodological approach adopted for conducting the assessment of the environmental, health and safety, and socio-economic impacts of the Development Minerals sector is presented above in.

Environmental Context

Jamaica's environment is characterized by a high degree of biodiversity with a variety of coastal, freshwater and terrestrial ecosystems. The country has gained international recognition for its biodiversity and high levels of endemism of flora and fauna species, where it is rated fifth among islands of the world in terms of endemic plants (approximately 33% of the estimated 3,304 species of vascular plants occurring in Jamaica are endemic), birds and reptiles.

The island's terrestrial ecosystems include wet and dry forests, rivers, caves, mineral springs, rocky shores, herbaceous swamps, mangrove swamps, marsh wetlands and swamp forests. Over 30% of Jamaica's land surface is covered by natural forests, which include lower montane mist forest, montane mist forest, dry limestone forest, wet limestone forest, mangrove woodland, herbaceous swamp and marsh forest. Notable forested regions include the Blue and John Crow Mountains, and Hellshire Hills in south-eastern Jamaica, and the Cockpit Country in central Jamaica. These forests are the most important repositories of Jamaica's biodiversity, especially of endemic plants and animals[55].

[55] NEPA: http://nepa.gov.jm/new/projects/docs/yallahs_hope/adaptation_fund_jamaica_pro_doc_final.pdf

In the *State of the Environment Report 2013*, NEPA refers to mIning and quarrying in the context of the licensing and regulatory procedures. It alludes to the potential impacts such as land degradation and debris floods from hillside operations, and although it does not provide an assessment of the impacts of these activities, it refers to the high level of land restoration (97%) by the bauxite industry post-mining. NEPA insists that environmental integrity and socio-cultural values must be upheld, while avoiding mineral exploitation in areas protected under the *National System for Protected Areas* legislation (which specifies 'no mining' in protected areas where there are endangered species). This implies the establishment of a more responsible, cleaner and integrated mining industry within the wider economy[56].

Field Assessments: Environmental Impacts

During the field research, the SLR field teams assessed the levels of environmental planning, management and rehabilitation, as well as the environmental footprint of quarrying for Development Minerals.

Environmental Planning & Management

All visited quarries reported that they had prepared a Quarry Plan, as part of their licence application. In some instances this document was more than 25 years old. In just two instances (3.7%) did the current quarry operator show an actual Quarry Plan to the team, while less than five (9%) reported having one on-site. As part of the quarry application process, the applicant is obliged to produce an *Environmental Management* statement.

It was observed that the Quarry Plans (QP) are rarely updated over the life of mine; the QP should be considered as a 'living document' to be updated periodically as the quarry evolves and more material is extracted. Linked to this should be an updated Environmental Management statement and ideally a linked Environmental Management Plan.

Not one (0%) of the quarries surveyed had a valid Environmental Management Plan. Furthermore, not one of 54 quarries (0%) had a Mine Closure Plan ("*quarries in Jamaica never close*")

It was clear to the survey teams that none of the quarry operators follows the original Quarry Plan and there is effectively zero to very weak environmental management of operations among all quarry Groups 1-4. The larger internationally owned quarries have the best systems in this regard.

Environmental Permitting

Only one Group 4 quarry displayed their Natural Resources Conservation Authority (NRCA) / National Environmental Planning Agency (NEPA) environmental permit in public view at the site entrance (Photo 13).

[56] http://nepa.gov.jm/new/media_centre/publications/docs/SoE_Jamaica_2013.pdf (Section 9.3).

Photo 13 Environmental Permit/ Licence, Hodges Aggegates & Powders

It is unclear whether all others have been permitted to extract specific volumes of materials.

Environmental Impacts of Quarrying

The environmental impacts of quarrying for Development Minerals are very different to those of mining of metallic minerals. These natural minerals (limestone, gypsum, marl, shale etc) are largely non-reactive and stable in the local environment; thus the potential for chemical pollution or legacy reactivity is low.

The following potential environmental impacts were preliminarily screened for all quarry types, as typically these factors would be measured over at least one year period to account for seasonal and climatic variations.

- **Physical Footprint:** landscape area impacted by extractive activities
- **Noise:** emitted by crushing plant / transport by trucks on access roads;
- **Dust:** limited to crushing plant & roads leading in and out of quarries;
- **Water:** minimal impact in limestone areas due to karstic topography;
- **Chemicals :** almost zero, due to non-use in 99% of operations;
- **Fuels/ Oils:** requires systematic & safe disposal; and
- **Run-Off / Leachate** only an issue in river-run sand & gravel operations, mainly benign muds, but may cause turbidity downstream (fisheries, water usage by communities)
- **Old equipment** old machinery lying about the margins of the quarry
- **Habitat Destruction** by removal of natural vegetation

- **Biodiversity impacts** linked to habitat removal and cumulative effects
- **Visual impacts** on the landscape due to changes in natural topography and vegetation;
- **Cumulative impacts** accumulation of all activities leading to intensification of adverse impacts on the overall environment, particularly where clusters of quarries centre on particular quality materials.

The impacts were recorded on a site-by-site observational basis and through semi-structured interviews with operators. In all cases, for all sizes of quarries, it was clear that there is weak planning, management or monitoring of impacts. In particular, Types 1, 2 and 3 quarries lacked any formal systems for environmental management or recording of impacts. These issues are discussed below.

Physical Footprint

The environmental impacts of quarrying are largely physical and confined to the active quarry site. For most operations surveyed, there appears to be minimal impact outside of the immediate quarry footprint; for example, see Figure 18 (Group 2 operation). Habitat loss is largely contained within the quarry space and access roads.

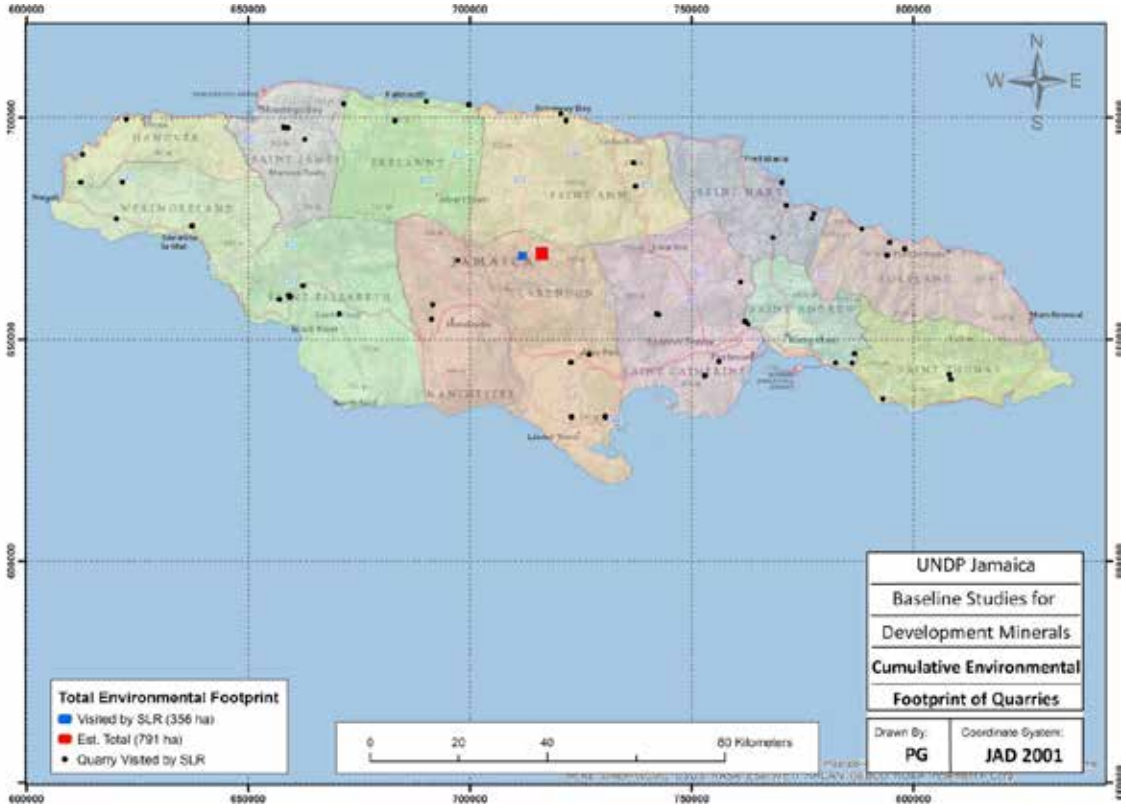
Figure 18 Remote location of QL1723, Westmoreland (from Google Earth)

The physical environmental footprint of the 54 quarries visited was calculated. The quarries represent 16.4% of the total licenced quarries (330 on MGD database, 2017), or 45% of the total number of active quarries (see Table 13 above).

For each of 54 quarries, using google earth imagery, the full physical footprint impact was assessed as **356 hectares** (890 acres). If the total impact is estimated against this footprint, assuming a similar size profile, the footprint of the 120 operational quarries (on MGD's website) would be **791 ha** (1,978 acres) or 0.07% of the total landmass of Jamaica.

If this area is plotted on the land area of Jamaica, the physical impact is seen to be small – see Figure 19 below (relative to e.g. housing, agriculture or forestry). The blue square represents the combined footprint of the 54 quarries, while the red square shows the cumulative footprint of 120 quarries.

Figure 19 Cumulative Environmental Footprint of Operational Quarries in Jamaica



(Blue square in centre of Jamaica is footprint of Quarries surveyed (May 2017); Red square is projected footprint of all 120 licensed and operational quarries in 2017.

This footprint (which does not include bauxite mining) may be compared with other resource rich jurisdictions, where the total amount of land used in mining is relatively small (compared e.g. with agriculture or forestry). In Peru, although 12% of the total land is under mining concession, only 0.08% of the country's land is estimated as being mined; in Brazil, less than 0.45% of the total land is under mining concession; while in Australia with its expansive mining industry, mining sites disturb less than 0.26% of total land mass[57].

[57] Fraser Institute, Canada – see http://www.miningfacts.org/economy/how-does-large-scale-mining-affect-agriculture/

Screening of Potential Impacts

Large quarry operators were conscious of minimising any adverse impacts on the local communities, while Group 2 and some Group 3 operators had little awareness of any potential impacts.

Noise impacts within the quarries are confined to crushing plant and in-house operations. Most (>90%) operations have natural vegetative screening along their perimeters which act as noise barriers. The noise of contractor trucks/ hauliers is outside of the control of most quarry operators, but community stakeholders who were interviewed did not mention transport volumes and noise as a problem for them.

Dust is a key potential impact of quarrying and **suppression** is a key mitigative measure in which impacts can be minimised and controlled – in larger operations, trucks sprinkle water up to four times daily to prevent particulate matter rising from haulage roads (Photo 14). In smaller operations, the problem is less pronounced, while one Group 3 operator in St Thomas spreads gravel along his haul road to suppress dust and avoid nuisance to neighbours.

Photo 14 Dust Suppression is a key issue for Quarry Sector

Low levels of particulate dust were raised by quarry vehicles in May 2017

Sprinkler truck suppressing dust on Quarry haulage road, May 2017

A large volume of **fuels and oils** are consumed in all quarries surveyed, which require systematic and safe disposal. This was not observed and is an area to be flagged for improvement among operators. Only one female manager mentioned this in discussion as an issue that she was working to improve by collection and recycling of waste.

Because of the benign nature of most minerals quarried, the issue of **run-off / leachate** is mainly an issue in river-run sand and gravel operations, generating suspended muds which may cause turbidity downstream. The Group 3, 4 river quarries visited use settling ponds to capture the fine muds before returning the water to the river system (Photo 15). This can impact on fisheries and water usage by communities. However, in at least three instances, fishermen were observed continuing their fishing activities downstream of S&G operations.

Photo 15 Mud Settling Pond
Mud settling pond at river-run Sand & Gravel Operation

Photo 16 Rusting Machinery in Quarries

The issue of **old machinery & equipment** lying about in quarries is largely concerned with visual pollution, as well as potential for rusty parts being a safety hazard (Photo 16). These items are used for 'patching' and for spare parts to maintain machinery, while many older operators have a quasi-emotional attachment to them. It is difficult to eradicate, but better storage and vegetative screening may be useful tools for operators.

The impacts of quarrying on **Biodiversity** are difficult to assess in the timeframe within which the field study was conducted; at least one year would be required to observe seasonal variations and responses of flora and fauna. The removal of habitat can create significant visual impacts (Photo 17) and loss of vegetative cover locally (Photo 18), as well as dust and noise impacts for roosting or breeding birds, with longer term cumulative effects on land and habitat integrity.

Photo 17 Visual Impacts of Quarrying can be Significant

The **landscape and visual impacts** of quarrying can be very pronounced in 'slope/ hill' quarries, and particularly where these are situated near to towns and cities (see below).

Guidelines for development of hill slope quarries to mitigate these impacts have been developed by MGD in association with NEPA.

Photo 18 Habitat Destruction can be locally Significant

Habitat destruction is a potentially significant impact of quarrying activity.

As shown in Figure 18 above, many quarry operations are located in zones away from housing and villages. Thus the impacts are contained within the quarry footprint and are not perceived negatively (among people interviewed) in the surrounding areas – see below for further discussion of impacts of Development Minerals on communities.

However, disused quarries provide certain refuge for plants and vines, ferns. Certain flowering native species were observed to be thriving in Group 2 quarries.

Blethia purpurea spp. (left) observed in disused Group 2 quarry in Portland.

However, the **cumulative impacts** of quarrying can be very significant, due to the longevity of operations and increasing footprint and abandonment over time – this has very clear negative impacts on habitat and biodiversity.

In the Google Earth image below of the John's Hall area of St. James' Parish, it can be seen that there are three to four significant quarrying operations in the zone (Photo 19). The impacts of one individual licence is not particularly significant, but the combined effects of dust, noise, vibration, habitat removal, heavy truck traffic etc. from multiple quarries in one locality can form a significant, cumulative environmental and social challenge for local communities.

Photo 19 Cumulative impacts of quarrying due to longevity and abandonment of Quarry sites

Rehabilitation & Restoration

It was observed that there was a complete and total absence of rolling rehabilitation or sequential restoration in all quarries, due to poor mine planning and management. This appears to be largely due to lack of knowledge about how to plan and manage a quarry correctly rather than wanton or blatant disregard for the environment.

There are very poor mine closure procedures in place for all quarries surveyed. None surveyed had prepared mine closure plans.

Despite the lack of planned quarrying restoration, it was observed in numerous redundant operations that "*nature reclaims its own*" and there is rapid vegetative regeneration once a site ceases to be operational (see below).

Biodiversity loss could not be quantified in such a rapid survey, but the native seed bank has the capacity to regenerate, at least in part, once operations cease (Photo 20).

Photo 20 Abandoned quarry (Type 2) vegetational regeneration, parish of St. Mary

Response of Environmental NGOs to Quarrying

The field teams contacted a number of environmental non-governmental organisations (NGO) to assess their attitudes to quarrying of Development Minerals. The responses varied (see below).

Environmental NGOs response to Quarrying

1. One local activist in an environmental NGO on the north coast stated that she recognised the need for quarry products. The NGO has objected in the past to coastal quarry operations and has been successful in preventing specific operations going ahead.

   The activist was clear that Jamaica needs much stronger zoning of Quarrying and effective regulation to preserve forest and upland habitats and biodiversity. She commented that once a quarry licence is granted, it is there for life and suggested that there are no penalties for infringement of the licence's environmental conditions.

2. A national environmental NGO, the Environmental Foundation of Jamaica <www.efj.org.jm> had no particular comments to make regarding quarrying of Development Minerals and noted that they had no programmes or community projects in train to deal with the environmental impacts of the activity, while they have active community programmes in bauxite mining areas.
3. Another national environmental NGO (Jamaica Environmental Trust, JET) was initially reluctant to discuss quarrying and its environmental impacts with the team. The CEO commented by email that "there are no Environmental Regulations in Jamaica. There is an organization that does not do its job. Evidence of this includes the numerous un-restored bauxite mined out pits in Jamaica, as well as the leaking residual pit left behind by the gold mining operation in Clarendon".

At the team presentation of Draft Key Findings (15 June 2017), a senior representative of the JET strongly expressed concern at the licencing of beach sands extraction in Trelawny parish, and the fact that this activity was not considered in the above review. In response, the team noted that from the original list of active quarries selected for assessment, beach sands were not listed on MGD's website as 'licensed' in March 2017 when the selection was made (see).

The representative of JET also suggested at the June presentation that communities are not speaking out as they are "being 'paid off' to stay quiet" and not complain about the levels of noise, dust and public health impacts of quarrying.

In the consulting team's experience and discussions with community residents and actors, there was no evidence of such payments during the consultation phase.

Key findings: Environmental Impacts

- **The cumulative environmental footprint of the 54 quarries visited is estimated at 356 hectares** (890 acres). Assuming a similar size profile for all 120 operational quarries in Jamaica, the footprint of the 120 quarries would be **791 ha** (1,978 acres).
- On balance, due to the chemically inert nature of Development Minerals, the environmental impacts of such quarrying are **significantly less than those of metallic minerals mining.**
- **There is an almost universal lack of systematic environmental planning, management and monitoring in the quarry sector, irrespective of size (Group 2, 3, 4).** There are key environmental issues that need to be addressed in terms of training in quarry planning and management, environmental planning and management; rolling rehabilitation and restoration of lost habitats.
- Higher capacity quarry operators (Group 3, 4) are **aware that environmental management is important** and are keen to receive training in environmental planning and management. Most Group 2 and some Group 3 operators are not so aware of the need for environmental management to international standards.

- **Regulation and enforcement of environmental law and standards needs to be considerably strengthened**, as pointed out by environmental NGOs.

Baseline Field Assessments: Health & Safety

There are two key aspects to health and safety in quarrying for Development Minerals:

1. Quarry Management & Geotechnical Safety
2. Occupational Health & Safety

These are addressed separately below.

Assessment of Geotechnical Safety

In almost all quarries visited (98%), there was zero advance spatial planning of the quarry to design appropriate benching and future quarry progression. There was an almost total absence of benching (just 1 of 54 demonstrated a good standard of benching).

Photo 21 Lack of benching and practice of 'rip and slide' from the top leads to dangerous slopes

Many quarries use gravity to excavate materials at the surface of the quarry and simply 'rip and slide' the material downhill. This leads to irregular, over-steep slopes on quarry faces and significant dangers for people working in the base of the quarry (Photo 21, Photo 22, Photo 23).

Photo 22 Group4 Quarry, operating for decades, uses the natural dip of the limestones to slide excavated materials from the top of the quarry to the toe for crushing. Note the lack of benching.

Photo 23 Group 2 Quarry rips material at the top and slides it down to the toe of the quarry for loading and sale.

Examples of good benching were seen in just two quarries, where bench heights were less than 5m and of similar height along the productive face (see example, see Photo 24 below).

Photo 24 Group 3 Quarry: Good benching leads to more efficient & selective production, while reducing the potential for accidents

Many Group 2 quarries also use a simple ripping mechanism to excavate soft limestone and marl beneath the (harder/ indurated) weathered cap, leading to dangerous overhanging material in many cases (Photo 25).

Photo 25 Ripping of 'soft' material from the base of the quarry face leads to dangerously unstable quarry overhangs

Occupational Health & Safety

Occupational Health & Safety (OHS) is defined as the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health**,** controlling risks and the adaptation of work to people, and people to their jobs (ILO / WHO 1950). This definition has not changed significantly since the 1950s, but

there has been an increasing emphasis on the duty of care of the employer to the employee in international labour law and the responsibility to provide a safe workplace through training in all aspects of safe working, suited to the job or tasks in hand. Similarly, there is a duty of care for trained employees to work safely, observe rules and regulations and to take responsibility for one's own actions.

The following provides field observations on aspects of occupational safety that were recorded during the surveys, as time constraints did not permit any assessment of occupational health issues.

OHS Safety Management

The total number of people employed in the 54 surveyed quarries numbered 788 (88% male; 12% female.

- Despite the numbers of employees, ranging from 1-76 people in the 54 site operations surveyed (Groups 1-4), just two quarries (internationally owned) have a formal *OHS Management System*.
- Of the 54 operations, just two quarries (internationally owned) have an *OHS Training System* to provide duty of care through safety training to their employees.
- Many Group 4 operations had partial but undocumented OHS systems, without any formal records of employee training, accidents, incidents or lost time injuries.

OHS Quarry Signage

Of the 54 quarries visited, c. 5% had adequate safety advisory signage (Group 4 operations), while 95% had no safety signage either on the approach to, or within, their operations (Groups 1-3) - Photo 26.

Photo 26 Samples of mixed quality Safety Signage in Quarries surveyed

In just one of 54 quarries visited were team members asked to sign-in as 'Visitors' on the safety register.

Personal Protective Equipment

Only one quarry formally asked the SLR Teams to adopt Personal Protective Equipment (PPE), while on site. Less than 5% of quarries displayed personnel wearing the correct PPE (Photo 27) although up to 50% of Group 3 and 4 managers reported that they had issued safety boots, hard hats and high-visibility vests to their staff[58] (Photo 28).

In one Group 4 quarry, working to international standards, the manager insists on staff wearing their PPE, with a penalty of dismissal if this rule is breached more than three times.

Photo 27 Quarry worker with no PPE, exhibiting dangerous behaviour also

Photo 28 Quarry Personnel wearing correct PPE

On the other end of the spectrum, in a Group 2 quarry, personnel (or site visitors?) were observed walking barefoot outside the office area.

Sanitation for Employees

Any quarry that employs women has reasonable to excellent office facilities, with separate bathroom and clean sanitation in the office areas (Photo 29).

Photo 29 Office environments were observed to be clean with good sanitation facilities

[58] Two quarries reported that when they issue PPE, the staff keep the boots for personal social use, such as dancing, and do not wear them to work.

In other cases (Group 3, 4) the employees are provided (as required under law) with clean canteen facilities to eat their food. This varied in quality, depending on the attitude of management, size of operation and resources available (Photo 31).

Photo 30 Staff Facilities varied according to size of Quarry Operation

Group 3 staff facilities

Group 4 staff facilities

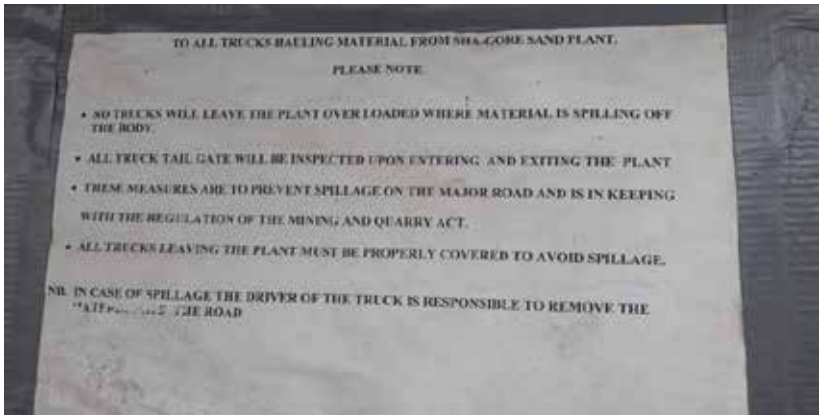
Transportation Safety

The control of truck safety is beyond the reach of most quarry operators, as most (>90%) transport of minerals is contracted out to haulage firms, or the clients themselves collect materials ex-works. Large companies operate their own truck fleets, but also use contract hauliers as needs arise.

The National Works Agency (NWA) has rules concerning the weight of loads that can be carried in specific sizes and capacity of trucks. Most Group 4 and some Group 3 quarries have weigh-bridges which control the weight of despatch trucks, however there appears to be a 'blind eye' approach to the load weights in many Group 2/ 3 operations, with overloading of the trucks to cut transport costs. A number of operators in St Thomas complained that the enforcement of the correct weights by the NWA was significantly impacting their cost base.

Some quarries display signage that warns the truck drivers concerning appropriate weights (see Photo 31) to prevent spillage on public roads (and thus hazards to the public and other motorists).

Photo 31 Site safety notice concerning overloading of despatch trucks



OHS: Accident & Incident Rates

The reporting of accidents, incidents and near misses is almost non-existent among quarry operators. An 'accident' is almost universally understood to mean a 'fatality' and even then, reporting is very poor.

The concept of 'near miss' reporting or its value in reducing more serious incidents/ accidents is totally absent.

For the quarries that reported any fatalities, accidents or incidents, there have been 5 accidents that are classified as 'lost time injuries'. There were five (5) fatalities recorded by three Group 4 operations over the past ten years. In at least one case where a single fatality had occurred in a single incident, the operator confessed that he had not reported the fatality to the Mining Regulator or the relevant national authorities.

Table 24 Fatalities Accident & Incidents / 10 years

INCIDENT	Number / last 10 years	Reported officially?
Accident *Lost Time Injury*	4	NO
Fatality	5	One definitely NOT
Near Miss	1	NO
n = 54 quarries *(not all operating)*	*788 employees* *12% female*	

In one quarry, the operator noted that the neighbouring quarry (*not visited*) had a fatality where a tractor that was working on the top of a steep incline, pushing material downslope, had also slipped over the edge. The driver was killed instantly. It is unknown if this was reported to the authorities.

There is almost certainly a severe under-reporting of accidents, fatalities and near miss incidents. The larger operations (Type 4) are the most likely to report any OHS incidents. A very high percentage (>70%) of operators interviewed identified training in safety management as highly desirable.

There was no possibility to calculate Lost Time Injury Rate Frequency (LTIFR) as the data were too inconsistent, with no recording of total hours worked by any operator.

Key Findings: Health & Safety Impacts

- The observed standards of Geotechnical safety management are critically weak and will require significant capacity building to improve safety standards across all operations.

- There are very poor standards of Occupational Health & Safely management and training systems across all types of quarrying.
- A large percentage of operators asked for training in OHS, recognising that poor practice is bad for their employees, reputation and the business.

Recommendations: Health & Safety Impacts

- Training in Quarry safety planning, management and training is recommended as a key outcome of the ACP-EU Development Minerals Programme
- Strengthened regulation of Occupational Health & Safety is strongly recommended in basic principles of duty of care to employees in the workplace, with related sanctions.
- Training in the requirement for reporting of Health & Safety incdents and accidents to the appropriate regulatory authorities is strongly recommmended.

Socio-Economic Impacts of the Sector

This section provides an assessment of the socio-economic contribution of Development Minerals in Jamaica.

Tax Contribution of Quarrying

All licensed Quarries are obliged to report their production (tonnes/ cubic yards) and sales of quarried minerals to the Mines Commissioner on a quarterly basis. For all production, the licensee is required to pay a royalty of 3- 3.5% of the market value to the Ministry, although this has recently changed and the Ministry of Finance will collect this tax forthwith. The tax rate is 5% for any quarry minerals sold by operators of a mining lease. The General Consumption Tax (GCT) of 16.5% is charged on all local aggregates sales from the quarry.

The MTM Industrial Minerals Survey (2016) reported that of 86 quarries surveyed in 2015, 7 Mt of material was produced, worth J$7.28 billion (approx. US$57 million). Assuming a 3% royalty on production, MTM calculated that the Quarry Sector contributed J$218,400,000 (US$1.7 million) in royalties to the exchequer.

Employment in the Quarry Sector

The quarry sector is a significant employer in dispersed rural areas across the island of Jamaica. The 2015 MTM survey of local Development Minerals quarries[59] estimated that 826 persons were directly employed by 40 quarry operators interviewed for the survey (47% of total, 20 jobs per operation), while the total estimated number of persons employed in 86 operators reporting production during 2015 was **1,720** persons (20 jobs per operation).

Approximately 91% of the direct employees had achieved primary and secondary level education, while only 7.25% had received any formal training in mining and quarrying or other related subject areas. Of the surveyed machine and equipment operators, 32% had received formal training to operate their equipment (see Table 23).

[59] *MTM Survey of Local Quarry Operations (2016)*

Table 25 Number of Trained Employees by Parish in 2015

Parish	Total No. of Employees	No. of Employees Formally Trained in Mining/Quarrying	No. of Employees Formally Trained in Mining/Quarrying as a Per cent of Total Employees
Kingston and St. Andrew	34	1	2.94
Clarendon	154	16	10.39
Portland	26	0	0.00
St. Mary	43	10	23.26
St. Ann	58	7	12.07
St. Thomas	89	6	6.74
St. Catherine	69	12	17.39
Hanover	3	0	0.00
Westmoreland	24	3	12.50
Trelawny	65	2	3.08
St. Elizabeth	72	0	0.00
St. James	69	0	0.00
Manchester	120	3	2.50
Total	826	60	7.26

Source: MTM Industrial Minerals Survey (2016)

Of the 54 quarries surveyed in the current baseline assessment in 2017 (*many of which were in Group 1 (17%) or Group 2 (28%) with zero - low levels of employment*), there are **788** recorded employees, averaging 15 employees per site. If the figures for the 54 quarries (45% of 120 total registered 'active' quarries on MGD's website) are extrapolated proportionately, it is estimated that **1,750** people are directly employed in 120 active Development Minerals operations in Jamaica in 2017.

In 2017, each surveyed quarry type employs the following numbers (see Table 26; Figure 20):

Table 26 No. of Employees by Quarry Type

QUARRY GROUP	NO. EMPLOYEES (MAY 2017)
Groups 1 / 5	**No employees**
Group 2	**2-4**
Group 3	**3-5 employees**
Group 4	**6-76**

Based on the fact that quarries generate a high ratio of indirect employment, the MTM (2016) estimated that certain job types created different levels of indirect employment (e.g. transport, equipment suppliers and mechanics generate one indirect job per direct job, while a ready-mix concrete and pre-casting job creates potential for 2.7 indirect jobs[60]. The MTM thus estimated that for **1,720** direct jobs, between **6,880 - 8,600** persons were indirectly employed, or approximately 4-5 indirect jobs for each direct job.

If this factoring is applied to the 2017 estimate of **1,750** direct jobs, then **7,000 – 8,750** indirect jobs are created for the entire sector.

The decrease of average jobs per quarry from 2015 (20 employees) to 2017 (15 employees) may

[60] The calculation of the level of indirect employment per direct job used the methodology of the *MTM Industrial Minerals Survey (2016, page 12)* to allow direct comparisons.

be reflective of employers trimming their employment budgets in the tight economic environment. However, the total employment data, both direct and indirect, appears to be slightly higher from 2015-2017 due to the higher number of producing quarries and measured growth in demand from the domestic construction and hotel sector[61].

There are limited alternative sources of income for people employed in the quarrying/ mining sector in rural areas, apart from agriculture, forestry and low-paid jobs in coastal tourism resorts. Thus, the employment opportunities generated by quarry operations are deemed to be very significant.

Employment & Gender

In the Quarry Survey conducted in 2013 by the Ministry of Science, Technology, Energy and Mining (Policy, Planning and Development Division), of a total of 986 operators, 90 females in the workforce were recorded (9%).

The ACP-EU Development Minerals Programme draft *Roadmap for Capacity Building of the Development Minerals Industry in Jamaica (2016, page 8)* noted:

> "*The average employment in the Mining industry in 2015 was 5,800 persons, which was 5.7 % reduction in comparison to 2014 when the average employment was 6,150. Moreover, male employees constitute the majority of the labour force for the Mining sector, where 5,300 employed persons were males and 500 were females (9.4%). This may be owing to the fact that the machine operators, electrical engineers, mining engineers and other mining jobs are usually male dominated jobs, which makes up the majority of the mining industry".*

In the current study (2017), the proportion of male to female employees in the Development Minerals sector is 88% male:12% female, which is in line with the MTM quarry survey of 2015 (89% male; 11% female). Thus while the total number of direct employees is rising, the relative number of female employees is largely static. Most operations visited employ less than three women (see Figure 21).

[61] In 2016, total domestic cement demand improved by c. 3% compared with 2015 due to increased demand in infrastructural projects and hotel construction…Continued growth of the domestic market is expected, driven by increased infrastructure projects, private developments, and retail consumption ((Caribbean Cement Company - Annual Report 2016, p. 16).

Figure 20 Development Minerals Quarries in Jamaica: Total No. of Employees

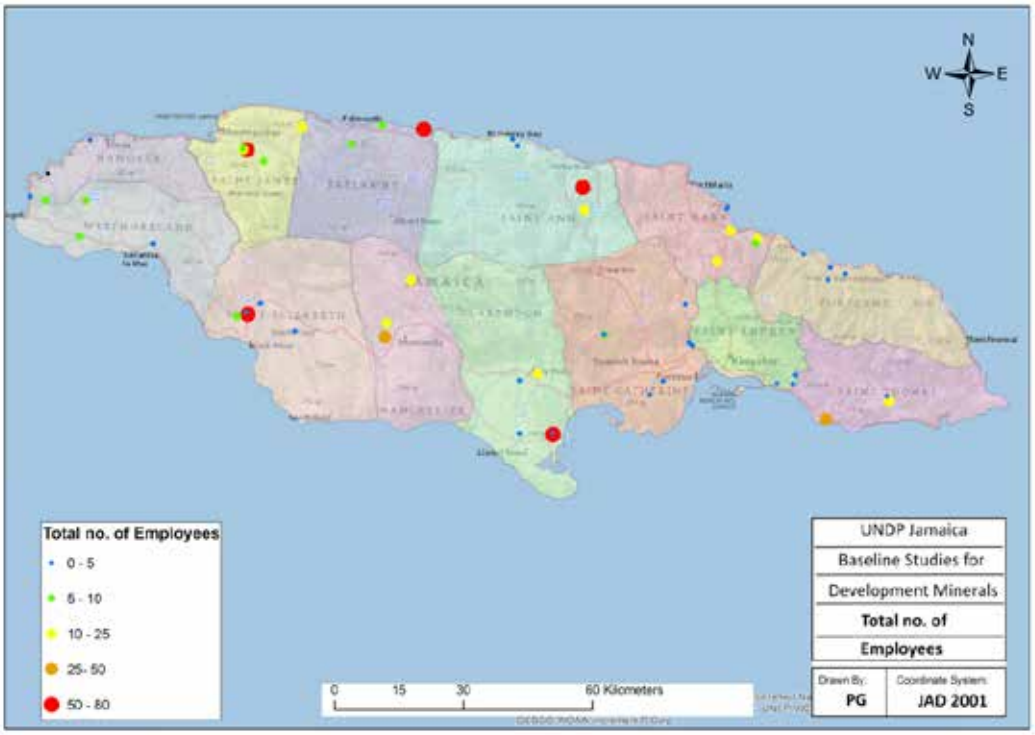


Figure 21 Development Minerals Quarries in Jamaica: Total No. of Female Employees

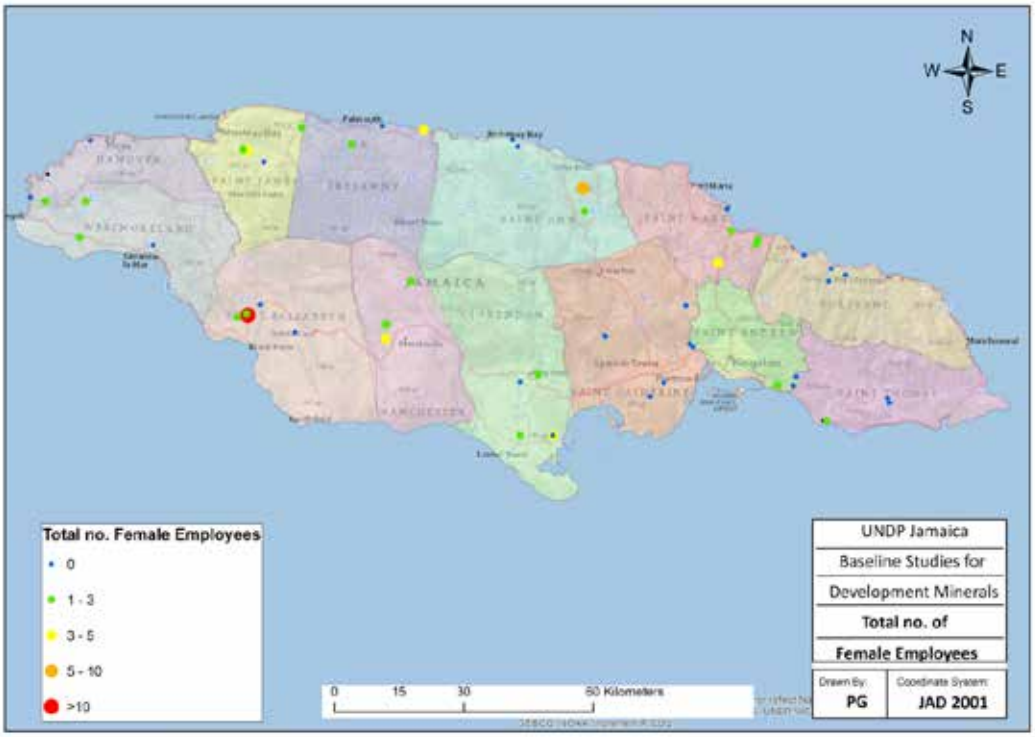


Photo 32 Father and Daughter management team at Shaw's Quarry, St. Ann

Source: SLR – Ms Michelle Shaw-Elliott and her father Mr. Wayne Elliott, 2017

Women are mostly employed in office roles as receptionist/ administrators, office managers, ticketing clerks, accountants or in executive management roles. There is a number (c. 4-5) female owner-managers in the quarries surveyed. Most have entered the Development Minerals sector through family connections (marriage) and / or inheritance from parents, frequently working with a founder parent (Photo 32), but bringing advanced management and business skills due to their increased educational access.

In one quarry, there was a young female manager, working on behalf of the owner to supervise an operating staff of 13. This same quarry unusually had two female operatives working in the crushing plant.

One Group 3 employer commented that he liked having women working as supervisors, as he felt that they are more focused on their tasks and responsibilities. Another commented that men work better under female supervision, as they were aware that the women would be 'watching' to ensure they completed their work.

Employment Conditions

In all quarries surveyed, there were common issues in terms of working conditions.

- Typically operatives work 5-6 days per week, 9-10 hours (7am/8am – 5pm)
- Larger operations have defined holiday benefits.
- In Groups 3, 4, employees are mostly full-time employed, with contracts in Group 4.
- In Group 2, most employees are employed without contracts or on a casual basis when the quarry 'pops-up' for a specific term.

The surveyed companies reported that they pay employment taxes and contribute to pension funds. Wages are reported as "above average" by c. 23% of Group 3/ 4 operator/ managers, which if benchmarked against the minimum wage (*J$6,200/ 40 hour week or $155/ hour*) is certainly above average[62].

[62] National Minimum Wage in Jamaica was increased in March 2016 to **$6,200** per 40 hour week. The hourly rate is $155; time-and-half rate is $232.50, and double-time rate is $310/ hour. See http://jis.gov.jm/minimum-wage-rates-effective-march-1/

The following ranges of wages were reported from a selection of quarries *(noting that many operators were reluctant to discuss wages – these data came from the operatives themselves)*:

- Plant Supervisor J$100,000/ week
- Overseer J$400/ hour / Operatives J$300/ hour
- Dozer/ Loader Driver J$600/ hour

Case Study: Young Male Quarry Overseer, Type 3 Quarry, St James

A member of the SLR team spoke to a young man, who was a working as a crushing plant supervisor at the Quarry (while waiting for the owner to arrive). He is from St Marys but has been working in St. James at the quarry, full time without contract, for three years. He only goes home every few weeks to see his family. He said he has a good relationship with his boss and the boss' wife. Two of the quarry operatives are from Westmoreland, while three are from the local area.

The young overseer works 5-6 days per week, from 8am-5pm (depending on customer orders). He does not have defined holiday benefits, and only gets paid when he works, although can get time off when he needs. He is paid J$400/ hour as the overseer, while the general workers in the quarry get paid J$300/ hour.

Photo 33 Male Overseer, Type 3 Quarry

The overseer (left, photo) has not had any formal training, but has learned his role on-the-job. There is no trade union representation in the quarry.

There used to be one woman working in the quarry, but none now. He asserts that the male workers prefer not to have women in the quarry, but did not say why.

Many employees reported that they are given additional supports in the form of food/ housing/ medical and other family support. There is a broadly 'paternalistic' view of employees' welfare, possibly stemming from Jamaican family culture. One Group 4 company manager, which pays well, stated that "*everybody is entitled to a living wage*".

Level of Livelihood Diversification

Despite the significant job creation, there is limited diversification of livelihoods within the quarrying of Development Minerals, related to a number of constraints, but in particular due to:

(i) the limited access to training and education for specific skills within the sector.

(ii) Limited value adding in Jamaica, which would require advanced process engineering, quality assurance systems, management of marketing & sales etc.

These constraints inhibit both the potential for development of human capital in Jamaica and the advancement of the sector itself.

Economic Linkages to Other Sectors

The economic linkages to other sectors drive the Development Minerals business, as the production of construction materials and industrial minerals are critical to the functioning of other socio-economic activities. These include road construction (aggregates), housing development (cement, blocks), agriculture (fertiliser, lime) and many industrial processes (paint manufacture, toothpaste, plasterboard, pharma and food additives etc).

The 2015 survey of industrial minerals by the Ministry of Transport and Energy quantified these relationships as percentage of quarry materials utilised by other sectors (see Table 27).

Table 27 Percentage of Quarry Materials Utilised by other Sub-Sectors (MTE, 2015)

Material	Cement Manufacture	Block Manufacture	Building Construction	Lime Manufacture	Road Construction	Others	Total
Limestone	45%	7%	32%	3%	12%	1%	100%
Gypsum	100%	0%	0%	0%	0%	0%	100%
Sand and Gravel	0%	3%	78%	0%	18%	1%	100%
Marl & Fill	0%	2%	48%	0%	47%	2%	100%
Shale	100%	0%	0%	0%	0%	0%	100%
Pozzalan	100%	0%	0%	0%	0%	0%	100%
Andesite	0%	0%	0%	0%	100%	0%	100%

Economic Links: Critical Infrastructure

Infrastructure was mentioned by many operators as a key constraint to their potential to develop new markets, both domestically and regionally. An overview of the national transport and energy infrastructure was conducted as part of the field study. This identified **four key areas** in which the infrastructure is critically impeding the Development Minerals sector in Jamaica.

Road Network

With the exception of the T1 highway (*under construction*) Kingston – May Pen - Mandeville and the T3 highway from Spanish Town to Ocho Rios, the primary and secondary road network is poor to moderate in condition. The North Coast Highway (A1/ A3) is not of motorway standard.

It is challenging for medium-large size trucks to negotiate these roads, for intensive, repetitive haulage loads.

It was suggested that the use of a modern 20-tonne (20t) truck fleet could supply the domestic demand, but large (up to 40t) trucks would be required for any future (expanded) export activity.

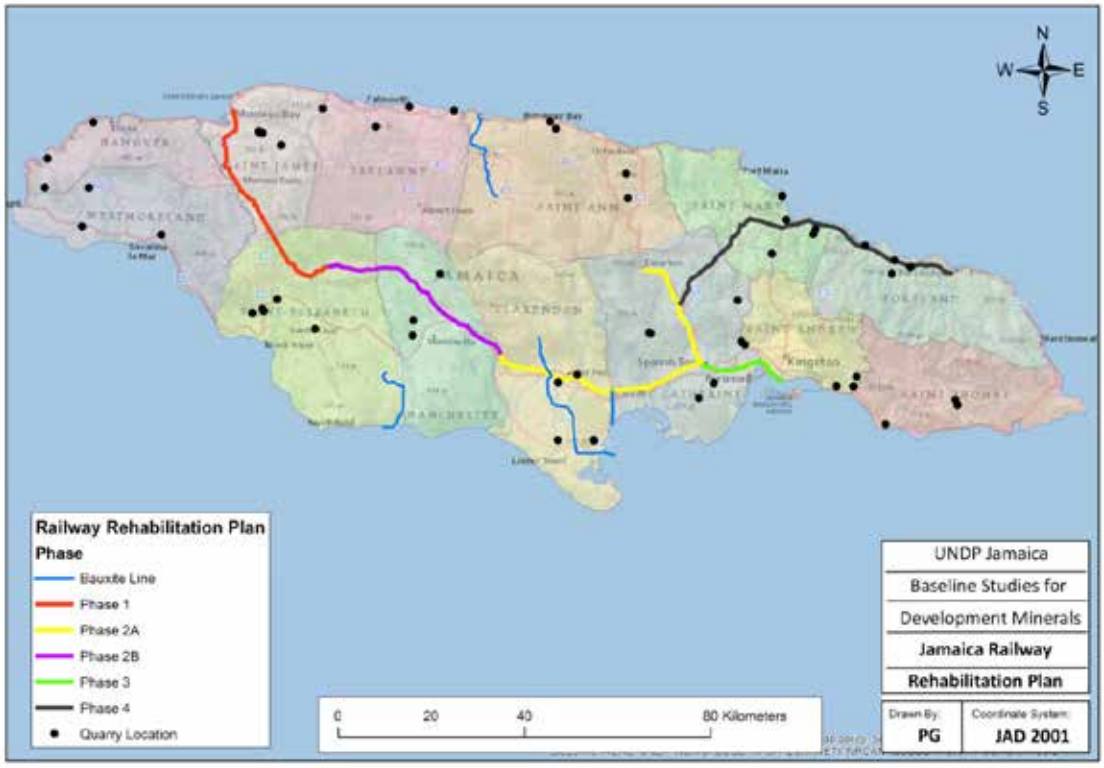
Road tolls are very expensive for truck haulage and with increased regulation of load weights, are prohibitive for many small operators.

Railway Network

There is currently no public operating railway in Jamaica, although there is a defunct rail network in place; thus use of the railway network is currently not an option for most quarry operators.

There are a number of short private railway spurs to bring bauxite to the key ports (Figure 22). A Memorandum of Understanding (MoU) was signed between the Ministry of Transport & Mining (MTM) and Jamaica Railway Corporation (JRC) in December 2016, for phased rehabilitation of the main segments of the old network (Figure 22).

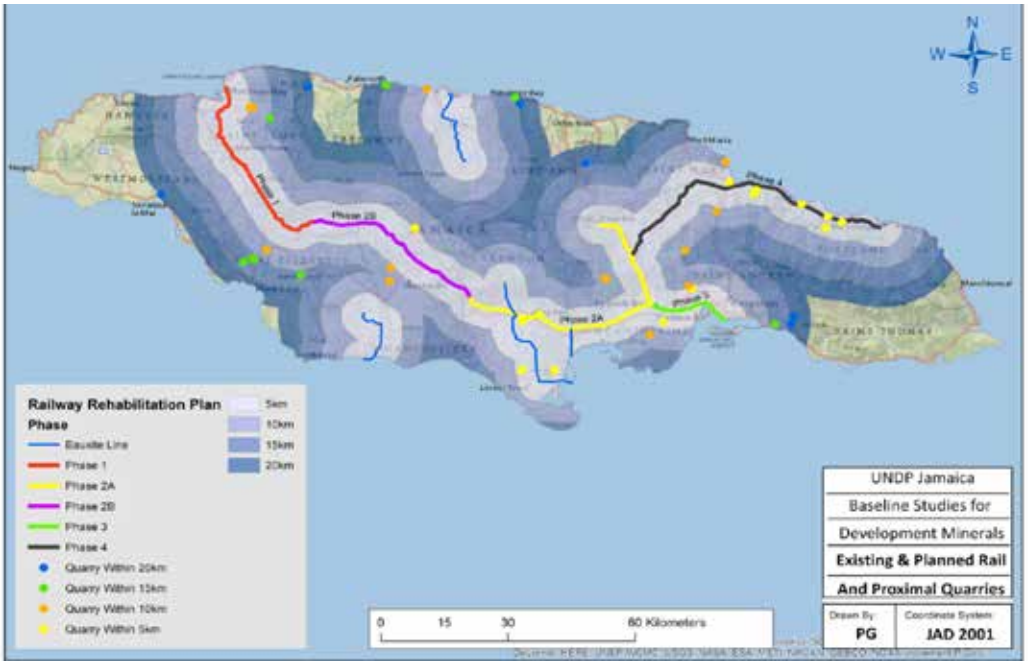
Figure 22 Map of phased Railway Rehabilitation Plan for Jamaica



When the 54 visited quarries were plotted in relation to distance to railways, it is clear that most operating sites are within 15-20 km of a railway line (Figure 23 below).

It is clear that effective railway planning and commissioning is an essential element in the future expansion of the Development Minerals sector.

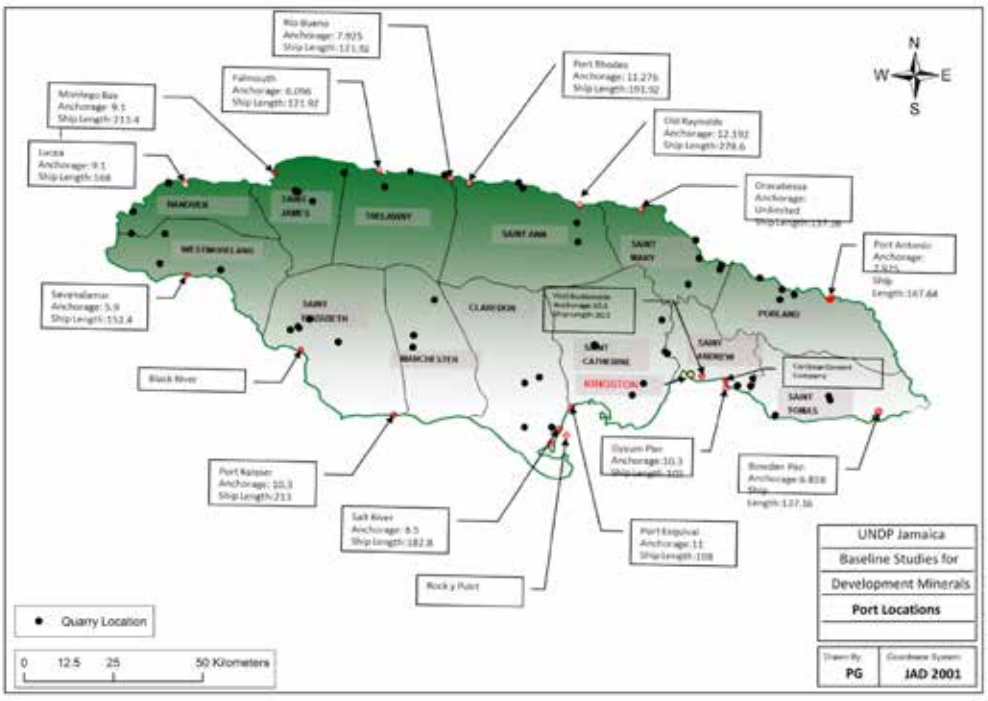
Figure 23 Proximal Quarries to Rehabilitated Railway lines - Jamaica Rail Network



Ports Infrastructure

There are up to eighteen historical ports arrayed around the coast of Jamaica (Figure 24), many of which are in private ownership of mining / quarrying companies.

Figure 24 Quarries surveyed in relation to existing Port network, Jamaica (2017)



Source: Base map kindly supplied by Mr. Norman Davis – also MTM Industrial Minerals Survey (2016).

The issue of broader industrial access to the ports infrastructure has been debated in Jamaica over many decades. There has been a focus on de-industrialisation of the ports with a view to attracting increased tourist cruise liners. In our consultations with state authorities and with quarry operators, it is clear that:

- The Harbour Head Port in St. Andrew and the Ocho Rios Port in St. Ann are the only ports facilitating bulk handling of aggregates (MTM 2016).
    - There is a small number of operating ports (Kingston and Montego Bay, and Harbour Head (*CCC owned*)) with appropriate bulk handling facilities for export of Development Minerals consignments.
    - There is no infrastructure for containers and bulk handling in other port sites.
    - Loading and unloading facilities are restricted
    - Access to e.g. Ocho Rios for bulk materials requires crossing of the North Coast Highway, frequently causing delays to traffic.
    - There is a defunct under-road conveyor belt system at Ocho Rios that could be rehabilitated to convey materials under the road into the port more efficiently.
- Several of the existing ports are significantly under-utilised (30-40%), including some of the private Bauxite ports.
    - Many of the private bauxite ports are reluctant to handle other materials through the ports for fear of contamination of the raw product. This is disputed by many of the limestone producers in particular as un-necessary, as lime is used in the refining process of bauxite to alumina, post-shipping of the source materials (i.e. thus cannot be considered as a contaminant).
- There is poor inter-connectivity between the ports using the existing road or rail network.

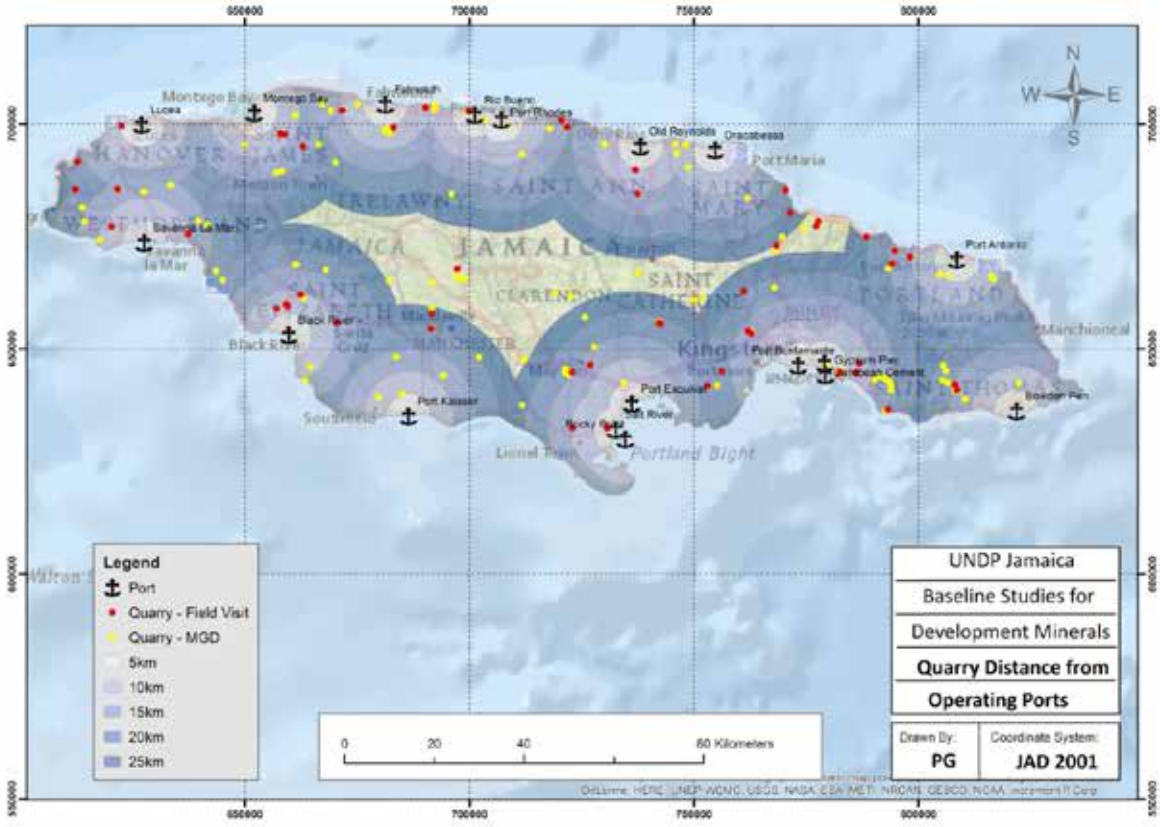
A short review of the existing port network was undertaken during the field survey, and all quarries, including those on the MGD database, were plotted in relation to their access to the ports (see Figure 25 below).

It is clear from the map that most surveyed quarries lie within 0-15km radius of the existing port infrastructure. A further minority lie within 15-25km, while a smaller minority lie well beyond 25km.

It is also clear that accessible multi-purpose ports, which can accommodate both tourism/ leisure and industrial/ commercial purposes, are widespread internationally and these functions are not mutually exclusive.

Significant appraisal of the bulk handling, conveyor systems, loading / unloading facilities and future proofing of requirements is required to determine which ports could or should be enhanced in relation to future export capacity for Development Minerals. A minimum of five (5) strategically located, multi-purpose ports should be considered for Development Minerals access. This must be expedited urgently by the relevant authorities if the sector is to develop.

Figure 25 Quarry Distance to Port Infrastructure, Jamaica



Red spot: *surveyed Quarries (SLR 2017)* ***Yellow spot****: additional quarries on MGD database*

The Prime Minister of Jamaica (Jamaica Observer, 19 July 201763) announced the rehabilitation of the 110-kilometre roadway between Harbour View, Kingston, and Port Antonio, Portland, under the planned US$384 million *Southern Coastal Highway Improvement Project* (SCHIP), which is due to commence in early 2018. Linked to the road development, the Port Authority of Jamaica plans to upgrade the Bowden Pen wharf in St Thomas (see Figure 25) to a bulk port to facilitate the movement of aggregates, in support of development of the limestone industry in St Thomas, as well as removal of heavy traffic off the planned new highway.

In consideration of the requisite national ports infrastructure, cognisance must be taken of the impacts of climate change on the coastline of Jamaica. According to a UNEP 2010 report, *Linking Ecosystems to Risk and Vulnerability Reduction: The Case of Jamaica*, beaches in the west have been eroding at a rate of 0.5m/year at Negril and 1m/year in Bloody Bay and Long Bay respectively, over the past 40 years. Some sections of beach have retreated more than 55m during that period. Evidence suggests that these trends are likely due to accelerated sea level rise which was estimated at 0.14 m from 1968 to 2006, as well as recent intensification in storm wave and surge activities in the Caribbean region[64].

[63] http://www.jamaicaobserver.com/news/no-toll-on-upgraded-road-to-st-thomas-portland_105322?profile=1338&template=MobileArticle

[64] UNEP (2010). *Linking Ecosystems to Risk and Vulnerability Reduction: The Case of Jamaica*. RiVAMP - Risk and Vulnerability Assessment Methodology Development Project. See: http://www.grid.unep.ch/product/publication/download/RiVAMP.pdf

Plans for roads, railway and ports developments have been considered for many years and it is crucial that phased developments are executed without delay to allow quarry operators access to cities and ports to deliver materials to markets domestically and regionally. This must be undertaken in the context of rising sea-levels and accelerated storm wave surges in the Caribbean region.

Cost of Energy

By nature, the processing of minerals is an energy intensive activity. The cost of energy was an issue of major concern to quarry operators during the survey. Many have taken the decision to go-off-grid due to the perceived exorbitant costs of standing charges for grid access.

The following were noted:

- High connection and standing charges for access to the JPS grid (cited as J$400,000 month for one quarry);
- Energy costs are very high in Jamaica (US$ 0.33-0.35/ Kwh), which is almost double that of the USA and EU; and up to five times costlier than that of Columbia/ Venezuela.

The energy mix requires review both for electricity generation (oil vs gas) and for consumption.

The swing to renewable energies, including wind and solar, may require initial public subsidies but should in the long run bring down the cost of energy, as evidenced in Europe.

Energy policy and pricing in Jamaica, "*which is killing the industry*" according to one respondent, must be addressed to facilitate the SME enterprises within the Development Minerals sector.

Economic Linkages: Art/ Ceramics/ Stone/ Craftwork

The island of Jamaica hosts a number of small marble deposits, semi-precious stones and a host of other minor mineral deposits (see Figure 9 above, after Busby 1990). MGD has been working with the '*Stone Crafts Project'* to assess the potential exploitation and marketing of these mineral resources. MGD selected two projects: the (i) Mendez Hill Stone Crafts Project and the (ii) Semi Precious Minerals Project. It has been working to highlight the availability of these materials to local investors and artists, in association with the Ministry of Culture, Gender, Entertainment & Sport and the Ministry of Tourism[65]. It has also aimed to develop a monitoring and management system for the responsible prospecting and collection of gemstones and other minerals.

The MGD identified four possible sources of materials in St Andrew, close to Kingston:

1. **Alabaster** (Bito, St. Andew)
2. **Kintyre Porphyry** (Kintyre Porphyry)

[65] *www.*mcges.gov.jm / www.mot.gov.jm

3. **Halberstadt Limestone** (Bito, St. Andrew)

4. **Stream Sediments** (Hope River, St. Andrew)

The idea is to facilitate the creation of *objets d'art* from stone and minerals through a sustainable supply of raw materials to the creative industry. Funding of this initiative has been challenging.

Other ***agate*** and ***jasper*** occurrences in Jamaica (*Yolanda Drakapoulos, pers. comm*) are recorded in the Rio Nuevo and Tiber River in St. Mary; on the beach at the mouth of the Rio Nuevo; in stream beds in Clarendon and near the Trelawny-Manchester boundary. These materials could be a source for niche jewellery making. Additionally, ***silicified wood***, although not strictly a semi-precious stone, could be used in the craft industry. It is recorded in areas such as Smithville, Kellits and Crofts hill in Clarendon, Guys Hill in St. Catherine and in the Hector's River near Troy in Trelawny.

During 2016-17, the ACP-EU Development Minerals Programme in Jamaica has engaged actively with artists that use clays (pottery, ceramics) and semi-precious stones (jewellery) in their creative work.

On 11/05/17, a focus group, facilitated by the Jamaica Business Development Corporation (JBDC), was held by the SLR team with artists, ceramicists and jewellery-makers at the Pegasus Hotel, Kingston. Members of the group had travelled with the ACP-EU Development Minerals Programme to Tanzania in April for training and capacity building. They were inspired by the level of collaboration and integration of raw materials, services and equipment that Tanzanian artists enjoy at the African Minerals Development Centre in Dar es Salaam.

In discussion of these issues, it is clear that the Jamaican artistic community are seeking to use local raw materials in their work where possible, but currently there is a lack of local materials so that they rely on imports. They noted that although micro-scale, artisanal production may be occurring in Jamaica, it is not quality assured or with guarantee of supply. The artists need defined and sustainable sources of:

(i) Clays, that have the correct chemical and physical properties suited to firing for pottery, earthenware and ceramic objects;

(ii) Semi-precious stones (agate, jasper, serpentinite, onyx etc) availability for jewellery.

(iii) Precious minerals such as gold and silver for jewellery making.

Additionally,

(iv) Designs may need to be adapted to international quality standards and trends, and

(v) They require support for marketing of their finished products; and

(vi) Access to retail outlets, craft markets and online e-presence.

The group reflected on the fragmentation of the Jamaican artistic community, despite many efforts over the last 20-30 years to address this. Some work was conducted in the 1980s in relation to sourcing clays, which was advanced by Hodges Quarry in the 1990s. However, this closed as production of small volumes of ceramic clays for artists was economically unviable at that time.

There is also a dearth is suitable facilities for sharing of processing equipment and kilns, as well as gallery spaces in which they could exhibit their work to the public or to tourists.

The artists discussed the possibility for emulating the AMDC in Kingston. The group have significant expectations of what the ACP-EU Development Minerals Programme can deliver and would dearly like to see start-up supports for key development aspects, in conjunction with JBDC, including:

- ✓ definition of suitable clay resources, with the support from MGD
- ✓ sourcing of semi-precious stones, with support from MGD;
- ✓ identification of a suitable venue in which the artists could collaborate and share processing and firing equipment;
- ✓ purchase of key processing and firing equipment;
- ✓ improved marketing of products, with greater online presence (with support from JBDC).

Individual artists expressed a healthy cynicism – "*we have seen all this before"* and that a different approach is required by the ACP-EU Development Minerals Programme if the programme is to have a lasting supportive effect in the long run.

On the upside, there was strong agreement that there is potential to develop an Artists Collective action with Agency support, such as collaboration with the UNDP, MGD, JBDC and the training institutions such as Edna Manley School of Art, the University of West Indies, University of Technology and the relevant Ministries of Culture, Tourism and Mining, respectively.

The artists' proposal could adopt an integrated approach to source Development Minerals (raw materials, MGD), research & training (training institutes/ Universities/ Art College) processing and firing/ jewellery making (collaborative creativity in shared facility), market research, marketing and sales of their artistic products (marketing & sales, JBDC), all supported by the relevant ministries – see Figure 26.

Figure 26 Collaborative Model to support Artists' Development Minerals Requirements

Such a model would require very significant integrated effort at every level of activity. Fundamentally it will require leadership and a 'driver' of the initiative to ensure that a strategic approach is taken an delivered.

Downstream Trading Activity in Development Minerals

There is provision for regulated mineral trading in Jamaica. MGD sets out the role of mineral traders and the associated fees to register as a minerals dealer (J$1,000).

However, a review of the trading situation in Jamaica indicates that most development mineral raw materials (as mined and related aggregates) produced in Jamaica (90% limestone, marl, sand &gravel for the construction industry) are sold ex-works, directly to customers who arrange their own transport from the quarry gate to the end use site.

There is no trading for clays due to lack of small brick and pottery factories or other small industries that might utilise this raw material (e.g. animal feed products' manufacturers). At present, clay production is exclusively sold by two companies directly to bauxite companies, mainly to seal the waste storage facilities ('red ponds').

In rare cases, basic added value products, such as limestone-cement interlocks, building blocks and kerbstones are produced in, or close to, the quarry site and are sold ex-factory directly to the customers.

The assessment indicated that there are no wholesalers of raw construction material, like sand, gravel, aggregate in Jamaica. A few traders exist, mainly around the main towns, selling construction materials such as building blocks, cement bags, cement blocks and other cement pre-cast products for the building industry, interlocks etc. (the latter often imported) - Figure 27.

Figure 27 Large Ceramic & Natural Stone Show Room in Kingston

The issues of market pricing, potential and opportunities for value adding are discussed in detail in Chapter 8.0 (Market & Value Chain Analysis).

Component 4B: Social & gender impacts of Development Minerals

The social, gender, human rights and youth impacts of Development Minerals were analysed separately, specifically to assess the potential positive and adverse impacts on local communities.

Objectives

The objectives of the social and gender assessment are as follows:

- Broadly characterize the social context of the quarrying sector in Jamaica;
- Identify the motivations, challenges and critical needs of the entrepreneurs,
- Identify the negative and positive impacts of quarrying activities on communities.
- Address human rights and gender issues related to quarrying sector.

Methodology

A literature review (see Annex 2) was undertaken to identify the main social issues related to quarrying and mining activities and which was used to plan fieldwork.

A total of 54 sites were visited and assessed. The field assessment was carried out over two weeks in May 2017, which encompassed visiting quarry sites to interview owners and site managers to establish the profiles of owners and entrepreneurs. Where time permitted, neighbouring communities and activists were also consulted, using "semi-structured" interviews.

For the following reasons, relatively few interviews were conducted with local communities:

- Most of the quarries studies were located in relatively remote areas, without neighbouring communities. Operations were mostly conducted at a very small scale (see Figure 28).
- When asked, local inhabitants generally were unaware of the existence of the quarry as they appear not be affected in any significant or quantifiable way.
- Communities interviewed did not feel concerned by the social assessment and thus, interviews were not always productive.

However, interviews with communities were more appropriate for larger scale operations. In such cases, semi-structured interviews were carried out in the surrounding areas with individuals who may be affected (residents, shop owners on approach roads) and with representatives of local institutions (schools, churches).

With regards to gender and youth issues, gender aspects were approached by consulting men and women and by disaggregating both quantitative and qualitative data gathered in the baseline assessment by the SLR teams.

Figure 28- Operations isolated from inhabited areas, example of two quarries, southwest Jamaica

A workshop was organized in Kingston[66] which mobilized eight women from across the quarrying sector. The objective of this female focus group was to identify issues that may limit women's entrepreneurial opportunities and to identify their needs within the Development Minerals sector.

Social Context of Quarrying

Profiles of Operations and Quarry Entrepreneurs

The objective was to establish the typology of sites in terms of management structure (ownership), motivations to enter the sector and constraints that limit potential growth. In this context, two key profiles of operations were identified: (1) sporadic 'pop-up' operations and (2) larger entrepreneurial operations.

The following table lists these indicators and how they translate in both categories (Table 28).

[66] Women in quarrying focus group, held at Mines & Geology Division, Kingston, 11th May 2017.

Table 28- Two Key Quarry Profiles

INDICATORS	SPORADIC POP-UP OPERATIONS	ENTREPRENEURIAL ' OPERATIONS4
Entry into the sector	Respond to short term market opportunities	Inspired by family, or previous occupation in a related sector (transport or construction)
Main activity	Farming, Services sector	Quarrying
Land allocated to quarrying	Surface Quarry licence is <10% of the land owned (generally inherited)	Quarry licence cover > 75 % of the land (leased or owned)
Employment	Average 1 < 7 employees	>7 – 79 employees
Management	Absence of management structure	Formal management structures
Skills	No skilled workers hired	Skilled (or trained) workers
Equipment	Use of simple and old equipment	Varied range of equipment
Operation regularity	Small operations easy to 'start-stop' by adjusting to market fluctuations	Market volatility and competition of 'pop-up quarries' are constraints which depress price and inhibit investment

This typology illustrates the diversity in the quarry sector. It appears that there are fundamental differences in setting priorities, management and organisation of the "pop-up profile" and the "entrepreneur profile". Their different strategies overlap in a way that interfere with the development of the sector (contribute to market volatility and depression of local price).

Most of the 'pop-up' owners have primarily inherited the land, in which they start quarrying when an opportunity arises for Development Minerals (needed due to hotel or road project construction in the surroundings). The quarry represents a low proportion of their owned land, and is often presented as a side activity. In contrast, the "entrepreneur profile" usually leases or owns only the land necessary to work the quarry licence. The land has been purchased by the current or previous generation that developed the quarry as the main business activity.

Photo 34 'Pop-up' quarry, use of simple and old equipment

The following table indicates the proportion of land allocated for quarrying[67]. The data obtained are arranged according to the two profiles previously established, as land access is relevant for the typology: the 'Pop-up' operator gains the benefit of existing materials on its estate with a low level of investment, while the entrepreneur invests on lands dedicated to the quarry licence (see Table 29 for estimate).

Table 29- Proportion of land allocated for quarrying on owned land

	PROPERTY SIZE (HA)	LICENSE SIZE (HA)	PROPORTION OF LAND ALLOCATED FOR QUARRYING
POP-UP QUARRY			
N° 30 (QL 1723)	16	1.6	10%
N° 31 (QL 1497 & 1872)	8	0.5	11%
N° 32 (QL 1704)	408	2	1.2%
N° 34 (QL 1556)	160	10	2.5%
N° 48 (QL 1952)	120	<1	>1%
N° 37(QL 1506)	500	<1	>1%
N° 52 (QL 2038)	10	0.2	2%
N° 45 (QL 1221)	120	1	0.8%
ENTREPRENEUR ' QUARRY			
N° 35 (QL 1922)	87	87	100%
N° 38 (QL 1247)	56	56	100%
N° 41 (QL 1682 -2 sites)	4	4	100%
	10	10	100%

This analysis illustrates the social processes likely to pose restrictions on development mineral capacity. Whereas operations in pop-up quarries are limited by low investment and sporadic nature of activities, operations in entrepreneurial quarries are faced with competition and lowered prices when key opportunities arise. The latter type (particularly Group 3 operations) are generally struggling to return a profit on their initial investment.

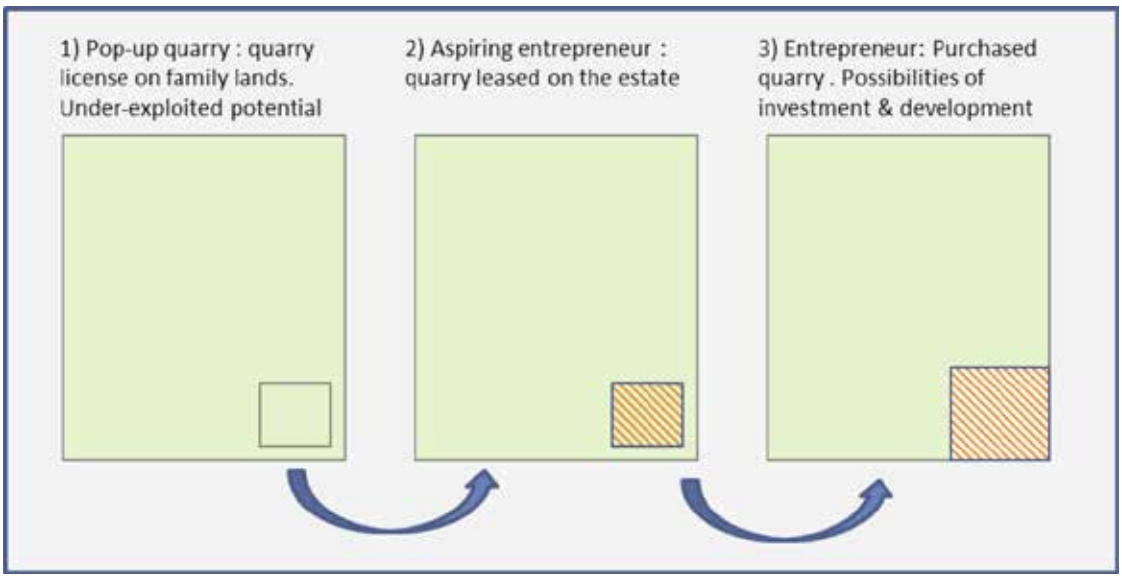
Access to Lands for Quarrying of Development Minerals

Quarrying licences can be granted for both owned and leased lands, respectively. The most common process to transfer land rights for quarrying occurs when a pop-up quarry owner, aware

[67] Not all visited quarry are listed, only those for which data were disclosed by the owner, on the South Coast assessment.

of the limitations of his/her investment capacity (willingness, money and time), delegates the operation to a dedicated entrepreneur. Many entrepreneurs encountered during the assessment obtained their first quarry by leasing these existing and under-exploited quarries. The lease agreement is established between the parties (payment, surface area, duration of the lease); while the licence covers the technical part of the operation. For the entrepreneurs, leasing is a good way to start operations. However once the entrepreneur is well established, the possibility that the lease may not be renewed becomes a brake to further investment. Entrepreneurs generally end up by purchasing the land from the private owner or by applying for ownership when it concerns governmental lands (Figure 29).

Figure 29- Quarry evolving from pop-up to entrepreneurial operations



The assessment indicated that the duration of the lease is often shorter for limestone quarries (not exceeding 5 years), than that for sand and gravel quarries (several decades). Landlords and lessees explained this limitation of length for limestone quarries by the visual impact of operations, which tends to be higher than any impacts caused by sand & gravel extraction from riverbeds, where the reserve replenishes itself. However, many land owners do not dare to lease their land for quarrying operation (especially for limestone). Even when aware of their limited capacities to develop their operations, many fear the lack of regulation, absence of control and penalties, especially regarding the land rehabilitation process as required under the Quarrying Act.

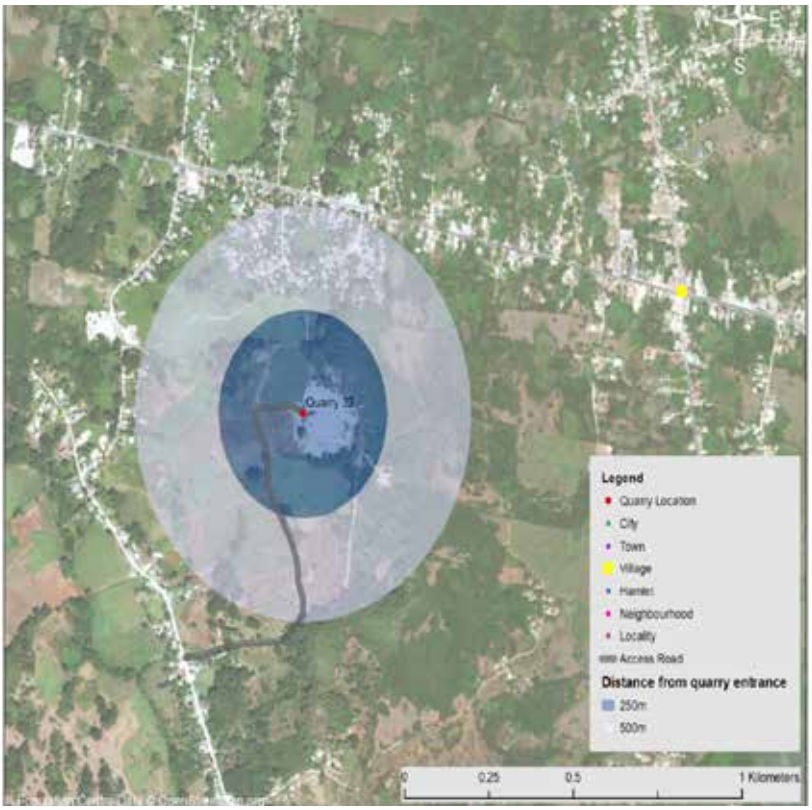
Understanding of actors' strategies allows the identification of constraints that may impede the development of the sector. As the two identified profiles can compete in a negative way for the sector's development (e.g. pricing), they may also be linked along the single value chain. By working cooperatively with both profiles, and promoting potential partnerships, the Development Minerals Programme could contribute to the transition from opportunistic and under-exploited quarries to sustainable practices that contribute to both local and national development.

Social Impacts & Relations with Communities

Adverse Impacts: Nuisance & Complaints

Many surveyed quarries are located in remote areas, where inhabited places are only slightly exposed to adverse impacts through transport of materials from operations. Quarries mainly have a dedicated access road which isolates them from the neighbouring community, as shown in Figure 30 below. The baseline assessment indicates that the immediate (potential) negative impacts of quarrying on neighbouring communities in such instances appear to be minor.

Figure 30- Location of a Quarry relative to Inhabited Areas



However, the following nuisance issues were mentioned during the community interviews:

- Noise: emitted by crushing plant / transport by trucks on access road (complaint for 2 quarries)
- Dust: limited to crushing plant & roads leading in and out quarries (systematic issue when asking question re. nuisances)
- Lack of water: competition possible between quarry operations and farming needs during the dry season (complaint for 1 quarry)
- Safety: complaint of lack of fencing around the quarry perimeter, allowing children to access unsafe sites (complaint for 1 quarry).

Grievances relating to water use and noise were rare, as only two community respondents mentioned these matters. Adequate measures have been taken to remedy the nuisances (construction of retention pond, improvement of equipment and limitation of time-slot for their use). All quarries reported that they notify local communities when blasting is due to take place (via local respected elders) and no complaints were recorded in that regard.

The most common impacts related to quarrying are created by trucks that generate dust emissions on the roads during the dry season. All the complaints identified during the assessment were resolved directly by the owner / manager of the quarry by dust suppression via water spraying or gravel on the concerned areas (Photo 35).

Photo 35 Dust suppression - water spraying truck on Quarry access road

Conflict Resolution

Community complaints about aspects of the quarry operations are generally directed to the owner / manager of the quarry, while members of the community can make a simple call or "knock on the door" of the quarry.

In all the 54 visited quarries, no complaints have required a mediation process, nor involved official authorities to resolve conflicts.

However, it was noted that in cases where unresolved complaints had any potential to turn to conflict, both community and quarry representatives would refer to the local 'Justice of Peace'. The latter is usually embodied by a qualified local citizen, invested with an official authority and decision-making power to solve local conflicts. The situation would be then communicated to the Parish Council, which is the first official administrative level.

At the final stakeholder workshop (held 15th June 2017), one national environmental NGO suggested that communities are 'paid off' to keep quiet and not complain about nuisance factors. However, this was not raised in any discussion with community activists or other environmental NGOs during the field research.

Economic Impacts: Local Employment

Employment : Direct Impacts

Employment is a direct positive economic effect of the quarry operations visited. The owners promote local employment (from the adjacent community, or the Parish), especially when seeking unskilled operatives. In total, the 54 quarries visited hire 788 employees (average 15 employees per quarry). Most of them are employed full-time, and work 5-6 days per week, 8-9 hours per day.

They receive additional benefits (employer provides meals in many cases, medical support & some specific allowances to employees' family such as school books). Employees generally do not have contracts with the employer and most are paid fortnightly (daily pay for casual workers). This highly flexible labour market is an advantage for quarry owners to adapt their production according to market opportunities, and the production capacities (higher in the dry season). However, this flexibility of employment conditions can be a significant disadvantage for employees, who endure low job security, although most interviewed were glad to have relatively stable jobs in rural areas.

Case Study from the field: A group of five adults and one child were sitting in a small house ('night club'- see Photo 36 below) within a local community of simple houses, adjacent to the haul road to two limestone quarries. The team queried whether the quarries caused any problems for them and each replied that there was no problem with noise, trucks or dust. One woman said they recognised that the haul road was there before they came, and that they chose to live beside the quarries. They commented that a few young men locally were working at the quarry, which was considered to be good. They also commented that small shops in the area benefited from passing trade from the quarry trucks and workers.

Photo 36 House and 'night club' on Quarry Haul Road

Employment: Indirect Impacts

Positive impacts on local employment affect more than the site's employees. An employee contributes to food and improving the living conditions of his/her family, and the whole community benefits from the stimulating effects on the local economy.

The direct employment figures for the active operational quarries in Jamaica (n= 120) in 2017 are factored proportionately, this suggests that quarrying employs up to 1,750 people directly. Using a multiplier of 4-5 jobs per direct job, this equates to 7,000 – 8,750 indirect jobs across the sector.

(see Section 6.5.1 above for methodology of estimation)

Some small shops in rural areas are highly dependent on quarry activities; those surveyed increase their sales by passing trade from the quarry trucks and workers.

One small shop beside a quarry on the north coast reported that when the adjacent quarry closed temporarily, it had a very negative impact on sales and revenues – they were pleased to see the quarry re-opening. Another closed once the quarry closed (see Case Study below) - Photo 37.

Photo 37 Typical shop beside Quarry gate, benefiting from passing trade

Photo 38 Depleted Sand Resources at the Zion Hill community Quarry (Type 1)

Case Study from the field: sand quarry of Zion Hill: In this remote area, the local church took out a quarry licence on its land to provide jobs for its parishioners. Over ten years, fourteen workers operated by extracting sand from the river with nothing, but a shovel. The community comprises around 150 people, which means that the quarry had employed more than 10% of the total community. The positive economic impact of that quarry has been locally consistent for the entire worker's family and small shops which benefit from the customer flow. However, due to sand depletion, the quarry closed in 2013 without any consistent alternative employment for the workers (Photo 38).

Unfortunately, the site closure has been followed by the nearest shop closure.

Social Impacts: Community Support

The quarrying sector is a significant contributor to community and social activity in the parishes in which they are situated. Activities supported include school books, sponsorship of sports teams, provision of aggregates for road maintenance, and assistance to local institutions such as church, school and police.

MSTEM (2013)[68] estimated the total social contribution from producing quarries in 2011 as J$25,666,000 (US$ 198,000) with each quarry donating up to J$558,000 (US$4,300) locally (Table 30).

Table 30 Total & Average Values (J$) of Social Assistance by Quarries, by Parish 2011

PARISH	TOTAL VALUE	AVERAGE VALUE
St. Andrew	390,000	130,000
St. Thomas	2,256,000	564,000
Portland	330,000	110,000
St. Mary	1,120,000	560,000
St. Ann	1,500,000	1,500,000
Trelawny	440,000	146,667
St. James	1,370,000	456,667
Hanover	40,000	40,000
Westmoreland	360,000	90,000
St. Elizabeth	1,780,000	254,286
Manchester	2,730,000	546,000
Clarendon	4,200,000	1,400,000
St. Catherine	9,150,000	1,307,143
Total	**24,666,000**	**557,957**

Source: MSTEM Survey of Local Quarry Operations (2013)

By 2015, it was reported that each operator donates approximately J$1,219,625 (approx. US$9,450) in either cash or kind annually to the communities in which they operate, and that community involvement is of great importance to many operators (MTM 2016)[69]. MTM estimated that on a yearly basis, the sub-sector contributes at least J$48.8 million (US$378,000) to community development issues (Table 31), which almost doubled the amount reported in 2011.

[68] Ministry of Science, Technology, Energy & Mining (MSTEM, 2013). *Survey of Local Quarry Operations 2011*
[69] Ministry of Transport & Mining (MTM, 2016). *Industrial Minerals Survey 2015*

Table 31 Total & Average Values (J$) of Social Assistance by Quarries, by Parish 2015

PARISH	TOTAL VALUE	AVERAGE VALUE
St. Andrew	425,000	141,667
St. Thomas	1,840,000	306,667
Portland	unable to estimate	unable to estimate
St. Mary	530,000	265,000
St. Ann	1,000,000	1,000,000
Trelawny	2,150,000	1,075,000
St. James	650,000	216,667
Hanover	200,000	200,000
Westmoreland	500,000	100,000
St. Elizabeth	200,000	100,000
Manchester	7,260,000	1,815,000
Clarendon	13,500,000	4,500,000
St. Catherine	20,530,000	3,421,667
Total	**48,785,000**	**1,219,625**

Source: MTM Industrial Minerals Survey (2016)

Materials and Funding

All quarry owners and managers surveyed in 2017 provide support to the local community, as evidenced in the MSTEM/ MTM surveys of local quarry operations in 2011-2015. The support may take different forms, by:

- Provision of materials for construction (mostly for school, church, police station, but also private buildings),
- Funding of student scholarships,
- Provision of school books and treats for local school children,
- Support of sports clubs and community associations.

Besides religious and social customs, the owners of quarries are fully aware of the necessity to maintain good relationships with the neighbouring communities. Supporting schools is explicitly presented as a means to reach the entire community (Photo 39).

Photo 39 School which benefits from private Quarry funding

Sharing Land and Interests: Farming, Housing and Security Issues

As secure access to land is a key issue for extractive activities, the team assessed the issue of community access to land in the vicinity of operating sites. No land conflict was identified regarding the occupation of land for quarrying, although community squatting was noted at the entrance to the Cane River quarry sites to the east of Kingston.

In the limestone areas, karstified rock outcrops close to surface with skeletal soils, scrubby vegetation and rolling topography; thus in many areas these lands are not coveted for agriculture or building. Even if the land could be used for livestock farming, there is no competition for access to these lands. The quarry licence typically does not cover all the property, and it is common that owners / lessees of the quarries arrange access to a part of their land for the local community to farm (e.g. in St. Ann).

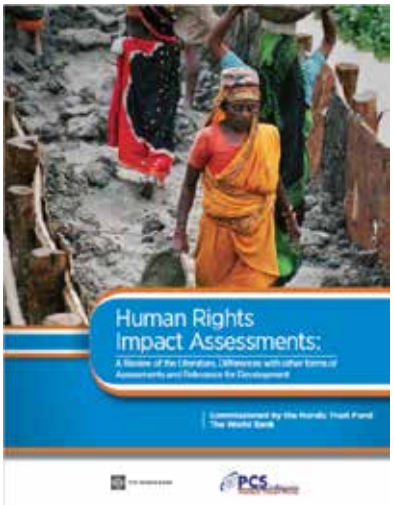
Quite commonly, theft occurs (fuel, portable machinery, spare parts), and cash payments attract armed robbers (e.g. two cases of hold-ups were reported in 25 visited sites along the south coast). To avoid robberies, quarry owners hire security staff (usually trustworthy individuals sourced from the community, versus security companies) as watchmen, regardless of the size of the quarry. They are usually housed in small huts within the quarry. Quarry owners tend to allow informal settlement in the crown lands at the periphery of their operations. Instead of trying to remove them, they employ some of these "squatters" as casual workers, and even provide building materials to allow them to build their houses. Such assisted housing in the quarry neighbourhood is a means of ensuring the security of the site and equipment.

Case Study from the field: working as manager in a sand and gravel quarry, Mr Albert obtains land for farming from the owner in the surrounds of the quarry operations (Photo 40). He started working in the quarry because he knew the owner, but he considers himself primarily as a farmer. He hires people from the neighbouring community for crop-care and pig farming. On his desk, Mr Albert dealt with both quarrying and farm invoicing, while customers came to buy sand, and sometimes left with a pig. This situation could be regarded as a win:win situation for both Mr. Albert and the quarry owner.

Photo 40 Permissive farming within Quarry lands

Human Rights in Development Minerals Sector

The potential impacts of extraction of Development Minerals on human rights were assessed within the UNDP's *'Protect, Respect and Remedy' Framework* (Ruggie, 2008) and the World Bank's *Framework for Human Rights Impact Assessments (2013*), respectively.



Each of these documents specifically includes consideration of the impacts of mining on human rights.

Other guidelines prepared by the IFC, ICMM, the Danish Institute and other agencies (see Section 1.4 above) were also referred to in assessing human rights issues pertaining to quarrying.

Most are focused, however, on metallic minerals rather than Development Minerals.

The UNDP (Ruggie 2008) "*Protect, Respect and Remedy*" Framework, rests on three pillars: (i) the

State's duty to protect against human rights abuses by third parties, including business, through appropriate policies, regulation, and adjudication; (ii) the *Corporate responsibility* to respect human rights, which means to act with due diligence to avoid infringing on the rights of others and to address adverse impacts that occur; and (iii) *greater access by Victims to effective remedy*, both judicial and non-judicial remedy.

State responsibility in terms of regulation of Development Minerals to protect human rights is critical and proposals for strengthening of regulation of quarrying activity are made in Component 2 above, based on field observations. The corporate responsibility to protect human rights was measured against the criteria set out in the World Bank guidance, which suggests that where private sector projects are being assessed, the normative standard that applies would be the community-derived responsibility to respect human rights.

The assessment included a high level review of Human Rights (HR) in relation to the Development Minerals sector. Based on guidance in the World Bank framework)[70], the following issues were assessed in the surveys (Table 32):

Table 32 Assessment of Human Rights in Development Minerals Sector of Jamaica

HUMAN RIGHTS ISSUE (WB)	OBSERVATIONS IN DEVELOPMENT MINERALS SECTOR OF JAMAICA IN RELATION TO HR
Child rights and child labour	It is clear that there are no children working in legal quarries in Jamaica (100% observation).
Conflict	No conflict was observed or documented during the research. Anecdotally, most conflict has centred around planning application stage for quarrying of Development Minerals (e.g. on the north coast) and on extractive stages of metallic mining (bauxite).
Employment	Employment in the sector is positive with no evidence of breach of HR.
Gender	The observed gendered issues did no breach human rights
Community issues –	The observed impacts upon, and relationships with, communities did not breach human rights.
Local economic issues	The local economic issues are largely positive and did not breach human rights.
Relation with business partners	There were no observed or reported breaches in terms of business partners.

The right to effective remedy particularly non-judicial, for individuals and communities, is of increasing concern internationally. Based on emerging norms for meaningful community consultation and stakeholder engagement early in project development stages, there is a case for local community forums to be established. These could provide forums for discussion of the environmental and social impacts, issues of concern or key remedial actions, pertaining to the extraction of Development Minerals in Jamaica. A recommendation to that effect is made in the key recommendations of this report.

[70] World Bank & Nordic Trust Fund, 2013, Study on Human Rights Impact Assessments. http://siteresources.worldbank.org/PROJECTS/Resources/40940-1331068268558/HRIA_Web.pdf

- The analysis considered that no prejudices to Human Rights were identified during the baseline assessment.
- It was noted that no children are employed in the Development Minerals sector in Jamaica.
- To ensure that human rights were fully addressed, these issues were complemented in this assessment by a more specific analysis of informal employment and risk of monopoly. These issues are situated at the confluence of the State (to protect) and Enterprise (to respect) duties and responsibilities[71]. By also addressing these issues, the report provides a broader perspective of Human Rights issues observed in the Development Minerals sector in Jamaica. If no prejudices are observed at the very local level, then the assessment would suggest that the State must engage in a dialogue to promote responsible corporate behaviour around core human rights.

No major prejudices to Human Rights were identified during the baseline assessment. There are no children employed in the quarry sector. It is recommended that the State (through policy and regulation) engages in ongoing dialogue with the industry to ensure that human rights are not violated and that responsible corporate behaviour is maintained at all times.

However, some aspects of the above Human Rights issues may be explored below.

Human Rights: Informal Employment

Informal employment is an important issue in Jamaica, as observed by the International Labour Organisation (ILO, 2015)[72] and across the Development Minerals sector during the assessment. As developed in the '*Guiding Principles on Business and Human Rights*' (UN, Geneva, 2011)[73], the State must take appropriate means to remedy any abuses and encourage enterprises to adopt appropriate and fair employment processes.

The volatility of the construction market in Jamaica is one of the reasons for labour market flexibility. Production is also highly dependent on weather conditions with a marked decline in the wet season. These constraints lead companies to adopt ad-hoc hiring strategies, mainly by hiring casual, informal workers.

The timeframe for the study did not allow a full due diligence assessment of compliance with

[71] Ruggie John (April 2008). Promotion and Protection of all Human Rights, Civil, Political, Economic, Social and Cultural Rights, including the Right to Development - *"Protect, Respect and Remedy: a Framework for Business and Human Rights"*. Report of the special representative of the Secretary-General on the issue of Human Rights and transnational corporations and other business enterprises.
GOTZMANN Nora, Human Rights and impact assessment, conceptual and practical considerations in the private sector context, the Danish Institute for Human rights, 2014.

[72] ILO, 2015, Formalization of the Informal Economy in Jamaica, http://www.ilo.org/caribbean/projects/WCMS_532641/lang--en/index.htm

[73] https://www.unglobalcompact.org/library/2

labour standards, even for full-time workers. However, field observations and the data gathered mirror the ILO findings regarding informal employment.

The ILO indicates that the lack of employment opportunities is a key factor in the flourishing informal economy, estimated to provide between 45% and 5% of total employment (ILO, 2015)[74]. The existing reports explains this high rate of informality by

(i) ignorance of the legal requirements of establishing business,

(ii) by administrative burden avoidance and

(iii) tax evasion,

all of which reflect low institutional capacity to control and monitor compliance with labour standards (ILO, FORLAC[75]).

These conclusions have been also noted during the current assessment pertaining to the quarrying sector, where informal employment appears to be a common practice, particularly in smaller operations (Type 2).

Photo 41 Break time for two informal Quarry Workers

[74] ILO, 2015, Formalization of the Informal Economy in Jamaica, http://www.ilo.org/caribbean/projects/WCMS_532641/lang--en/index.htm
Since 2014, the ILO provides support to overcome the large amount of informality that exists in Jamaica. The informal economy is defined as: *"all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements"*.

[75] FORLAC & ILO, Informal Employment in Jamaica, 2014, http://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/documents/publication/wcms_245888.pdf

Monopoly and Conflict of Interest

The construction materials sector in Jamaica has experienced a monopoly in the cement market. As developed in the 'Guiding Principles on Business and Human Rights' (UN, Geneva, 2011), the State must take appropriate means to remedy any potential abuses and encourage (force) enterprises to adopt appropriate and transparent processes.

The 'Anti-Dumping and Subsidies Commission' conducted a safeguard investigation that denounced the policy of creating a monopoly supplier of critical construction materials and its impact on the industry's domestic development (2009[76]).

The current assessment has observed a risk of conflict of interest between public functions (Parish councillor) and some private interests in the quarry sector. These were particularly associated with likely monopoly in the sand and gravel quarrying sector in some parishes.

In many instances, such conflicts of interest were alluded to by operators during consultations, but there appears to be a culture of silence and thus the practice persists.

Gender & Youth Issues

Gender in Jamaica

The assessment adopted a mainstream gender approach to identify the differential impacts of Development Minerals operations on female and male proponents.

Existing reports[77] show that impacts of the extractive sector are not gender neutral; women faced consequences of these operations in different and often more pronounced ways than men.

Following International good practice, this baseline assessment disaggregated both quantitative and qualitative data to capture male and female concerns, in order to provide an analysis of their differentiated capacity to access opportunities in the extractive sector.

[76] Fair Trading Commission, The impact of waiving safeguard measures on the monopoly producer of cement in Jamaica, 2009. *"The investigation concluded that the increase in the importation of cement had the effect of causing a level of injury and the threat of serious injury to the viability of the domestic industry and that safeguard measures should be imposed to protect the industry* http://jftc.com/Libraries/Industry_Studies/Impact_of_of_Waiving_Cement_Safeguard_Measures.sflb.ashx

[77] Eftimie A. Helle C., Strongman J., 2012, Gender Dimensions of Artisanal and small-scale Mining, a Rapid Assessment Toolkit, World Bank. http://siteresources.worldbank.org/INTOGMC/Resources/toolkit-web.pdf
Madden & Collins, 2017, A Guide to Gender Impact Assessment for the Extractive Industries, Oxfam, Melbourne. https://www.oxfam.org.au/wp-content/uploads/2017/04/2017-PA-001-Gender-impact-assessments-in-mining-report_FA_WEB.pdf
Mokwena Barnard, 2009, Women in Mining, A Guide to Integrating Women into the Workforce, draft V1.0, IFC. http://www.ifc.org/wps/wcm/connect/b31e4e804879eacfafb9ef51e3a7223f/IFC-LONMIN_WomenInMining_Manual.pdf?MOD=AJPERES

Photo 42 Teaching Respect for Gender Differences at School, Jamaica

It is necessary to assess the influencing roles of the State and social norms to understand the root of the situation that could generate gender inequity.

Jamaica was the first English-speaking country in the Caribbean to achieve universal adult suffrage and grant women the right to be elected to Parliament. However, in contemporary Jamaican society, gender inequality and inequity remains an issue. The Economic and Social Survey of Jamaica (ESSJ, 2013), states that women, representing 50.5% of the population, are heavily under-represented in the public and private decision-making sphere of the country. Moreover, despite the fact that women outperform men at all levels of the educational system, the female unemployment rate stands at 20% (annual average for the year 2013) compared to the male rate of 11%.

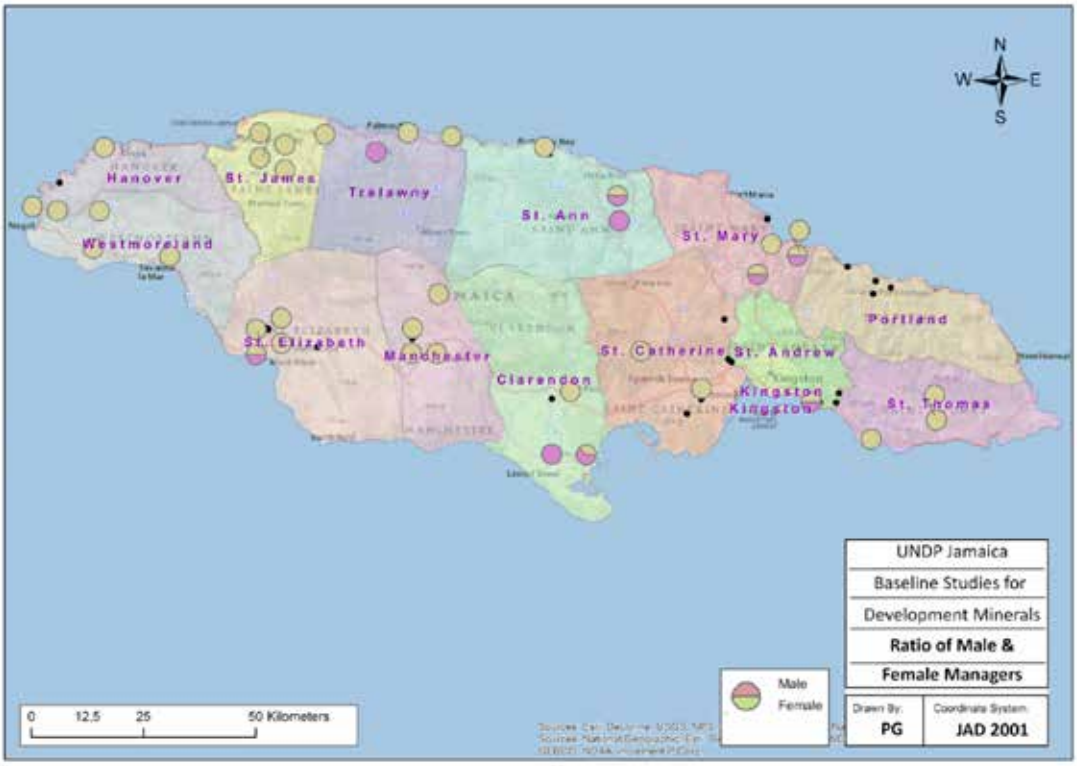
In the domestic sphere, gender relations in Jamaica are impregnated by a kinship system with matrilineal transmission and matrifocal residence, which gives to the women a commanding influence at the domestic level. Despite their role in the family unit, women's authority is not transferred in the context of social hierarchies (Mulot, 2013). The broader institutional context is governed by a prevalence of patriarchy, issuing rules and norms that perpetuate gender inequality.

Female & Male Quarry Owners

Quarrying is almost universally a male dominated sector; however, during the baseline assessment women represented almost 20% of the owner/managers consulted[78] in 54 quarries (**Figure 31**). Analysis of the field data suggests that most of these women did not start the quarry business, rather they have inherited from their father.

[78] 42 owners / managers identified, including eight (8) women.

Figure 31- Ratio of Male to Female Managers, Baseline Assessment 2017



Eight women working in the Development Minerals sector participated in a focus group held in Kingston on 11th May 2017, and five of these were running a quarry inherited from their father. Most of this group of women are graduates, frequently in business or finance, with one qualified as a process engineer. They largely improve their business by hiring skilled supervisors to supervise the technical operations, and by taking out loans to recapitalise the equipment. On-site semi-structured interviews also revealed that these women feel a strong responsibility to take over and improve the inherited family business.

Men mainly initiate the opening of quarries, although in one case, a woman and her sister had started the operation. The "Entrepreneur profile" (as described above) had been largely engaged previously in a related sector (construction or transport). As observed for women, men rarely have a formal background in the extractive industry (only one of the quarry managers interviewed had graduated in a mining or geology-related discipline).

Female & Male Employment Roles

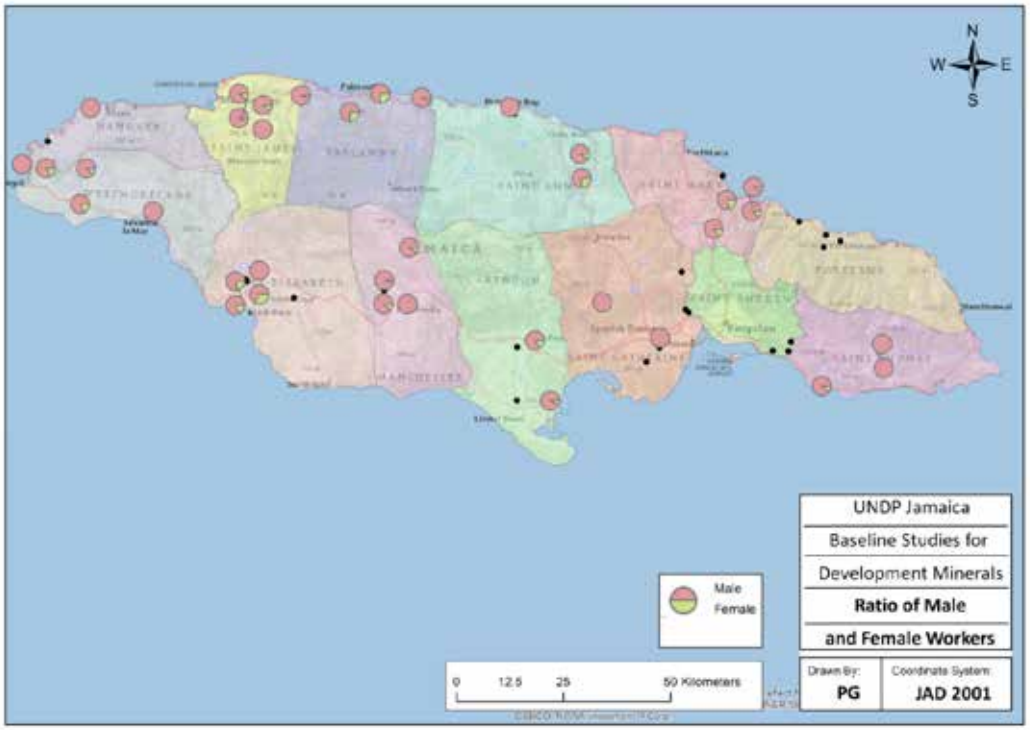
There is a clear division of labour between male and female among the 54 quarries visited. Women apply for, and are recruited almost exclusively in, administration / sales (ticketing – see Photo 43) accountancy and management roles, while men apply for and work as supervisors, trades or quarry operatives. Women comprise c. 12% of the quarrying workforce (Figure 32).

Photo 43 Women in charge of ticketing at the quarry entrance

All quarries where women are hired have sanitation facilities, which is not the case in the quarries with only male workers. The need for clean facilities is explicitly associated with the presence of women: some quarry managers have explained that they cannot hire women without suitable facilities; thus In Group 3 and 4 quarries, sanitary facilities and clean office environments prevail. In Group 2 and smaller Group 3 quarries, the lack of sanitation may be a disincentive for women to seek quarry employment.

In at least three quarries, male managers commented that they like having women working there as they attend assiduously to their work and that the men perform better under female supervision. This may reflect the matrifocal domestic power arrangements (see above).

Figure 32- Ratio of Male to Female Workers in visited Quarries (incl. employees and managers)



Work: Gender Perceptions

Several reasons were presented by interviewees to explain the under-representation of women in the sector and their absence as quarry operatives. In the collective perception, quarrying is a male activity which requires physical strength. Driving heavy vehicles is also considered to be a typical male job; the only (sub-contractor) female truck driver, who was mentioned during discussions, was considered an exception and well known in the whole Parish.

In line with these collective perceptions, the lack of female interest in working in this 'dirty/ tough' sector was an argument that was proposed by both females and males. Both agree on the broad organizational abilities of female (frequently associated with their ability to manage the household); while male reputations are directly opposite. Male behaviour is often associated with a lack of reliability, due to their propensity for addiction (drug and alcohol consumption). Such dualism led many quarry owners to avoid employing men in administration, and to intentionally target the recruitment of women. One operator expressed disappointment when he advertised for machine operators and no women applied, as he felt they would have looked after the equipment better.

Gender issues in the extractive (*mainly metallic mining*) sector have been the subject of several international guidelines and frameworks[79], which indicate that the impacts of extractive projects are not gender neutral. In the case studies illustrating the frameworks, women are more subject to informal employment and face greater difficulties in accessing assets (e.g. excluded from transmission process or decision making regarding family assets).

Photo 44 Girls in a Rural School, Jamaica

[79] Oxfam, 2017, *A Guide to Gender Impact Assessment for the Extractive Industries*;
World Bank, 2012, *Gender Dimension of Artisanal and Small-Scale Mining*;
IFC, 2009, *Women in Mining, a Guide to Integrating Women into the Workforce*.

However, the women encountered in the Development Minerals quarrying sector in Jamaica show a different picture. As noted above (Section 7.10), women in the quarries visited are almost exclusively working in administration and management, which provide the most formal and stable jobs within the sector. Moreover, transfer of quarry ownership (and more broadly transfer of assets) from father to daughter appears to be a quite common practice in Jamaica.

Finally, the over-representation of women in administration of quarrying is closely related to the fact that women outperform men at all levels of the educational system.

Rather than denouncing women's exclusion from the sector, the primary concern of women participants in the project focus group held in Kingston was to address youth employment issues, especially for young boys who leave school early and 'drop out' without any formal qualifications.

Addressing Youth Issues: Training for the Sector

Youth issues were raised during consultations not only by women during the focus group, but by almost all the male interviewees also.

- For quarry owners and managers (both men and women) there is a lack of formal upskilling, particularly in the area of quarry planning and management, that needs to be filled to develop the sector;
- Women feel particularly concerned about the lack of vocational training for young people, boys in particular. In their opinion, the educational system is failing to prepare students for work and the requisite skills required;
- For educational staff, the lack of male parental guidance is a cause for school rejection, which affects particularly boys. As teachers are mostly female, school is thus associated with a female world from which boys are inclined to exclude themselves. Boys suffer from a lack of male role models both at home and at school.

A critical issue raised is the need for development of quarry apprenticeships to encourage youth to enter the sector, which in turn will provide a pool of skilled employees to the developing quarrying sector.

Social Constraints & Needs through Women's Eyes

A small focus group of women working in various aspects of quarrying of Development Minerals in Jamaica was held at MGD's office in Kingston on 11th May 2017 (Photo 45)

The women were selected from across different roles, commodities, age groups and geographies. Fifteen (15) women had agreed to attend although eight women participated on the day, facilitated by the SLR team. The participants ranged from quarry managers and owners (established and emergent), to quarry operatives, engineer, one jewellery maker and one senior regulator.

Photo 45 Members of Women's Focus Group, Kingston, 11th May 2017

The objective was to build understanding of the key challenges, opportunities and needs of women working in the sector and to identify any gender/ youth specific issues.

The women discussed a range of issues and provided feedback on identified barriers, challenges and needs. These are recorded below using the World Bank framework for female entrepreneurship[80].

Many issues were cross-cutting and were relevant to both women and men, while others were more gender specific. Many participants were keen to encourage more young people into the sector through exposure and vocational training.

Table 33 records the issues that were addressed by the women during the focus group. Those 'women and youth specific' issues are shown in (highlighted) colour, while others are non-gender specific and record both men and women's concerns related to the Development Minerals sector.

[80] World Bank: Framework on Female Entrepreneurship, Guidelines and Case Studies http://siteresources.worldbank.org/EXTGENDER/Resources/FemaleEntrepreneurshipResourcePoint041113.pdf

Gender & Youth specific issues identified by Focus Group are shown in colour

Table 33- Key Challenges / Opportunities for Women Working in Quarrying

AREA	BARRIERS & CHALLENGES	NEEDS
Human Capital	• Training & Skills • Mainly done on-the-job; lack of formal apprenticeships and training institutes suited to quarrying (e.g. Technicians, mechanics, welders etc shortage) - women manage skills shortage by cross-training their operatives) • Administration – good skills available (mainly young women) • Business acumen for start ups • Business development • Quarry Management (to meet new Regulations) • Equipment maintenance/ • Occupational health & safety (OHS) within quarries	Training is critical – need exposure of young people to the sector HEART/ NTA[81] provides some vocational training, but trainees emerge under-qualified – much on-the-job mentoring /finishing of skills required on site. Need bespoke quarry training programmes. Problem with retention of skills – many leave once trained; go to Canada/ other jobs. Many problems with young men not engaging with education system: academia (suited more to girls) is culturally valued higher than trades (suited more to boys). Up to 80% of all graduates are female (except medicine and engineering about 50:50) Parental guidance is critical to overcome this and encourage boys
Selection of Sector	• *Profile of women participants :* • 5 participants entered sector through family business (father) • 3 (of 5) have formal business/ management training • 1 (of 5) process engineer • 1 artist • 1 operative in sister's quarry • 1 regulator • *In their opinion, women are under-represented in the sector because quarrying is considered too 'rough' / 'dirty'. However, female numbers tend to increase in quarry administration, due to their higher educational attainment.	Women's presence in the sector could be encouraged through trades/ apprenticeships
Access to Information	• **Access to ITC**: • Rural broadband deficiencies a problem for business management/ marketing • Reliance on cell networks - very expensive • **Technical Information** – MGD website good (legal regulations geology etc), but could be improved from customer needs side • **Market Information** absent – state bodies not providing relevant market intelligence • **Advance notice of Public Procurement** is very difficult – often hear of contracts after awarded (very political) • **Demand DATA is lacking** • Lack of communication channels: no opportunities to give and to share opinions.	Urban: rural digital divide…..needs to be addressed Government e-tenders system required/ public the public procurement project pipeline in advance, with products & specs required. This could extend to the Housing Need advance warning of projects, specs and requirements – *to include the National Housing Trust; NWA roads; Master Builders Association* Need frequent and local meeting (monthly? At the parish level?)

[81] Human Employment & Resource Training Trust / National Training Agency

AREA	BARRIERS & CHALLENGES	NEEDS
Access to Finance	• **Bankers are too 'white collar'** and not understand the industry • **Not understand that women** operate as managers equally – assume men know 'dirty' business, not women - *("easier for women to buy an SUV than front-end loader!")* • **Some stereotyping but not major gender issue**: problems same for men and women: collateral and cash guarantees (lock up working capital) • **Capital too expensive in Jamaica**	Need to make banks and institutions more aware (for loans & grant) of the potential and reliability of the quarrying sector ("lack of respect" for sector). Banks must understand that women are serious quarry managers and operators Clear that access to finance is a problem for both women and men
Institutional Factors	• **Lack of respect** for the Jamaican quarry sector- over-reliance on bauxite • **Institutional 'blindness'** to the forward & backward economic linkages and their potential – this is not quantified economically – major deficit. • **Rural development & jobs contribution** of the sector – the value adding potential is not realised or supported at all • **Lack of product specific market intelligence** (see above) – require intelligence specific to key products and minerals / domestic and CARICOM/ USA demands • **Procurement process lacks transparency** – see above • **Cost competitiveness is a key issue for Jamaica** – cost base too high, regionally and for entry to key markets • **Lack of level playing field**: why do Bauxite industry and foreign investors get tax incentives (e.g. fuel; and capital allowances on equipment imports) – but not domestic producers?[82]	Demise of bauxite industry in 2008 was wake-up call and Government realise now that have to broaden the mineral base of the country **Energy, port, transport** costs exorbitant (monopolies) This issue has been raised by many quarry operators (women and men)
Policy/ Legal issues	• **National Mineral Policy –** should give data on mineral production but also DEMAND targets • **Lack of ethical standards** (*'sharp practice'*) from some investors – why is this tolerated? • **'Pop-up' quarries** causing problems for established firms – project specific and undercut pricing – thus all pricing too low, not enough profit to recapitalise the business. • **Women must keep licence in good standing**/ current > then have legal rights to make representations. Regulator will insist on renewal 3-months in advance. • Lack of awareness of best international practice (Envir, EIA, H&S, …)	As provided in Trinidad minerals policy Are there too many quarries? Regulator currently cannot stop anyone from applying if they meet requirements. Should qualifying criteria be more rigorously applied? *Need training on International Standards to be compliant with best practices and to be able to seize international opportunities.*

AREA	BARRIERS & CHALLENGES	NEEDS
Social / Cultural Norms	• **Work: life balance –** all women participants in the focus group have home help or else could not do their jobs – according to the resources they have available but culturally professional women expect to have help at home (cleaning/ cooking/ etc). • Major support to women from extended family (mothers/ grandmothers)	*Never switch off* - parenting with the phone always on (difficult when children are young/ school homework/ sports etc) but as go up management chain have more flexibility in working hours.
Value Adding (potential)	• Artists: jewelry – gemstones; clays for pottery/ ceramics • Ceramics - tile making/ marble – need research into materials and markets • Demand Data (see above) – how can we produce/ add value when we don't know what the market needs	Advance Procurement notice to meet upcoming demand and specs (see above)
Representation	• **Mining & Quarrying Association (MQA)** not functioning as an effective industry lobby or market research group • Women willing to support each other/ provide technical and business advice	Women suggest to form a Working Group/ Sub-Committee of the MQA to strengthen the organisation and lobby effectively for key policy, research and institutional supports.

[82] Note that this issue was raised by many quarry operators, but under international WTO rules and recent IFC interventions in Jamaica, it is not allowable for government to provide direct incentives to industry. Those previously allocated to the bauxite industry are being phased out.

Key Findings & Recommendations: Community, Human Rights, Gender

The following key findings were made:

- Different types and sizes of quarries were characterised in the assessment. Operations in 'pop-up' opportunistic quarries are limited by low investment and sporadic extractive activities, while operations in entrepreneurial quarries are faced with competition and lowered prices when key opportunities arise. The latter thus struggle to turn a profit on their initial investment.

- There is a direct positive economic impact through employment in quarry operations. In total, of 54 quarries visited, there are 788 employees (12% female). If the employment rate of the 54 quarries (45% of total operational quarries, 2017) is factored upwards, the quarrying sector employs up to 1,750 people directly in Jamaica (suggesting 210 women). Although many people are employed on contract or by informal arrangements, most are employed full-time in the larger entrepreneurial quarries, working 5-6 days per week, 8-9 hours per day. It is estimated that up to 7,000 – 8,750 men and women are employed indirectly across the sector.

- No land conflict was identified regarding the occupation of land for quarrying. Karstified limestone with skeletal soils are not coveted lands for agriculture, forestry or building. The quarry typically does not cover all of the licensed property, and owners / lessees commonly occasionally arrange access to a part of their land for the local community to farm.

- All quarry owners and managers (100%) surveyed provide support to their local communities, as also evidenced in the MTM survey in 2015. The support takes different forms, mainly by provision of construction materials for school, church, police station, private buildings, as well as student bursaries, school books and treats, and financial support for community sports and associations. The owners of quarries are very conscious of the need to maintain good relationships with neighbouring communities.

- No major prejudice to Human Rights was identified during the baseline assessment. However, it is recommended that the State (through MTM/ MGD) engages in ongoing dialogue with the industry to ensure that responsible corporate behaviour is maintained and that human rights are respected at all times. Furthermore, it is recommended that in areas of intensive quarrying, community forum should be promoted to encourage dialogue and access to redress.

- The current assessment has observed a risk of conflict of interest between public functions (Parish councillor) and some private interests in the quarry sector. These were particularly associated with likely monopoly in the sand and gravel quarrying sector in some parishes. Such conflicts of interest were alluded to by operators during consultations, but there appears to be a culture of silence and thus the practice persists.

- The baseline assessment has identified different needs, constraints, and priorities for women, men, girls and boys. In the domestic sphere of Jamaica, gender relations are determined by a kinship system of matrilineal transmission and matrifocal residence,

which gives to the women a commanding influence at the domestic level. Despite their role in the family unit, women's authority is not transferred in the context of social hierarchies. The broader institutional context is governed by a prevalence of patriarchy, issuing rules and norms that perpetuate gender inequality.

- However, there is no evidence of gender barriers to the Development Minerals sector, rather the women interviewed as quarry managers, office workers and administrators were more highly educated than the unskilled and semi-skilled workers in the quarry and thus able to access higher-skilled jobs.
- Women proportionately feature as senior managers in the workforce, largely through familial connections and father-to-daughter ownership transitions are not uncommon.
- Concern was expressed around the lack of youth entry, particularly boys, into the sector, due to the non-availability of tailored apprenticeships for quarrying skills and trades.

The following **recommendations** may be factored into the future design of a Develompent Minerals' support programme:

- **Control the application of rules, regulations and good practices** to ensure fair lease agreements and encourage partnerships between large land owners and quarry entrepreneurs.
- **Vocational Training and Apprenticeships:** design sector-appropriate apprenticeships with existing training schools (HEART/ NTA; UTech), for youth (boys and girls) and increased awareness about work/ career opportunities in the sector.
- **Improved Social Impact Assessment and participatory mechanisms** for effective community engagement.
- **Develop more formalised recording of the social/ community donations** by the Development Minerals quarrying sector:

Group 4 quarries would like to see this happening, although many Group 2/ 3 operators expressed no desire for such formalisation, preferring a case-by-case basis of donation.

- **Develop transparent grievance & complaints procedure** for local community residents adjacent to quarry operations, to ensure fair process, through community forums.
- **Exposure to International Standards** in Occupational Health & Safety; Environmental management and impact assessment; monitoring & regulation; to ensure that quarrying does not impact adversely on vulnerable groups in the community.
- **MQAJ to meet needs of Women Members:** the Mining & Quarrying Association needs to become a much stronger and dynamic organisation to represent the needs of women in the Quarrying sector; women to set up regular meetings at the Parish level and/or as a Women's Chapter in the MQAJ.
- **Improved communications and mutual support** among quarry operators, with dedicated communication channels for women.

Component 5: Market and value chain analysis

Selection Criteria for Focal Commodities

The following criteria were applied in selection of commodities to be considered for attention under the programme:

(i) natural geological endowment and resource potential;

(ii) capacity to produce in-country;

(iii) potential for the ACP-EU Development Programme to contribute to the vital capacity building requirements to achieve requisite standards and

(iv) potential opportunities identified for import substitution and/or market penetration in CARICOM and nearshore Americas.

Selection of Materials for Focused Development

The following commodities have been selected for further analysis based on Component 1 profile of the sector, recent MTM/ JAMPRO studies and the current baseline field assessment (Table 34).

Table 34 Selection of Minerals for Focused Development

CONSTRUCTION MATERIALS	
Raw materials	**Limestone, marl, sand, gravel, (andesite), clays**
Processed materials	High quality, **crushed Limestone** for export (spot), other industrial purposes
	Limestone-cement Construction Blocks
	Limestone-cement Interlocks
	Building and Paving stones from ignimbrites, hard limestones, marbles
INDUSTRIAL MINERALS	
Crushed Gypsum	Manufacture of cement, plasters compounds
Crushed Pozzolan	Manufacture of cement
Whiting	High grade, very pure limestone for export; as animal and pharmaceutical additives
High Quality crushed Limestone	For export (spot), range of applications
Pottery Clays	Artisanal pottery/ ceramics – domestic, small scale
DIMENSION STONES	
Dimension Stone Blocks	Processed finished products – *currently not produced, potential exists*
SEMI-PRECIOUS STONES	
Agates, quartz, other stone	For jewellery making/ carvings

These and other potential products are central to the future development and enhanced production mechanisms in the Jamaican context. These products have high economic and linkage potential through value addition, if an appropriate development/ investment strategy is adopted among the private sector operators, financial/ lenders and Institutions.

Product Mapping: Development Minerals

Based on the geological endowment, it is clear that there is considerable potential for value adding among the following Development Minerals:

Construction Materials:

- **Limestones**: A high proportion of Jamaica's limestone is considered to be of 'high purity grade'. Most of the limestone output is used in the local construction industry, as well as in the manufacture of calcined and hydrated lime for various applications, such as flocculants, fillers and for agricultural purposes, and mostly (until the recent past) bauxite refinement.
- **High-magnesium Limestone** deposit in Trelawny has been evaluated and quarrying and restoration plans developed. This material, among other uses, could be used as input of high quality "plane glass" production.
- **Hard Dolomitic Limestones** for (i) high quality resistant aggregate; (ii) dimension stones (if not highly fractured, with attractive colours) and iii) as chips and powder for "reconstituted stone" and "terrazzo tiles" (see Photo 46).

Photo 46 Slabs of reconstituted stone" imported from China (l) and Terrazzo tile from India (r)

Industrial Minerals

- A **High Purity/ High Brightness Limestone** deposit in Trelawny has been also evaluated and Quarry/Restoration Plans developed for calcium carbonate ($CaCO_3$) production.
- Many other **pure white Limestones** in central Jamaica (Photo 47):

Photo 47 High quality limestones of White Limestone Group; good sources for added value products

Existing chemical data (see JETCo./MGD reports, 2013) confirm the high quality of limestones of White Limestone Group formations in many areas ($CaCO_3$ > 98-99 % ; CaO > 55.5-55.9 %) and very low to trace concentrations of iron (Fe), titanium (Ti) and other " impurities".

- **Volcanic rock deposits** in the parishes of St. Andrew, St. Mary and Hanover, mainly for use as high performance aggregate in the building and construction sector and also as skid-resistance (anti-skid) aggregate for use on surface pavements of roads and runways.

- **Several other Industrial Minerals areas also exist**, at present artisanally mined or worked by very small companies with low market and financial capacity such as: gypsum, silica sand, kaolin, clays input materials for cement (marls, clays etc.). Most of these materials are locally utilized in small and medium size clay brick, glass and ceramic factories.

- **Clay Deposits:** Several small clay deposits (smectites and illites) are reported in Clarendon,, St. Elizabeth (above the Yellow Limestones, under silica sands), Westmoreland, with micro-production recorded in St. Mary and St. Catherine.

- Clays suited to artisanal production for pottery, ceramics and industrial brick/ pipe making, in Clarendon, St Catherine, St Ann, Trelawny, were estimated from the deposits cited in GSD's (Bailey 1970) report is approximately 158,000,000 metric tonnes (see Table 6). This requires modern investigation, as many of these deposits may be over-built by housing.

Dimension Stones

- **"Marbles" - limestones and recrystallized limestones** as source of coloured, cream and white *Dimension Stone* blocks, and/or for the possible production of building & paving stones; with lesser options for recrystallized marble, green serpentinites and alabaster, the latter mainly for artisanal objects. (Some of these have been extracted at a small scale in the past by MSMEs with little success, mainly due to weak capacity, poor marketing and trading strategy, with weak institutional support and long term planning.)
- **Volcanics (intermediate ignimbrites and lavas**) of the Wagwater Group, as potential sources of paving cubes, other building stones and hard aggregates (if not weathered or weatherable), including andesite, dacite, and possibly granodiorite, basalt.

Semi-Precious Stones/ Materials

- **Small Agate or Jasper deposits** occur as pebbles and boulders in both Rio Nuevo and Tiber River in St. Mary, especially at the confluence of the two rivers; on the beach at the mouth of the Rio Nuevo; in stream beds in Clarendon and near the Trelawny-Manchester boundary. These materials could be a source for niche jewellery.
- **Silicified wood**: occurs as boulders and pebbles within rivers and streams having their headwaters in areas such as Smithville, Kellits and Crofts hill in Clarendon, Guys Hill in St. Catherine, in the Hector's River near Troy in Trelawny, upstream of the bridge.

Photo 48 Agates from Jamaica

Source: https://it.pinterest.com

There is potential for value adding for a range of these Development Minerals in Jamaica, but there is insufficient market intelligence or private investment, coupled with infrastructural barriers, to exploit these at the present time.

Market Overview by Product

Current Markets and Marketing

More than 90% of the 54 quarry operations visited in Jamaica sell raw and crushed products (marl, limestone, sand & gravel) only within the domestic market, mostly in <20km range (Group 2) and 50-80 km range (Group 3-4).

Very few operations (3-5, >7%) have access to the Export market, while just two operations secure regular exports for the following products:

a. **Whiting** and other high quality fine limestone to USA;

b. **Fine and coarse, washed aggregate** to CARICOM, main Trinidad & Tobago

The mineral products, **Gypsum** and **Pozzolan**, which are producted by Gypsum & Quarry Ltd (CCC Ltd.) are used primarily to feed local demand for cement manufacture in Kingston. However:

c. **Spot exports of Gypsum** (low-medium quality) are made to the CCC parent company (Trinidad Cement Ltd) from the Harbour Head private port in Kingston.

d. **Washed sand & gravel** are exported by Jamaica Aggregates via Harbour Head port.

Smaller high quality S&G operators find it difficult to access the ports due to high handling costs (J$15,000/t cited) which, together with in-country transport costs (trucking, tolls), renders their product uncompetitive for export to the USA.

Current Pricing for Development Minerals

The Industrial Minerals Survey in 2015 (MTM 2016) identified the following pricing structure for minerals (Table 35):

Table 35 Average Price (J$) of Key Materials (2013-2015, per metric tonne)

MATERIAL	AVERAGE PRICES MT		
	2013	2014	2015
Limestone and Whiting	900	900	900
Sand & Gravel	900	900	900
Gypsum	953	2270	2270
Clay	125	125	125
Marl and Fill	350	350	350
Shale	190	190	190
Pozzolon	2163	2163	2163
Silica Sand	4800	4800	4800
Marble	5200	5200	5200

It is clear that prices (per metric tonne) have remained almost static for most materials over the three-year period, except gypsum.

Significant pricing and sales data (per 'cubic yard') were also recorded during the current field survey and varied according to quarry types (1-4), products, quality and geographies (Table 36).

Table 36 Product Pricing by Quarry Type (per cubic 'yard' - May 2017)

PRODUCT	GROUP 1	GROUP 2	GROUP 3	GROUP 4	REMARKS
Limestone «raw material»	n/a	300-400	350-500	470	No particular differences among Parishes
Marl/Limestone «raw material»	n/a	350-500 Max. (750)	350-500 (1000)	750 -900	Higher in South Central JAM and close to cities
Sand & Gravel «raw material»	n/a (1000)	n/a	500-550	900-1000	

Limestone Agg. fine	n/a	1000	1050-1200	1600	
Limestone Agg. coarse	n/a	800	650-850	1300-1500	
Sand&Gravel Agg. fine	n/a	n/a	1900-2000	2000-3000	
Sand&Gravel Agg. coarse	n/a	n/a	n/a	1100-1900	
Clay	n/a	n/a	n/a	Awaiting data	Chemical Lime Ltd.

The following observations on current (2017) pricing may be made:

i. Prices for limestone and marl raw materials largely differ for Type 2 & 3 quarries as follows:

- geography: from area to area, slightly higher in the Kingston metropolitan area.
- each type secures a relatively low price, due to high price-driven local / pop-up competition.
- often soft limestones (misnomer "marl") are sold at the same price as hard limestone (due to poor understanding of the basic quality of products and consequently value)
- "Marl" can be also utilised for road base, mainly in projects where a single base level is utilised (easily compacted).

ii. Hard crushed limestones (coarse: 2", and smaller: ½" and less) are sold at significantly higher prices, for large road projects (such as new highway projects).

iii. Larger quarries (Types 3/ 4) in general command a higher price (quality & guaranteed supply).

iv. Pricing for Development Minerals in Jamaica is largely driven by local competition (volumes) rather than quality. Higher prices can be achieved through value adding for quality exports of e.g. washed river sands to the USA, but prohibitive transport costs (road and port) prohibit the advancement of such markets for many Group 3 operators.

Although, there is no significant current production of dimension stone exists, the team considers that a significant potential exists for stone products. A high level market pricing assessment, concerning imported Dimension Stone semi-finished (slabs) and finished products was carried out, by visiting large and medium size importers and traders (show rooms and deposits), in Kingston (e.g. Exotic Stone Ltd., Jamil Tiles Ltd. and Creative Building Finishes Ltd.)

The main imported products and related prices (ex-deposit) are shown in Figure 33 and Figure 34 below. The SLR team feels there is potential for significant import substitution for these products.

Figure 33 Selection of Dimension Stones products imported and sold in Jamaica (2017)

Figure 34 Price Ranges of Dimension Stones products imported and sold in Jamaica (2017)

❑ Marble s.s. slabs (to be cut-to-size)	1300 - 1600 J$ /sq. foot
❑ Limestone slabs (to be cut-to-size)	900/1,000 (Egyptian) to 1,400 J$ /sq. foot
❑ Granite finished «pre-fabricated» tops	
❑ Reconstituted «Quartz» «pre-fabricated» tops (126" x 64" x 2 cm), generally from Italy, china or Spain	1100 - 1800 / unit top
❑ Travertine, Limestone Tiles (32" x 32" x 1cm; 24" x 24" x 1 cm; 18 x 18 x 1 cm)	500-700 J$ /sq. foot
❑ Sets of n. 6 (16"x16") marble tiles (e.g. Carrara white)	2,200 J$
❑ Sets of n. 13 random size tiles of Sandstone (imp. from India)	4,400 JS
❑ Antique limestone/travertine random tile pattern	800-900 J$ /sq. foot

Notes:
- 1 m^2 = 9.5 sq. foot
- V.A.T/GST = 16,5 %
- A 30 t. truck carry about 20-22 pallets (total: 200-230 m^2). Transport Kingston – Montego Bay : 65,000 – 80,000 J$. Organized by the seller

A more detailed assessment of the potential for Dimension Stone production in Jamaica and domestic-export market potential is presented in Annexe 4.

Potential for Import Substitution

JAMPRO, through funding from the EU Centre for the Development of Enterprise (CDE), commissioned the *Limestone Marketing Initiative Project* to identify unexplored limestone

opportunities in Jamaica. Findings from the research by Conrad Douglas and Associates (2013)[83] indicate that Jamaica could earn up to US$7 billion annually through increased production of limestone and its value-added items (as in Table 33) for the local and exports markets. The research also revealed that the industry offers tremendous opportunities for investors in agriculture, food processing and manufacturing[84].

The Conrad Douglas report provided an excellent synthesis of the medium term market opportunities. These included:

- **Limestone aggregate** (used in e.g. construction, Portland cement, asphalt pavement, road base. structural fill, or railroad ballast);
- **Ground calcium carbonate** (GCC) – used in many industrial applications;
- **Precipitated calcium carbonate** (PCC) - used in many industrial applications;
- **Quicklime** – use in water treatment and purification;
- **Various grouting, thinset, specialist plasters**, etc. for construction industry;
- **Worked/non-worked** monumental stones, re-crystallised limestones (marble, travertine, alabaster);
- **Enamels, glazes, engobes** (used in ceramics, enamelling or glass industries).

Conrad Douglas' (2013) top limestone and lime-based imported value added products are seen in Table 37.

Table 37 Domestic Market for Top 10 Limestone & Lime based Imported Products 2013

Item Description	CIF (US$)	Quantity (kg)
Dietary and nutritional supplements (vitamins and minerals etc., both in tablets and powders)	US$26,115,113.58	1,096,080.00
Glazed ceramic tiles cubes and similar articles the largest surface of which is capable of being enclosed in a square the side of which is 7 cm or more.	US$24,064,713.24	40,114,631.74
Folding cartons boxes and cases of non-corrugated paper or paperboard	US$9,590,030.46	4,305,441.01
Toilet or facial tissue stock in rolls or sheets	US$8,894,894.71	5,292,029.97
Cartons boxes and cases of corrugated paper or paperboard	US$8,836,806.12	4,855,185.07
Soap (other than medicated soap) and organic surface-active products and preparations in the form of bars cakes moulded pieces or shapes for toilet use.	US$8,382,136.11	2,126,258.38
Napkins and napkin liners for babies of paper pulp paper cellulose wadding or webs of cellulose fibres.	US$7,869,346.41	2,021,910.65
Toothpastes	US$7,355,198.78	1,596,980.35
Toilet paper cut to size or shape in rolls or in sheets.	US$7,030,519.46	2,559,547.56
Sanitary towels and tampons of paper pulp paper cellulose wadding or webs of cellulose fibres.	US$5,606,502.03	718,985.58
Grand Total	**US$113,745,260.88**	**64,687,050.31**

[83] Conrad Douglas & Associates Ltd. (Nov. 2013). *Market Assessment, Design & Implementation of a Marketing Initiative for Limestone and its Derivatives*. On behalf of JAMPRO, Kingston and CDE, Brussels. CD*PRP 577/13

[84] http://www.jamaicatradeandinvest.org/investment/sectors/mining

The total estimated quantity of imported limestone derived imported products was almost 65,000 tonnes of processed products, valued at almost US$114 million in 2013 (Conrad Douglas 2013). Consideration of how these products may be substituted by domestic supply of a range of available industrial minerals and materials was provided. However, apart from limestone derivatives, little market research has been carried out in Jamaica for other commodity groups identified, either by public institutions or the private sector.

SLR reviewed more recent data for imports and exports of minerals over the past three years, as well as international trading data85 for regional and international markets flows (CARICOM, USA and EU). These data are aggregated in the tables below. In order to assess the potential for import substitution, the team reviewed the values (US$) of **quarried materials imported into Jamaica** in 2014-2015 (see Table 38 - note Product Codes are the international statistical codes for each specific product).The green shaded products in the following tables that are imported into JAMAICA could potentially be produced on the island, where there may be potential for import substitution.

Table 38 Quarried Materials Imported by Jamaica (US$ value, 2014-15)

PRODUCT CODE	PRODUCT LABEL	JAMAICA'S IMPORTS FROM WORLD US$ (000)	
		2014	2015
'2523	Cement, incl. cement clinkers, whether or not coloured	16,978	15,067
'2501	Salts, incl. table salt and denatured salt, and pure sodium chloride, whether or not in aqueous ...	1,636	1,611
'2505	Natural sands of all kinds, whether or not coloured (excluding gold- and platinum-bearing sands, ...	673	1,512
'2526	Natural steatite, whether or not roughly trimmed or merely cut, by sawing or otherwise, into ...	373	462
'2508	Clays, andalusite, kyanite and sillimanite, whether or not calcined; mullite; chamotte or dinas	301	238
'2516	Granite, porphyry, basalt, sandstone and other monumental or building stone, whether or not ...	176	104

The values (US$ (000)) of quarried materials being imported **to CARICOM from other parts of the world** are shown in Table 39. Similarly, many of the raw materials for these products are available in Jamaica.

[85] www.trademaps.org

Table 39 CARICOM Quarried Material Imports from World (US$ value, 2014-15)

PRODUCT CODE	PRODUCT LABEL	US$ VALUE (000) 2014	US$ VALUE (000) 2015
‘2523	**Cement, incl. cement clinkers**, whether or not coloured	218,829	207,152
‘2517	**Pebbles, gravel, broken or crushed stone, for concrete aggregates, for road metalling or for ...**	35,986	26,778
‘2501	Salts, incl. table salt and denatured salt, and pure sodium chloride, whether or not in aqueous ...	110,62	11,178
‘2516	**Granite, porphyry, basalt, sandstone and other monumental or building stone**, whether or not ...	3,401	9,370
‘2511	Natural barium sulphate “barytes”; natural barium carbonate “witherite”, whether or not calcined ...	148	7,952
‘2505	**Natural sands of all kinds**, whether or not coloured (excluding gold- and platinum-bearing sands, ...	7,256	7,637
‘2522	**Quicklime, slaked lime and hydraulic lime** (excluding pure calcium oxide and calcium hydroxide)	8,226	6,460

In looking at **stone and plaster imports to CARICOM from the rest of the world**, it is clear that there are products that could be produced in Jamaica and exported within the CARICOM region (Table 40).

Table 40 CARICOM Stone/Plaster Imports from the World (US$ Value, 2014-15)

CARIBBEAN COMMUNITY (CARICOM)’S STONE/ PLASTER IMPORTS FROM WORLD (US$) - ALL VALUES QUOTED IN US$ (000)			
		Value in 2014	Value in 2015
‘6802	Monumental or building stone, natural (excluding slate), worked, and articles; mosaic cubes ...	40,698	32,063
‘6809	Articles of plaster or of compositions based on plaster (excluding plaster bandages for straightening ...	21,816	21,624
‘6807	Articles of asphalt or of similar materials, e.g. petroleum bitumen or coal tar pitch	12,807	12,323
‘6810	Articles of cement, concrete or artificial stone, whether or not reinforced	15,241	11,887
‘6811	Articles of asbestos-cement, cellulose fibre-cement or the like	6,165	7,203

In reviewing stone and plaster imports to JAMAICA from the rest of the world, it is clear that there are products that could be substituted (Table 41) and produced in Jamaica.

Table 41 Jamaica's Stone/Plaster Imports from the World (US$ value, 2014-15)

JAMAICA'S IMPORTS FROM WORLD - ALL VALUES QUOTED IN US$ (000)			
CODE	**PRODUCT LABEL**	**VALUE IN 2014**	**VALUE IN 2015**
'6802	**Monumental or building stone**, natural (excluding slate), worked, and articles; mosaic cubes ...	7,875	8,298
'6809	**Articles of plaster or of compositions based on plaster** (excluding plaster bandages for straightening ...	3,166	3,223
'6805	Natural or artificial abrasive powder or grain, on a base of textile material, paper, paperboard ...	1,786	2,239
'6807	Articles of asphalt or of similar materials, e.g. petroleum bitumen or coal tar pitch	2,255	1,986
'6811	Articles of asbestos-cement, cellulose fibre-cement or the like	840	1,417

In assessing the value adding potential, it is unlikely that there can be complete substitution and there may be other factors (energy, infrastructure, shipping costs, etc.) making imports more cost-effective, but which merit closer investigation. The potential for Dimension Stone production may be limited, but as pointed out previously (Section 8.2), merits considerable and focused investigation (Annexe 4).

In assessing the practical potential for value added Development Minerals products for the construction industry, simple cement products and interlocks, a review of the Trade Maps (2014-2015 above) and STATIN data for 2016 imports (Table 42) reveals that many products are imported from the CARICOM area, Mexico and USA. Others such as paint, plaster, sealants, plasterboard and drywall panels are generally sold by wholesalers, are imported from USA, Panama, Mexico, Belize and Colombia.

Higher quality construction products, such as ceramic tiles, natural stone tiles and tops, glass products etc. are also imported from EU and China, or directly from India, and are generally sold in retail showrooms, all located in the main towns. In some cases, the larger traders run a small stone slab / top cutting workshop, equipped with a bridge saw and a few small circular saws, to cut-to-size the slabs and/or create kitchen worktops or lavatories, according to the final client requirements (see Figure 27).

Most 'value added' Development Minerals products are imported from USA, Mexico, Spain, Dominican Republic, Brazil and Colombia (Table 42), due to the lack of a manufacturing base in Jamaica, with a few rare exceptions at a preliminary development stage that are accessing the export market (mainly to Trinidad & Tobago and USA). These were valued at more than **US$18,000,000** in 2016.

Table 42 Imports of Key Development Minerals & Products to Jamaica 2016

DEVELOPMENT MINERALS	2016		IMPORTED FROM (PRINCIPAL SOURCES)
Commodity	**metric tonne**	**US$**	
Table/ Rock Salt	13,297	867,000	USA Colombia Trin&Tobago Curacao
Silica Sands	9291	1,263,772	USA Bahamas
Clays/ Kaolinite/ Bentonite	535	485,666	USA Canada
Crude stone / granite/ sandstone/basalt	102	44,088	India Brazil
Gravel/ crushed stones	29	18,914	USA
Gypsum (50), incl Plaster of Paris (5.5)	55.5	38,108	USA
Quicklime/ Hydra & Slaked Lime	25,138	3,189,538	Colombia Mexico
Cement	24,674	3,348,125	DomRep, Mexico USA Belgium
Semi-Precious Stones	1.94	133,469	USA Spain
Setts/ Kerbstones	29	21,950	India USA
Tiles/ Cubes of Stone	1.52	1,433,014	Spain, USA, DomRep Mexico
Marble / Travertine	2.38	1,907,680	DomRep Mexico Spain Turkey USA
Granite/ sawn/ cut	1.67	1,401, 867	China Brazil USA
Marble/ Alabaster/ Travertine turned/ polish	2.28	1,914,000	Mexico USA DomRep
(All Imported marbles/ granite/ travertine)			(6,885t / US$6 million)
Plaster Boards (various)	8121	2,547,706	USA Panama Mexico Belize Colombia
Building Blocks/Tiles/ Flags (concrete/ cement)	423	220, 531	DomRep Mexico Costa Rica Honduras USA
Pre-fab Concrete components	848	368,040	Mexica Spain
Ceramic Tiles	889	431,231	USA Spain Brazil Colombia
Total of selected Development Minerals Imports	83,441	18,012,301	USA Mexico Spain DomRep Brazil Colombia

Source: Statistical Institute of Jamaica (STATIN, 2017)

Jamaican market penetration and related imports vary depending on the type of products:

- Paints, plaster dry wall and sealants, are generally imported from USA, Panama, Mexico etc through agents and retailers representing large international companies, or imported directly by the traders from their country of origin.
- Paper, pharmaceutical, and other high quality value added products, generally from USA and EU
- Quicklime and hydraulic/ slaked lime are imported from Colombia and Mexico;

- Ceramic, glass and natural stone finished products are generally imported directly from large trading companies (via showrooms) from USA, Spain, Brazil, Colombia and/or directly from the owner's country of origin.
- Large hotel chains and construction companies located in the bigger metropolitan areas often import ceramic tiles, stone finished products, glass products etc. directly from producers and large exporting companies from the USA, Spain, Brazil etc.

Priority Focus: Development Minerals for Value Adding

Following the analysis above, the focal opportunities to create added value products are presented in order of potential and priority:

Construction Materials/ Industrial Minerals

1. **Fine grained limestone aggregate and powders (e.g. GCC and PCC) for particular Industries**:

   Domestic market: paints, plasters, plasterboard, lime building material for wall painting, animal feeding, artisanal ceramic, lime for bauxite processing[86] etc.

   Export market: for use in paper, pharmaceutical, cosmetics, toothpaste, animal feeding, adhesives, caulk and sealants, ceramic, drilling fluids, joint compound, paint and coating, plaster & plasterboard, PVC pipes, rubber, polyester/ plastics, vinyl flooring, soap, etc.

2. **Whiting limestone powder (PCC)** – *Export market*: for use in animal feeds and pharmaceutical applications; must be of highest quality, with no "impurities" (As, Cd, Fl, etc). Will require expanded conveyors and sterile port handling facilities of at least 2,500t/ hour for cost effective shipping to USA.
3. **High quality hard limestone (dolomitic) and non-altered andesite and other volcanic aggregates** for construction industry (road base and future railway ballast and base), size and material selected (*Domestic market*).
4. **Clay (refined):** for possible re-start of pottery, clay brick making and small ceramic industry in Jamaica (*Domestic market*); replacing imports of same.
5. **High quality river sand & gravels, sized and washed;** selective, for construction (*Domestic and nearshore Americas market*); will require competitively priced energy, transport and access to ports with appropriate handling facilities.

Dimension Stones/ Paving

6. **Dimension Stones:** marble blocks and finished products: for external and internal architectural construction purposes (*Domestic market*). Main products will include tiles for paving and cladding, counter, and bath tops and other paving products (cubes etc.)

[86] At present only one lime plant for Bauxite processing is operating in Jamaica, mainly due to high energy costs and other non-technical factors. Lime is currently imported from southern America (e.g. Colombia mainly due to much lower cost there of energy, c. 20% less than Jamaica).

This area will require specialist management capacity and technical/ market excellence, with preliminary support by MGD in the identification of the best resources. Local private sector investors are needed in this particular area, supported by the commercial banks and development agencies also (see Annexe 4 for further details).

7. **Possible development of a new industry, by using hard volcanic stone** (by sourcing outcropping rocks of intermediate and acid volcanic gravels, present in river beds) to produce external paving cubes for private garden, carriageway and pedestrian pavements, public squares etc.

   This opportunity would need the involvement of key construction sector decision makers (e.g. local architects / builders etc.), to create a new culture of awareness of local materials available in the domestic market.

Semi-Precious Stones

8. **Artisanal stone objects for the domestic arts and tourism market** by using limestone, alabaster, agates and serpentinite. This is likely to remain a low production, niche area, but with the correct supports, could forge a new brand of Jamaican artistry and creativity.

Market Potential: Domestic & Export

Recent research (MTM 2016) indicated that the 2015 export value of Development Minerals (from 303 surveyed quarries) was significant, particularly when value adding production was considered.

Table 43 Development Minerals Export Earnings (2015), Jamaica

Jamaica: Development Minerals Production (Mt) - 2015	8.8 million tonnes
Export Earnings	US$ 3.22 million
Value of Production	J$5.7 billion
Export Earnings with value added production	J$20.6 billion

Source: MTM Survey of Local Quarry Operations, Jamaica (2016)

However, it is clear that with the development of other market opportunities, these values can be expanded and enhanced through beneficiation and value adding.

The following opportunities will require commodity-specific feasibility studies to determine the current and projected demand; costs of production (energy, transport, fuels, labour etc) as highlighted in this study; development of quality standards and marketing strategies, as well as addressing barriers to development.

Domestic Market Opportunities

Based on this assessment, it is clear that there are domestic opportunities for:

- **Aggregates:** High quality, well selected, for building and road construction industry, sourced from hard limestones, recrystallized marbles, dolomitic limestones, sand & gravel, andesites and ignimbrites.

The local market demand, which is primarily "price driven", should be focused towards "quality driven". This can be helped by Governmental policy and improved regulation, higher specifications and technical awareness of final requirements (particularly for public procurement contracts). This will require promotional campaigns towards key decision makers.

- **Medium Quality Ground Calcium Carbonate (GCC)**

Potential to source high grade limestone and production of GCC is considered to be high, providing that excellent management, quality assurance systems and appropriate marketing strategies are in place.

- **Clays**: The clay potential was mapped in 1970 (see Figure 10) but unfortunately many of these indicative clay resources have been over-built (*UNDP Roadmap 2016, page 30; estimated as up to 70% sterilisation, pers comm. Dr. AJS Geddes, former Director of the Geological Survey of Jamaica*) due to poor spatial planning. However, clay production could provide cottage scale, clay brick factories, animal feeding production plants, public and private water / waste storage sealing projects e.g. in agriculture and mining;

    - **Artisanal Clays:** there is also a small but consistent artisan demand for good quality clays suited to ceramics, earthenware pottery and flower pots. This will require direction from MGD and guaranteed supplies of quality clays for artisans, potters etc.

- **Silica Sands:** Utilized in the glass making industry and as base for reconstituted stones. Based on the high potential demand in the island, a small silica industry could be promoted within the St Thomas parish. The British Geological Survey assessment of 2003[87] indicated a high potential for washed river gravels and in the offshore Yallahs estuary.

- **Gypsum i**s a non-toxic mineral that is mainly used by the cement industry as an additive and to manufacture gypsum panels or building plasters. However, Jamaica gypsum could also be utilised as a food additive; in soils and fertilisers; as a water purifier; for surgical plaster casts and as additives in industrial processes, such as cosmetics and toothpaste. Currently about 50 metric tonnes of gypsum are imported (2016) which despite limited resources, could be substituted by domestic supply.

- **Finished Dimension Stones** (tiles, counter-kitchen-vanity tops and other cut-to-size products) are in relatively high demand in Jamaica, and due to the growing middle class, the medium-long term trend is positive. Appropriate supports will be required to realise this potential

- **Building Stones and Paving Stones** to be manufactured from ignimbrites (*where a potentially suitable site can be identified*) and hard limestones and marbles. This market, with good potential in the island and regionally, needs a strong synergy between

[87] British Geological Survey (2003). Alternative Sources of Aggregates – DFID. CR/03/95N

private sector operators, the Institutions and the decision makers (mainly architects and building / real estate and tourism investors) to create a new culture for these products.

- **Agates/ Quartz and other semi-precious stones** for the local jewellery making market and tourism products. Agates occur as pebbles in both Rio Nuevo and Tiber River in St. Mary, especially at the confluence of the two rivers; on the beach at the mouth of the Rio Nuevo; in stream beds in Clarendon and near the Trelawny-Manchester boundary.
- **Silicified wood**: occurs as boulders and pebbles within rivers and streams having their headwaters in areas such as Smithville, Kellits and Crofts hill in Clarendon, Guys Hill in St. Catherine, in the Hector's River near Troy in Trelawny, upstream of the bridge – can be used for jewellery making.

CARICOM and Regional Market Potential

- **Aggregate:** if the domestic market is well structured, there is potential to build a regional export market. Conrad Douglas (2013) provided an excellent overview of the market trends for aggregate in the CARICOM, North America, Central and South America (see box below).

Regional and Extra-regional Markets for Limestone Aggregate

Over the five year period to 2013, the import data for the following regions is broken down as follows:

- Caricom region imported approximately 93,300 tonnes of limestone aggregate valued at US$5 million;
- Central America region imported 393,295 tonnes of limestone aggregate valued at US$1.6 million respectively;
- North America region imported 8.7 million tonnes of limestone aggregate valued at US$121.5 million
- South America imported 1million tonnes of limestone aggregate valued at US$13.7 million.

Source: CARICOM Statistic Bureau – Conrad Douglas Report(2013)

Overall, the countries collectively imported 9.9 million tonnes of limestone aggregate, for a total value of US$142 million. With the current upswing in international economic outlook, there is potential for Jamaica to supply high quality aggregates to CARICOM and the wider American regions.

- **Silica Sand**: the study on washed river gravels and derived aggregates (BGS/DFID, 2003) suggested that there is strong potential for export of fine washed sands to the CARICOM region. This requires further examination in the current period, but anecdotally, operators in 2017 are recognising this potential by seeking to export to USA, but smaller operators require access to affordable port facilities.

- **Finished Dimension Stones** In regional terms, there is potential for Dimension Stone quarrying and processing companies to produce and expand, based on an expanded domestic capacity and import substitution, as outlined above.

- **Precipitated Calcium Carbonate (PCC) and high Quality Chemical & Whiting Limestones for several Industries** (paper, pharmaceutical, animal feeding, cosmetics, toothpaste, adhesives, caulk and sealants, ceramic, drilling fluids, joint compound, paint and coating, plaster & plasterboard, PVC pipes, rubber, polyester & other plastics, vinyl flooring, soap, etc.) – requires a thorough market analysis based on robust quality assurance systems from quarry face to ship (FOB).

The excellent overview of the market trends for GCC and PCC in the CARICOM, North America, Central and South America pointed to this potential (see box below).

Regional and Extra-regional Markets for GCC (Ground Calcium Carbonate) and PCC (Precipitated Calcium Carbonate) products:

- Caricom: A total of 19,000 tonnes of calcium carbonate (GCC/PCC) valued at approximately US$5 million was imported into the region from sources excluding Jamaica.
- Central America: The targeted Central American countries imported a total of 110,000 tonnes of calcium carbonate (GCC/PCC) with a value of US$36 million (2008-2012)
- North America: During 2008-2012 the combined importation of GCC/PCC was 849,000 tonnes valued at US$242 million dollars
- South America: During 2008-2012, the two countries considered in this group – Brazil and Venezuela, imported 147,000 tonnes of GCC/PCC with a combined valued at US$87 million

Source: CARICOM Statistic Bureau – Conrad Douglas Report (2013)

A total tonnage of 1,125,000 tonne of GCC and PCC were imported by these four regions, to a value of US$370,000 between 2008-2012. There is certainly potential for Jamaica to tap into this market.

- **Dimension Stones** (blocks and finished products): significant potential for production of quality limestones and marbles, based on the necessary increase in managerial, technical and marketing capacity as outlined above.

- Jewellery based on **artisanal agate, quartz and other stones production**

Target Markets

The core markets for Development Minerals exports from Jamaica are broadly as set out in the JAMPRO (Conrad Douglas 2013) report for limestone products, namely CARICOM, Brazil, USA and Canada (Figure 35).

Figure 35 Target Markets for Development Minerals Exports from Jamaica (Conrad Douglas 2013)

The recent baseline research, including consultations with key agencies, would concur with this analysis, with particular focus on nearshore USA; Central America; nearshore South America and CARICOM partners.

Constraints and Barriers to Market Chain Development

The constraints to achieving significant value adding within Jamaica are well recognised and have been the subject of commentary over the past decade (e.g. Rainford 2008; Rainford and Rohan 2008; Conrad Douglas & Associates 2013; Norman Davis UNDP 2016) among others.

Following the above analysis, this current study also identified a range of 'soft' and 'hard' barriers to effective development of the sector, as follows:

'Soft' Barriers

- **Weak knowledge of market demands** at all levels; with a fundamental lack of **demand side data,** particularly in relation to domestic / regional / international demand profiles.
- Profound lack of knowledge of **large scale public project pipelines** available to operators, with details of mineral specifications, costs and identification of barriers to meeting those specs.
- **Poorly defined resources & reserves** across many commodity groups.
- Lack of detailed **Quality assured (QAQC) data** for target geological units
- Lack of **capacity & experience in value adding production** among many producers
    - Lack of entrepreneurial risk taking in the sector (?)
- Lack of targeted investment due to **lack of access to capital** or relationships with investing partners.
- **Weak promotion of the sector by industry** itself, with a frequently negative reputation among the environmentally conscious public;
- **Poor culture of "collaboration to compete**" – if this could be fostered, the producers could potentially guarantee supply of key minerals to a larger market (domestic and export).
- There is a lack of characterisation of **commercial structures and market operations** of target sub-sectors e.g. market constraints for high grade limestone in USA; demand for and sourcing of dimension stone; the operations of international buyer groups etc.

'Hard Barriers'

- **Costs of Energy** are prohibitive for many Group 2 and 3 operators, such that they are moving off-grid and are thus heavily curtailed in terms of developing energy-intensive value adding production to their operations. The cost of energy is twice that of USA/ Italy for example.
- **Transport and shipping costs** are a major impediment to the development of a solid export base:
    - ***Road Transport Cost***. : One large road truck (30-40 tonnes) from Kingston to Black River / Montego Bay US$ 600 – 800.
    - ***Shipping Cost:*** One 20 tonne container from Jamaica to CARICOM: US$ 1580
    - One operator commented that transport costs are "*killing the industry*" due to the costs of tolls & fuel ($1.44/litre retail price).
- **Transport Infrastructure:** The provision of an adequate and integrated transport network would be extremely valuable and would provide strategic competitive advantage to Jamaican Development Minerals producers.

- **Road network** is inadequate and costs of transport are too high (tolls, trucking)
- Rail network is scheduled for phased upgrade, but requires to be expedited and integrated with road and port infrastructure urgently.
- **Access to Port infrastructure** is critically inadequate (16 ports in Jamaica, many of which have only 30- 40% utilisation). The current ports are privately controlled and lack appropriate loading / unloading facilities; in particular bulk handling facilities for trans-shipment of aggregates.

These capacity and iInfrastructural deficits are critical and must be addressed with urgency if the Development Minerals sector is to move forwards.

Possible Solutions

The following solutions are recommended if the constraints and barriers to the sector are to be overcome. These must be accompanied by considerable capacity building at every level to upskill and build confidence among both public and private sector operators.

'Soft ' Solutions

- Carry out resource & reserve estimation to international reporting standards (JORC/ PERC etc) for focal target commodities (MGD assisting private operators).
- QAQC data for key geological horizons, available digitally to investors; coordinated by MGD and available freely online.
    - Public institutions (National Works Agency; National Housing Trust; etc.) should specify higher QC standards as consumers of these mineral products, which would eliminate producers of low standard products.
- Capacity building in quarry planning and management, market research, market intelligence, coupled with the need for certified and 'joined-up' training programmes (perhaps through the proposed National Minerals Institute);
    - Investment will follow if the industry structures are appropriate and standards can be guaranteed.
- MQAJ and private sector operators, with MGD/ MTM must promote what is available in Jamaica through proactive attendance at trade fairs, use of web/ online promotion, etc.
- Identify willing operating partners to "collaborate to compete" to supply larger markets consistently with high quality assured materials (via MQA/ Minerals Institute)
- Consider industry Joint Ventures to attract direct investment and key skills from overseas.

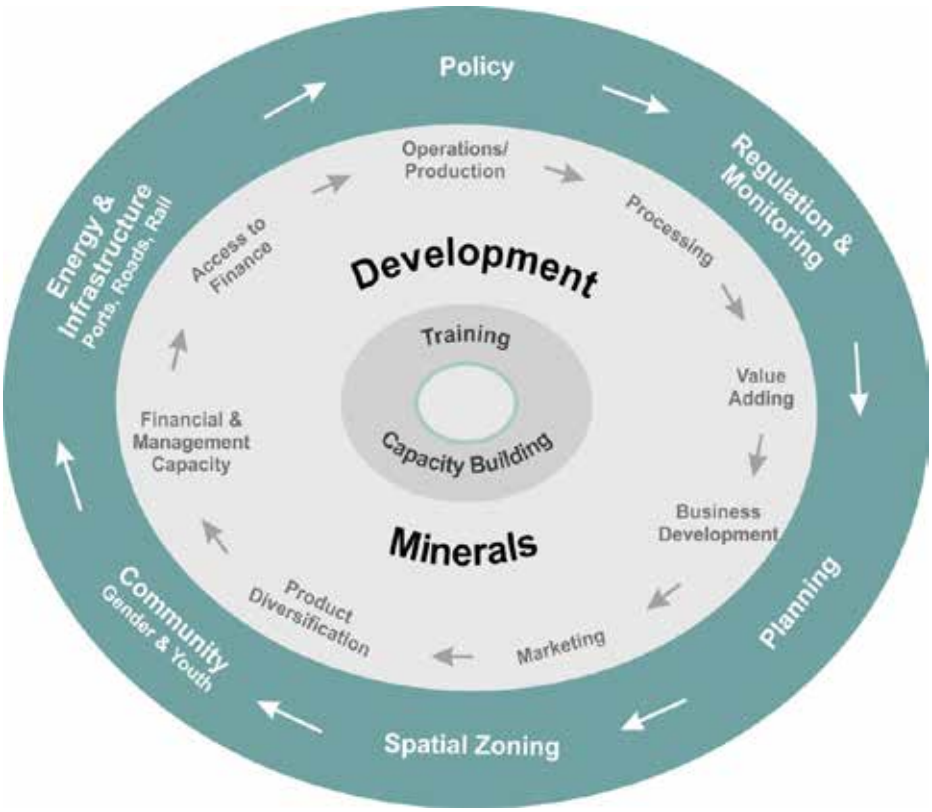
'Hard' Solutions

- Energy policy and costs must be addressed: there is an over-reliance on oil and there must be moves to shift Jamaica's energy consumption to use of clean (and cheaper) gas.
- The planned, phased Rail network upgrades must be advanced expeditiously.
- Bulk handling at five (5) multipurpose port facilities for aggregates/ bulk materials, with appropriate and future-proofed conveyor belts and loading/ unloading facilities.

These proposed solutions will require political and institutional leadership and collaboration across the public and private sectors to address these constraints with urgency.

The future sustainable development of the Development Minerals sector in Jamaica will require very strong collaboration between the public and private sectors (Figure 36). This will demand a supportive enabling environment (policy, infrastructure, regulatory, spatial planning & zoning, training), underpinned by capacity building in technical, operational, financial, environmental and social dimensions of quarrying for regulators and operators.

Figure 36 Integrated Model for Development Minerals Sector, Jamaica



Recommended Value Chain Actions to Add Value to Development Minerals

There is a number of strategic actions required for the fully integrated development of the Development Minerals' value chain in Jamaica. Ultimately, the private sector must finance, produce, process and deliver the value added products, but public sector support is required at critical stages.

Each component requires focal attention to each 'cog in the wheel' (see Table 44; Figure 37), with the support of the ACP-EU Development Minerals Programme for key capacity building elements.

Table 44 Recommended Value Chain Actions

SUB-COMPONENT	FOCAL AREAS FOR ATTENTION
Country level	National Minerals Policy Minerals Legislation Capacity Building - **Development Minerals Programme** Mapping and economic definition of focal resources Laboratory Testing Association building
CAPACITY BUILDING **Institutional level**	**UNDP Development Minerals Programme** Available and accessible / online Geo-Data Available QAQC data for target Development Minerals Strong regulation of mining, geotechnical, environmental & safety
Private Sector level	Quarry Planning & Management Resource and Reserve estimation All aspects of environmental planning & management Quality Assurance systems/ sampling/ accreditation Social impact assessment & systems Market research for value adding
Local Capacity Building & Training	Apprenticeships for operatives, with HEART / NTA Business planning and management for Quarry Managers with third level institutes (UWI/ UTech/ Other) Accredited laboratories (*National Minerals Institute*)
Infrastructure	Improved transport infrastructure for increased economic linkages and export potential Roads network Railways – phased development Ports – accessible to Development Minerals
Markets	Domestic, CARICOM, Overseas Market research: supply and demand sides Focal market analyses Mining Associations engagement in research Sensitisation of Banks/Lenders to Development Minerals Sector Trade missions/ conferences/ trade shows
Supports to MSMES	Start-up and support to micro-small-to-medium enterprises Focus on key value added products, suited to demand profile in domestic, regional and international markets

The following series of diagrams summarises the recommended actions to be undertaken with respect to enhancement and capacity building of the Development Minerals sector in its entirety (Figure 37) in collaboration with the public and private sectors, including the financial and education/ training institutions.

Additionally, there are recommended value adding actions to be undertaken for specific commodity groups, starting from an assessment of the 'opportunity' through the exploration, feasibility, evaluation and start-up phases, as follows (see Figure 38, Figure 39, Figure 40, Figure 41 and Figure 42 below).

Figure 37 Value Chain Actions for strategic development of the Development Minerals Sector, Jamaica

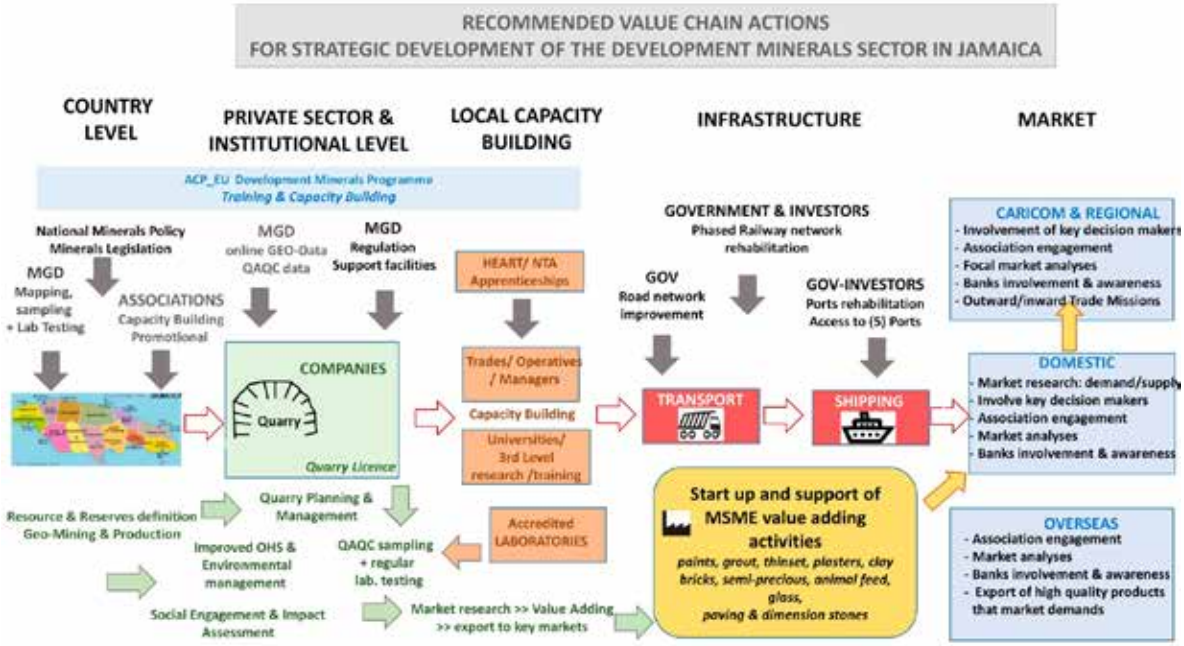
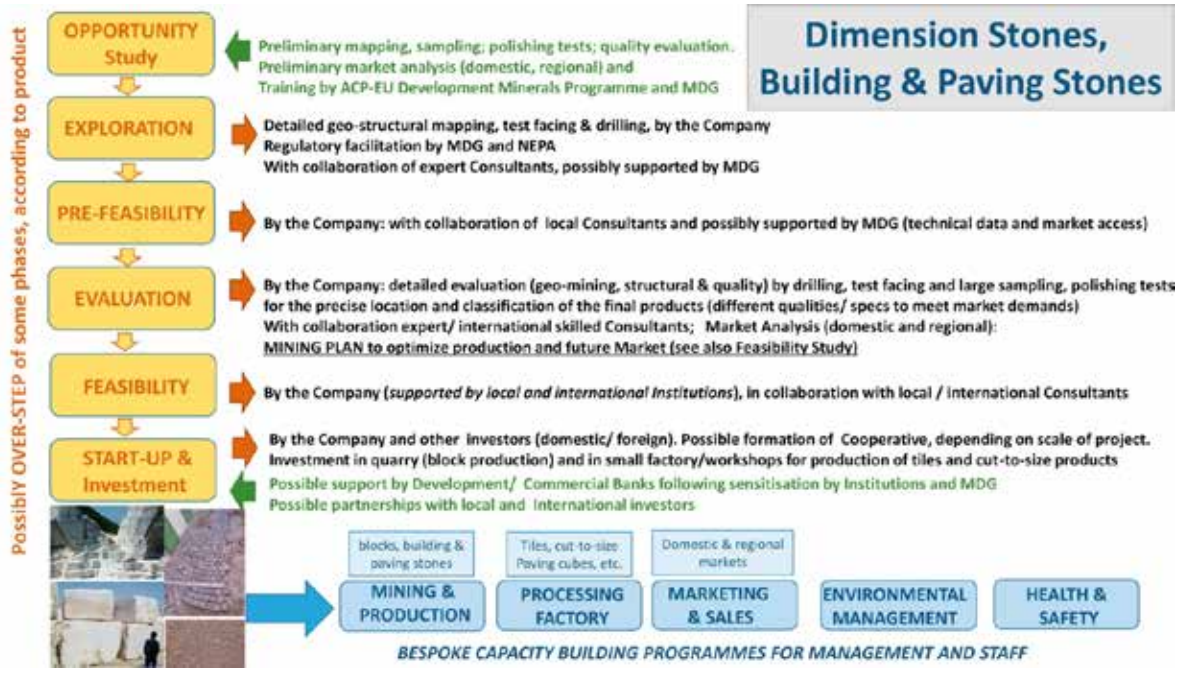


Figure 38 High Quality Limestone: recommended Value Adding Actions

Figure 39 Industrial Minerals - Clays: recommended Value Adding Actions

Figure 40 River Sands & Gravels: recommended Value Adding Actions

Figure 41 Dimension, Building & Paving Stones: recommended Value Adding Actions



Additional and specific recommendations for Dimension Stone development are presented in Annexe 4.

Figure 42 Semi-Precious Stones: recommended Value Adding Actions

It is evident from the proposed plans for each Development Minerals grouping that public and private sector actors must work together within a strategic development plan to achieve the desired outcome: a viable and thriving Development Minerals sector that will continue to contribute to the sustainable socio-economic development of Jamaica.

Baseline assessment: recommendations

The Baseline Assessment of Development Minerals in Jamaica was carried out in the period March-July 2017 under five key components (1-5), as set out in the terms of reference.

Recommendations

It is recommended that the following actions for each of Components 1-5 are addressed through an integrated strategic plan for the development of the Development Minerals sector in Jamaica.

A Matrix of Priority Actions (Table 45) is presented in Section 9.2 below, which summarises many of the following recommendations.

Component 1: Profile of Development Minerals Sector

- Improved **mapping and resource/ reserve characterisation** of focal Development Minerals (high quality limestone and dolomite formations, clays, marbles suited to dimension stone production, andesitic volcanic rocks, etc.).
- Improved **archiving and availability of online digital data** for citizens, quarry operators and potential investors in Development Minerals.
- Improved **integration of data sources**, including laboratory tests undertaken as part of the licensing process, across Government divisions to e.g. provide quality assurance data for target limestone units to encourage investment.

Component 2: Review of Legal & Policy Framework

- **Minerals Development Act** requires to be updated to include Mining & Quarrying under one piece of legislation, to facilitate application of operational standards (technical, environmental, social, closure), regulation and compliance;
- **National Minerals Policy** requires prioritisation and scheduling of key actions, with urgent implementation to support all other actions;
- **Mining Cadastral system** requires to be updated, linked to MGD's GIS systems.
- Creation of the **National Mineral Institute** to drive the development of the non-metallic quarry sector and the implementation of recommended actions, including Capacity Building via training courses and on job training programmes.
- **Promotional Activity must improve:** MGD to produce thematic "investment-promotion maps" to support local and international investors' decision making during the opportunity/ pre-feasibility/ investment phases.
    - Production of **Commodity Reports** for focal minerals.

Component 3: Review of Institutional & Technical Operating Context

- **Geo-Data:** Full capture and integration of data (geology, chemico-physical quality of materials, mapping, etc.) in robust GIS management system;

- Purchase of recommended software & hardware, with secure storage / back-up systems;
- Training for key MGD operators.

- **Capacity Building for Regulators** at MGD to meet international standards in:
  - Quarry planning & management, use of equipment; optimisation of production; etc.
  - Environmental management and monitoring, mine closure;
  - Occupational health & safety aspects of quarrying.
  - Stronger Regulation by MGD and NEPA with penalties for breaches of Licence terms
  - Consider establishment of the modular Mining School to build skills across the sector.
- **Capacity Building for Quarry operators** (private sector) to meet international standards in:
  - Quarry planning, optimisation & scheduling of production,
  - Environmental planning and management (see also below),
  - Tailored apprenticeships/ trades for youth to encourage skills entry to the sector.
- **Improved Access to Finance** will require capacity building in:
  - Business planning and development of tailored Business Plans for operators;
  - Planning and scheduling of optimised production to meet loan repayment terms;
  - Sensitisation of lending institutions to sectoral needs.
- **Infrastructural constraints must be overcome:**
  - **P*orts,* rails, road** must be addressed and political inertia must be overcome.
  - **Energy policy** must support the energy intensification of the sector for value adding.
- **Development focus must be on quality assurance, value adding** and **aggressive marketing** of Development Minerals products to domestic/ regional /export markets.

Component 4: Environmental, Health & Safety, Socio-Economic Impact Analyses

- **Capacity building across the board for Quarry operators** (private sector, in association with MQAJ) to meet international standards in:
  - Environmental planning and management, mine closure and reporting;

- Environmental impact assessment;
- Integrated health & safety management systems appropriate to quarrying;

- **Environmental Monitoring of Impacts** of quarrying by regulators, particularly:
  - Improved spatial planning and zoning of quarrying in appropriate sites
  - Monitoring of cumulative landscape & visual impacts; and dust, noise, vibrations
  - Environmental planning and management, mine closure and
  - Enforcement of regulations, with penalties for infringement.
- **Improved Social Impact Assessment:**
  - Formalised records of corporate donations to communities by the sector.
  - Improved social impact assessment (SIA) processes, tailored to quarry scale.
  - Develop transparent grievance & complaints procedures for community residents.
- **Economic Impacts:**
  - Monitor employment trends and contributions of quarrying; continue the excellent MTM/MGD series of surveys;
  - Support the formation of a Jamaica Artists' Collective, sharing equipment and facilities modelled on the Tanzanian AMGC[88] centre, with support from UNDP, MGD, JBDC and JAMPRO, as well as the Ministries of Mining, Culture & Tourism.
  - Finally address the critical *infrastructural barriers* for full economic integration to the Jamaican economy.
- **Gender & Youth Assessment:**
  - Continue to monitor female participation in the quarry sector
  - Encourage entry to youths, to proposed vocational apprenticeship training
  - Training for women in quarrying groups to improve their exposure to international standards in OHS; environmental management and impact assessment, monitoring & regulation; social and community engagement.
  - Support the establishment of a Women's Chapter within the MQAJ to advocate on issues of concern.

[88] African Minerals & Geoscience Centre (AMGC) located in Dar es Salaam, Tanzania – see www.seamic.org

- **Human Rights**
    - Continue to monitor human rights issues in relation to quarrying (through MTM surveys). Engage in activities with the quarry operators to ensure full awareness of core issues.
    - Consider official application of regulations and good practices to ensure fair lease agreements and encourage partnerships between large land owners and quarry entrepreneurs.

Component 5: Market & Value Chain

- **Focus on adding value** to key focal commodities:

  Limestone; High Grade Limestone; Clay, Sand & Gravels; skid-resistant stone; Dimension Stone; Paving Stones, and Semi-Precious Stones with requisite research and development support.

This will require:

- Development of accredited laboratories (public / private, internationally accredited);
- Implement digital quality assurance/ quality control (QAQC) data availability, for key geological units, available freely online, to encourage investment in quality resources.
- Develop industry collaborations to realise scale of opportunities, fostered by incubation at JBDC and/or University Business Schools.
- **Ongoing Capacity Building** actions, in line with the UNDP Development Minerals Programme road map, including training courses and workshops, field and on-job training actions, for private and institutional sectors, in evaluation, mining and market management, production of value added products, export market access, etc. Ideally such actions should be part of continuous professional development, beyond the life of the Programme.
- **Import substitute** for key supplies, based on rigorous feasibility analysis
    - Paint, plasters (grout, stucco, thin set), range of Stone Products, etc., based on hard research.

- **Market Intelligence & Surveying** needs significant improvement (Americas/ CARICOM)
    - Demand side data must be researched (*domestic /CARICOM/ international*) so that products can be tailored to meet specific demands;
    - Detailed and consistent analysis of markets and trends required (JAMPRO/ MTM);
    - Outward technical-market missions for private companies.
- **Develop targeted Marketing Strategies**, with specific Commodity Reports for each of the focal Development Minerals, linked to potential and specific market places.
- **Transport and infrastructure bottlenecks in roads, rail and ports**, as well as **energy costs**, must be addressed. These issues are larger than the Development Minerals sector, but will require concerted political support and delivery if intensification of the industry is to happen.

Matrix of Priority Actions

A matrix of priority actions is proposed to address the conclusions and implement the recommendations above.

Based on these priorities, an integrated Development Strategy for the Development Minerals Sector should be implemented.

These are summarized in Table 45 below.

Table 45 Matrix of Priority Actions: Development Minerals in Jamaica

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When[89] S	M	L
COMPONENT 1: PROFILE OF THE SECTOR							
1	**Profile of the Sector**	Excellent research conducted on the geological potential of Development Minerals in Jamaica, Demand side research is required. Key challenges facing the sector have been well documented; action is required.	Integrated research on the full value chain for Development Minerals, Demand side data are required, regularly. Core challenges must be addressed through an integrated, national strategic approach, to realise the full potential of the sector in Jamaica.	**MTM** **MGD** **JAMPRO** **Inter-Ministerial**			
COMPONENT 2: LEGAL & POLICY REVIEW							
2	**Legal & Policy Review**	Minerals Development Act requires to be updated and enacted to include Mining & Quarrying under a single Act	Review current legislation and update in light of findings in Baseline Assessment.	**MTM**			
		National Minerals Policy requires prioritisation and scheduling of key actions (*what, by whom, by when*)	Finalise and publish the National Minerals Policy as soon as possible. Prioritise the key actions and allocate *'by whens'* to the responsible agencies.	**MTM**			
		Mining Cadastral System requires to be updated, linked to GIS systems	Integrate the Mining Cadastral system with MGD's geological and technical GIS-based databases/ mapping facilities. Ensure all MGD regulatory staff have training and access to the system.	**MGD**	S		
		Spatial Planning must be strengthened to avoid conflict among competing land users.	Strengthen the strategic spatial planning function with clearly demarcated zones for quarrying of Development Minerals and other land uses (housing, agriculture, environment, forestry, mining etc.)	**MTM NEPA PIOJ**			
		Establish Minerals School as proposed by MTM/ National Minerals Policy	To advance training across all requisite disciplines, in association with universities and colleges.				
		WRA *flood monitoring* to be integrated with MGD's geo-systems to monitor impacts of rising sea-level on coastal infrastructure	This should take account of national climate mitigation and adaptation plans.	MRA MGD			

[89] Timeframe (by when): **S short term – 1-2 years – M medium term – 2-5 years – L longer term -> 5 years**

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When[89] S	M	L
COMPONENT 3: INSTITUTIONAL & OPERATING CONTEXT							
3a	Institutional Context	Complex array of agencies involved in the administration and regulation of Development Minerals	An alignment of agencies was proposed in the draft National Minerals Policy 2017-2030 and this should be advanced by Government. Any review of the institutional structure should consider separation of regulation from promotional activities.	**MTM**			
		MGD regulatory capacity for Quarrying and Mining requires to be strengthened.	MGD Regulators to be trained in advanced practice in environmental planning, management, rehabilitation, restoration and quarry closure.	**External expertise**			
		Community engagement is not required under the current licensing regime.	Meaningful community engagement and *Social impact assessment* could be considered as part of future Mining & Quarry licensing process.	**MTM**			
3b	Availability & Accessibility of Geo-Data	MGD produces high quality Geo-Data, but is poorly organised and inaccessible. Poor integration of Geo-data (geology, geochemistry, physical properties, etc.) GIS management systems and data integration required. Current system is vulnerable to data loss through server failure or viral attack. Quality control data (chemico-physical quality of key Development Minerals) not available to potential investors.	Design of integrated GIS data management systems, future proofed and fit for purpose. Broad-based GIS training for key MGD staff in systems & data management. Capture and integration of geo-data (analogue and digital) data to GIS platform - generation of economic maps on country-basis. Improved e-security systems / back-up systems QC data held in MGD files should be digitally captured, mapped in GIS and promoted widely, available freely online.	**MGD** External expertise MGD staff External expertise MGD staff			
3c	Operational Management Capacity	Weak quarry planning & management skills means there is no optimisation of production.	Training in Quarry Planning and Management for all Quarry operators, including geotechnical design for safety. Such training could be a pre-requisite for granting of a new licence.	**External expertise**			
		Access to finance is exceedingly difficult due to weak operational business planning.	Training in Business Planning and Financial Management for operators Sensitisation of financial institutions to sectoral needs	**UWI/JBDC** **DBJ/ EXIM**			
3d	Vocational Training	There is a dearth of formal apprenticeship training for the Development Minerals sector.	Engage with HEART /NTA to develop bespoke apprenticeships for quarrying skills Establish a *National Minerals Institute* with modular training across a range of training/ educational institutions	**HEART/NTA** **MGD** **MLSS** **Education**			

3e	**Industry Associations**	MQAJ has inadequate organisational structures, with weak advocacy/promotional skills; requires capacity and new entrants.	Organisational capacity building and recruitment of new officers.	**JBDC** **DBJ**			
3f	**Access to Finance**	Access to finance is particularly difficult for many SME quarry operators, due to weak technical (reserves estimation), business planning and weak environmental standards.	Training in for quarry operators to prepare credible Business Plans; Understanding of markets, technical specifications and demand; Training in resources and reserves estimation to international standards, and Environmental management to meet banking requirements	**JBDC** **DBJ**			
COMPONENT 4: ENVIRONMENTAL, HEALTH & SAFETY, SOCIO-ECONOMIC IMPACT ANALYSIS							
4a	**Environment Planning & Management**	No environmental management systems in place for > 98% of quarries observed. Environmental planning and management; rolling rehabilitation and restoration of lost habitats must be addressed. Environmental impacts of quarrying appear to be limited to quarry footprint. Environmental NGOS oppose quarrying and call for greater regulation and penalties for infringement. Regulation and enforcement of environmental law and standards needs to be significantly improved, as pointed out by environmental NGOs. Positive impacts of quarrying appear to outweigh negative socio/ environmental issues for communities	Integrated training in environmental planning and management for quarry operators and key operational staff. Stronger enforcement of environmental laws and regulations Stringent penalties for breaches of licence terms Quarrying must be supported as a key economic driver and source of sustained employment in in rural areas.	**External expertise** NEPA MGD MTM PIOJ			
4b	**Occupational Health & Safety**	Occupational Health & Safety and Geotechnical Safety management and training systems are largely absent. Poor reporting of safety breaches.	Training in Quarry safety planning, staff training and management systems to improve safety standards across all operations. Introduce stronger regulation with penalties for breaches of Licence terms. Mandatory reporting of accidents and fatalities must be introduced	**External expertise** **MGD** **MLSS**			
4c	**Community**	All quarries surveyed provide direct financial and material support to local communities, ranging from schools, church, police, etc.	Implement a formalised system of recording social / community donations (*noting that many operators prefer to keep this on discretionary 'as needs' basis*).	**MTM** **MDG**			

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When[89] S	M	L
4d	**Human Rights**	No major prejudice to Human Rights was identified during the baseline assessment. There is no child labour in Jamaican quarries.	Government to engage in ongoing dialogue with Development Minerals industry to ensure responsible behaviour and respect for human rights.	MTM MGD			
	Conflict Resolution/ Conflict of Interest	No specific land conflict was identified as many limestone lands are not suitable for agriculture/ forestry	Monitor this issue as land pressures become more intensified as population expands.	**PIOJ** **NEPA**			
4e		Conflicts of interest noted between public functions and private interests.	Politically sensitive issue that requires monitoring and legal redress where such conflict exists.	**MTM**			
		Redress of grievances / social engagement	Establish community forums to allow inputs at design stage; airing and redress of grievances and avoidance of ongoing conflict.				
4f	**Access to resources**	Poorly regulated 'Pop-up' quarries create undue pricing competition for quarries that work to meet standards.	Laws should be strengthened to permit only licensees with requisite technical, management and planning skills. Upskill the 'pop-up' operators to next levels to ensure they stay in sector.				
4g	**Socio-Economic/ Employment**	Positive economic impact through employment with 788 employees in 54 quarries (12% female) – equates to 1,750 people employed directly in 120 quarries; up to 8,000 indirectly.	Communities appreciate the employment options but this requires to be monitored in terms of public health are people accepting adverse dust and noise impacts to retain jobs?	**MLSS** **MTM**			
		Working conditions and wages are reported to be fair by operators and operatives. These jobs may be the only paid employment in the local area.	Conduct bi-annual survey of employment conditions: contracts , terms and social security, wage rates etc.	**MTM** **MLSS**			
		Development Minerals underpin other areas of the economy (construction, housing, roads, industrial processes etc.).	Better promotion of the role of Development Minerals in underpinning other economic activity, especially to planners, policymakers, and decision makers.	MGD MTM MQAJ			
4h	**Economic Linkages**	Support the establishment of Artists Collective for artistic / creative sectors.	Establish integrated framework for source and supply of indigenous clays, semi-precious stones, decorative stone and other minerals. Develop a shared facility for equipment, processing, training and marketing of Jamaican artists' products of Development Minerals.	**MGD, UNDP** **JBDC**			

4i	**Infrastructure** **Energy**	Critical infrastructure, in terms of integration of transport chain (road, rail, ports) is a significant inhibitor of the Development Minerals sector. Energy Costs are prohibitive for sector.	Plans for railway and ports developments have been considered for many years. It is crucial that phased developments are executed without delay to allow access to markets domestically and regionally. Energy policy needs to shift radically away from oil dependency, with costs in line with regional competitors.	GoJ/ Relevant Ministries			
4j	**Gender & Youth**	There no evidence of female barriers to the sector; women can access higher-skilled jobs in quarries, due to higher educational attainment. Youth work as operatives.	Strengthen women's organisational capacity through regular parish-meetings and engagement through women's chapter of MQAJ	**MGD** **MQAJ** **Women**			
		Concerns that young men are dropping out of school and training in trades / apprenticeships is required	Bespoke apprenticeships are required to entice young men to enter the quarrying sector.	**HEART/NTA** **MTM**			
		There were no specific health & safety issues for women or children identified.	Occupational health risks are high for young men, due to exposure to noise, dust, vibrations/ lack of PPE in quarries and must be addressed.	**MLSS** **MGM**			
COMPONENT 5: MARKET & VALUE CHAIN ANALYSIS							
5a	**Barriers to Development**	Weak knowledge of market demands at all levels; with a fundamental lack of demand side data. Lack of knowledge of large public project pipelines; mineral specifications, costs Poorly defined resources & reserves Lack of QAQC data for key commodities Lack of capacity & experience in value adding production Lack of targeted investment due to lack of access to capital Weak promotion of the sector by industry Poor culture of "collaboration to compete"	Ongoing research required in market demands in domestic, regional and international (near-shore Americas) Publication of large public projects online in advance to allow suppliers to position themselves/ collaborate. Training in resource/ reserve estimations to international standards. Develop and promote QC databases, publicly available to investors Training & sensitisation in potential for value adding for a range of products / study visits – based on demand forecasts (see above) Sensitisation of lending institutions to sectoral needs (see C 3c above) Capacity building for operators (see C 3c) Improved and 'joined up' promotion of sector to public/ lenders Capacity building on joint bidding/ shared client management	**JAMPRO** **MTM** **NWA** External expertise MGD External expertise DBJ/ EXIM JBDC MTM/ MQAJ JBDC/DBJ			

Component		Key Findings of Baseline Assessment of Development Minerals	Recommended Priority Actions	By Whom	By When[89] S	M	L
5b	**Opportunities**	Focus on adding value to key commodities: Limestone; High Grade Limestone; Gypsum/ Pozzolan products Clay, Sand & Gravels; Dimension Stone, and derivatives; Semi-precious stones - artisanal	Conduct resources/ reserve estimation for key minerals Develop *Commodity Reports* for key minerals, for promotional purposes Feasibility studies for value adding activities (whiting, GCC, PCC, cement, paving stones, inter-locks; high grade limestone for paint, foods, pharma) Support *feasibility studies* by private sector Trade missions to key target markets (private and public sector)	**JAMPRO** **MTM** **MGD**			
5c	**Market Intelligence**	Market Intelligence needs significant improvement (Americas/ CARICOM)	Demand side data must be researched (*domestic /CARICOM/ international*). Detailed and consistent analysis of markets required Develop targeted Marketing Strategies, with specific *Commodity Reports* for each focal Development Mineral, linked to specific market places.	**JAMPRO / MTM** **JBDC/ UWI**			
5d	**Import Substitution**	Import substitute for key supplies, based on rigorous feasibility analysis	Conduct *research for substitution* for paint, plasters (grout, stucco, thin set), cement, clinker, etc., based on hard research. *Development plans* for highest opportunity products	**JAMPRO** **Univ** **MTM**			
5e	**Infrastructure**	Transport, Energy & Infrastructure bottlenecks must be addressed.	As above (4i) - issues are larger than Development Minerals, and will require *concerted political support and delivery*.	Inter-Ministry MTM			

Closure

This *Baseline Assessment of Development Minerals in Jamaica* has been prepared by the Consultant, SLR Consulting (Ireland) with its partners AlpiConsult Stones (Italy), Dr. Arthur Geddes and Ms. Yolanda Drakapoulos (Jamaica).

It has been prepared with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Appendix 1 - Terms of reference

Terms of Reference (TOR) Baseline Assessment of Development Minerals in Jamaica

A. BACKGROUND

Programme Background

The ACP-EU Development Minerals Programme is a three-year, €13.1 million capacity building program that aims to build the profile, and improve the management, of Development Minerals (industrial minerals; construction materials; dimension stones; and semi-precious stones6). The program is an initiative of the African, Caribbean and Pacific (ACP) Group of States, financed by the European Union and the United Nations Development Programme (UNDP), and implemented by UNDP.

The mining of Development Minerals has important implications for sustainable development, however, they have to date received inadequate attention for their potential to impact livelihoods; and few development programmes have provided support for this mining sub-sector. Often referred to as Low Value Minerals and Materials (LVMM) due to their low price as a function of their weight, and their relatively low value to international commodity markets, Development Minerals provide crucial inputs for domestic economic development (infrastructure, manufacturing, construction and agriculture to name a few) and have the potential to be high value in terms of national development.

In comparison to the metals sector, Development Minerals have closer links with the local economy, and have the potential to generate more local jobs, with a greater impact on poverty reduction. This is partly because the sector is dominated by small and medium scale domestic businesses. However, there are a number of environmental, social and economic challenges confronting the sector.

Development Minerals commonly operate in an uncertain legal and regulatory environment, with a lack of publicly available and easily accessible geological data, which exacerbates wasteful exploration and discourages investment in the sector. The oversight of environmental, social, health and safety issues is often inadequate, and weak or often non-existent technical extension services such as skills training, capacity building, access to technology, finance, appropriate equipment, investment information and markets, has contributed to the sector's neglect.

The ACP-EU Development Minerals Programme is being implemented at both the regional and country levels. At the regional level, the programme conducts capacity building activities with participants from forty ACP countries through regional training workshops, field trips, the production of guidance products and knowledge exchange. The programme will also host a final conference to enhance the knowledge sharing activities conducted during the programme. Participants of our regional training workshops implement the skills and knowledge that they have gained from the training through return to work plans.

At the country level, in depth capacity building is undertaken with six focus countries: Cameroon (Central Africa); Guinea - Conakry (West Africa); Uganda (East Africa); Zambia (Southern Africa); Jamaica (Caribbean); and Fiji (Pacific). Country-level activities include: training; small grants;

the production of maps and databases; development of regulations on environment, health and safety; organization of community dialogues, technology fairs and networking events.

Capacity building support is provided in the following thematic areas of importance to the sector: 1) mine and quarry management; 2) environment, health and safety; 3) entrepreneurship skills; 4) market analysis and investment promotion; 5) geo-data and maps design; 6) community relations and addressing grievances.

The programme supports a range of key stakeholders in the sector, including public stakeholders such as regulatory agencies and local governments; private stakeholders such as small-scale mining enterprises, intermediaries, transportation and logistics service providers, construction companies; business development stakeholders such as mining and quarrying associations, chambers of mines, training centres, universities, consulting companies; and social stakeholders such as civil society organizations and community groups.

The aim of the capacity building activities are to:

1. Enhance employment and incomes, including employment and incomes of women
2. Improve the policy and regulatory environment
3. Minimize environmental impacts on communities
4. Address individual and community rights and preventing conflict
5. Ensure decent working conditions
6. Facilitate South-South cooperation and cross-country learning

Baseline Assessment Rationale

The study will provide a comprehensive baseline assessment of Development Minerals in Jamaica that highlights current dynamics and key issues relevant to improving the sector. Specifically, the study will:

· Profile the range of commodities mined, the sites of extraction and beneficiation, and the businesses and employees involved in the sector

- Review relevant laws, regulations, plans and policies (including the draft Minerals Policy that define the governance framework at the local, national and regional levels highlighting aspects favorable to, or hindering the sector (this should also include an assessment of any gender related barriers that affect the sector)
- Analyze the current institutional and technical operating environment at the national and the operational level
- Conduct environmental, health and safety, and socioeconomic impact analyses, using participatory approaches, where relevant
- Undertake market and value chain analyses for priority Development Minerals in Jamaica and the level of integration and interlinkages with other sectors of the economy.

Given the variety of areas, the study implies a holistic and interdisciplinary approach covering national, subnational and community levels. Thus, a robust methodology is required for this multidisciplinary task.

B. METHODOLOGY AND DESIGN

Methodology

The study will combine both qualitative and quantitative methods. It will combine desk review of published and unpublished (grey) literature, analysis of primary and secondary data, field work, consultations and key informant interviews with individuals from across the sector (e.g. government, regulatory agencies, artisanal and small-scale miners, businesses involved in quarrying and beneficiation, mining and quarry associations, business development centers, academic institutions, civil society organizations and affected communities). The study will target upstream and downstream stakeholders in the sector.

The study will document best practices and include brief case studies to provide the reader with a rich picture of the field context. This is particularly important where primary and secondary data are unavailable. The study will be accompanied by photos and videos from the field.7 It is not expected that the study will assess all commodities, operations or field sites, however, a representative sample should be selected to provide an accurate picture of the state of the sector. The study will also pay attention to gender issues throughout the components.

Practically, the study will encompass five components as follows:

- Component 1: Profile of the sector
- Component 2: Review of legal and policy framework
- Component 3: Assessment of institutional and technical operating context
- Component 4: Environmental, health and safety, and socio-economic impact analyses
- Component 5: Market and value chain analyses

Component 1: Profile of the sector

The study will profile the range of industrial minerals, construction materials, dimension stones and semi-precious stones mined in Jamaica. The profile will include an overview of the major sites of extraction and beneficiation (e.g. location, type of commodities mined, production data), the range of businesses involved in the sector (e.g. size, role, formality); the people employed and self-employed in the mining and beneficiation process (e.g. number of people working in the sector, gender, types of roles, location, age, socio-economic status of miners and quarry workers, alternate sources of income etc.); and the legal status of mines and quarries in Jamaica.

Component 2: Review of legal and policy framework

The study will map mining sector policies, regulations, legislation, plans and programmes and prioritize those related to the artisanal, small scale mining, and quarrying of industrial minerals, construction materials, dimension stones and semi-precious stones. The review will include policy at the local, national and regional level (pan-Caribbean). For example, in Jamaica, the national policy and legislation will be analysed against the Mining Sector Plan in Vision 2030 Jamaica: National Development Plan and associated Medium Term Socio-economic Framework to identify divergences, gaps, and the factors responsible for such divergences and to suggest policy improvements.

Example questions to be answered in the review include:

- To what extent do the legal and policy framework support the formalization of the mining of Development Minerals?
- How does the legal and policy framework address environmental, health and safety, employment, community relations, individual and community rights, gender and conflict related issues?
- How does the licensing and tenure process work in theory and practice?
- How are different sized operations treated by the law?
- What is the policy on incentives for the sector?
- Is the policy and regulatory framework adequately gender related issues?
- How can the policy and regulatory framework accommodate the mainstreaming of relevant Sustainable Development Goals (SDGs)?

For each legal and policy issue, the study will suggest and discuss alternatives or options based on the experiences of similar jurisdictions. To increase the degree of acceptability of the legal and policy recommendations they should be discussed with key stakeholders.

Component 3: Assessment of institutional and technical operating context

The study will assess the institutional and technical operating environment of the mining and beneficiation of industrial minerals, construction materials, dimension stones and semi-precious stones in Jamaica.

The assessment will include analysis of the:

i. availability and accessibility of geo-data, including: the capacity (human, institutional and technology) of the State agency in mapping, surveying, digitization; the systems and software currently in use; inventory of available geodata and level of 32disaggregation; access and dissemination of geo-data; level of use by end-users and barriers to use; other providers of geodata;

ii. sector promotion activities and initiatives, including: attraction of domestic and international investment; linking consumers of commodities and producers; information products such as investor guides and handbooks; trade fairs, technology exhibitions, networking events; consultation platforms, business incubators, or training centres;

iii. mine and quarry management skills and compliance by operators, including: capabilities in mineral exploration, reserve quantification, feasibility studies, mine planning, business planning, blasting and crushing, processing, marketing, waste management and rehabilitation, equipment maintenance, sanitation, environmental monitoring and management, worker health and safety and community relations;

iv. support services provided to miners and quarry workers, including: the current forms of sector organization and the presence of industry associations; availability and accessibility of training and capacity building; technical extension services; professional accreditation and licensing; representation and advocacy of workers interests and rights; operational, business and professional advice; standard setting;

v. availability and accessibility of finance, including: status of current financing options; incentives to access finance and technology; alternative options; gender and other demographic barriers to finance;

vi. research and development and the use/application of science, technology and innovation within the sector.

Component 4: Environmental, health and safety, and socio-economic impact analyses

The study will detail the range of environmental, health and safety, and socio-economic impacts associated with the mining and beneficiation of Development Minerals in Jamaica. The study will provide an overview of the current state; identify any significant risks and impacts posed by the sector; ; catalogue existing mitigation and management measures; suggest alternative measures; and consider the analysis against existing applicable standards and community expectations.

Examples include an analysis of:

- Environment: impacts to water, air, vegetation, biodiversity, soil and land and other relevant elements of the natural ecosystem; the status of rehabilitation/reclamation of mine and quarry sites; and the current state of climate change adaptation and mitigation.
- Health and Safety (occupational and community): incidence and severity of injuries; health and safety risks (e.g. radioactivity, noise, dust, vibration, blasting, rock falls, vehicle accidents); current health and safety practices; availability of health services.
- Social: impacts to neighbouring communities and workers; human rights; child and labour rights; Indigenous and land-connected Peoples; gender and inter-generational relationships; migration; housing, living standards and household assets; access to water and sanitation; transport infrastructure and services; infrastructure; safety and security; conflict; heritage sites; and the distribution of wealth. The impacts on poverty will also be assessed. A conflict risk assessment will be undertaken that documents the effectiveness of any prevention mechanisms and avenues for dialogue between miners and neighbouring communities.
- Economic: impacts to the economy at the family, local, regional and national scales; businesses within the supply chain; job creation, revenue generation and livelihood diversification; level of unemployment and under-employment; wage ranges for different roles; economic linkages with other sectors within the domestic economy; primary and secondary taxation and royalties.
- A gender assessment that incorporates an in-depth gender analysis of the environment, health & safety and socio-economic factors that impact on women, men, girls and boys in the Development Minerals sector will be undertaken; to provide recommendations that address the gender dimensions of the sector.

Component 5: Market and Value Chain Analyses

The study will undertake market and value chain analyses of a range of selected commodities. The selection of the commodities to be analysed will be undertaken with the membership of the ACP-EU Development Minerals Programme Country Working Group in Jamaica.

A long list of all of available Development Mineral occurrences identified in '*Component 1: Profile of the Sector'* should be used to consider all possibilities. A criteria for selection should be developed

that prioritises commodities with high economic and linkage potential. Where possible the selected commodities should represent each of the following commodity categories: industrial minerals, construction materials, dimension stones and semi-precious stones.

The market and value chain analyses should include the following components: (i) product mapping; (ii) market overview/market description by product (including market size, historic trends, consumers, location/geography; market share; price; factors influencing price); (iii) competitive analysis; (iv) value chain analysis.

The study should identify barriers and opportunities and propose solutions and alternatives. The market and value chain analyses will highlight the interlinkages between the mining and quarry sector and the other sectors of the economy and recommend ways that the sector could be further integrated into the economy.

C. TIMEFRAME OF THE ASSIGNMENT

The assignment will be undertaken from the 5th of December, 2016 2016 to 27th of March 2017 in four phases: preparatory phase (within 2 weeks of contract signing); data collection and analysis phase (within 8 weeks); reporting and review phase (within 12 weeks); finalization phase (within 16 weeks).

D. DELIVERABLES / TIME FRAMES AND PAYMENTS SCHEDULE

#	DELIVERABLES/DUTIES	ESTIMATED TIME OF DELIVERY FROM CONTRACT COMMENCEMENT DATE	PAYMENT PERCENTAGE
1	Inception Report covering the detailed work plan, methodology including the details for all planned methods (interviews, focus groups, desk research, public consultations, field research etc.) and timeframe of the study; draft outline of the Baseline Study report; draft agendas/protocols for field work, interviews and consultations.	Within first two weeks	25%
2	Field Study Report detailing the fieldwork activities and findings of the field work, especially including outcomes of the activities and work done with regards to relevant duties and responsibilities of the consultancy; submission of field photos, notes and video. The report will justify the selection of the commodities selected for detailed analysis based on the consultation process.	Within eight weeks	25%
3	Draft Baseline Study Report submitted to UNDP for distribution to stakeholders for validation and review. The Service Provider will present a briefing of the findings to the programme stakeholders for feedback.	Within twelve weeks	25%
4	Final Baseline Study Report and Short summary report for communication purposes	Within sixteen weeks	25

Appendix 2 - Bibliography

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Appendix 3 - Summary of guiding questions for interlocutors

Field research & assessment

Note: Full research documentation is presented in Annexe 3 of this ReportSUMMARY OF GUIDING QUESTIONS FOR FIELD INTERLOCUTORS/Check List

ACTION	OBSERVATIONS/ REQUIREMENTS* *see Appendix 3 for full Questionnaires*
A. PROMOTER /PRODUCER	• Name of the company, group, individual or other entities • Addresses (legal and physical) • Contact persons and their positions • Tel. / fax / mobile / e-mail / web /skype etc. • Description of company, group, individual or other entities and related activities_
B. AREA & DESCRIPTION	• Quarry location on topo map (large and small scale) • Area name, municipality, province, others • Morphology of the area • Weather conditions • Any other data and information for a good description
C. GEOLOGICAL DATA	• Geological data/ maps held on site by the Operator • Format / Software of the Geological data held (hard & soft format) • Use of Software for quarry planning
D. ADMINISTRATIVE DATA & INFORMATION	• Type of Licence (if not, type of operator/ registered or not) • Name and details of licensed person or company or other entity • Location map of the licence with official topo-grid points (pegs) • Copy of the Licence (if any) • Up-dated licence situation • Up dated royalty situation • Up dated land ownership situation • Up dated tax situation
E. QUARRY ACCESS, INFRASTRUCTURE and TRANSPORTS	• Quarry access (description and/or evaluation) • Available Infrastructure, state and quality (electricity, water, telecoms etc). • Building/Housing infrastructure in the quarry • Type and method of truck loading / transporting (bulk, bags, pallets) • Who does the transport (contract individual trucks or truck company, in-house trucks, etc. • Number and capacity of trucks (per day or per month)
F. MATERIAL / MINERAL EXTRACTED and RELATED GEOLOGICAL CONTEXT	• Type of material (description) / Rock formation • Geological country rock (if known) (formation / member) • Type of geological setting of target material (rock mass, dyke, alteration zone, band, lens, beds etc.) • Exploration carried out (description and history, if possible) • Geological context of the region / licence area / quarry operation • Structural data: rock mass mechanical & structural state and conditions, weathering, bedding, faulting, jointing, holes, karstic phenomena, etc. • Particular geo-mining issues (if any)

G. QUARRYING / MINING ASPECTS	• Type of Quarry (hill slope, top hill, trench) • Quarry geometry and dimension (sketch map or official existing documents) • Quarry method utilized • Quarry equipment utilized (list and brief description of state, if possible) • Quarry structure and organization • Material handling operations in the quarry • Mining Plan (if any official: written or "verbal"). State of Art of Mining Plan • Otherwise draft a simple quarry scheme/plan with state of operation to be regularly up dated for an easier monitoring • Production declared and Production estimated (m3, tons, trucks, units)
H. MANPOWER and QUARRY MANAGEMENT	• Number of employees and casuals in the quarry (divided by assignment/job) • Number and names of Managers and high level Staff (divided by assignment/job) • Living situation of workers and their families • Contracting system for employees and management in the quarry • Check if there are Insurances contracts available • Training levels/ accreditation
I. ECONOMICS and MARKET	***FINANCIAL ANALYSIS*** • Pre investment cost made (exploration, etc.) • Investment done (general calculation if official documents are not made available by the promoter) • Operating Costs: fixed and variable (if available) • Production and Production costs
J. MARKET & MARKETING	• Evaluation / Description of the market chain of the company: main products, clients, production & transport costs, selling prices (ex-works or other). Data collected by the producer (verbal communications, invoices, other documents) and Data estimation. • Marketing actions: domestic, regional, overseas; export via ? to? • Average Market prices for similar materials (domestic, regional and international)
K. OCCUPATION HEALTH & SAFETY in the QUARRY	• Induction & Training regime for staff/ contractors • Adequacy of safety signage in operations • Personal protective equipment (PPE) and attire of quarry workers • Emergency Assembly points • Emergency procedures clearly communicated • Quarry operations: drilling, blasting, diamond /other cutting, face cleaning, rock handling, loading and transporting • Explosives: type, transport, storing, use • Safety during haulage/ plant movement – training, signage • Any presence of women or children working in the quarry • Quarry organization / 'housekeeping' • Safety in the workshop and other departments • Presence of Medical Aid/ First Aid in the quarry and or in the area • Complaints & Grievance procedures

L. ENVIRONMENTAL ASPECTS/ PLANNING/ WASTE MANAGEMENT	• Presence of an Environmental Impact Assessment • Presence of a Rehabilitation Plan / Mine Closure Plan • Funds available for environment management / rehabilitation • Visual impact / Air / Water / Noise pollution • Impact/ Damage to Biodiversity? Footprint of damage? • Waste Management/ Waste material re-utilization_ • Evaluation of other impacts during & after quarry operations: • Removal of top and sub-soil to access the required target mineral • Exploitation operations (drilling, blasting, cutting, cleaning etc.) • Removal and management of Waste material • Processing operations in the area – waste output • Handling, loading and transporting target material and waste
M. SOCIAL ASPECTS	• Presence of Community Relations/ Engagement Plans • Presence of Community relations staff • Presence of Social Impact Assessment • Presence of Community Grievance procedures & Complaints Register • Analysis & response to community complaints • Local Community Development activities • Local employment opportunities • Number of women if any working in operation/ in which roles • Barriers to women working in the operation if any • Opportunities for advancement / training/ development for women
N. MAIN REMARKS	• Note clearly all observations for a comprehensive and precise Evaluation of the Quarry's activities and ECH&S performance
O. RECOMMENDATIONS	• Recommendations; with documentary evidence (photos/ video/ maps)
P. PHOTOS / VIDEOS	• Photos/Videos (*with respect, and permission as necessary*) of: products, rock mass, country rock, quarry faces, land from quarry face, access roads, • people at work, equipment & vehicles, etc.

Appendix 4 -

4a: Listing of consultees/ consultations held

4b: Listing of total number of quarries visited

Appendix 4a: Key Consultations held during Baseline Assessment of Development Minerals in Jamaica

DATE	ORGANISATION	ROLE	INTERVIEWEE
23 /03/17 23/03/17 01/05/17 23/03/17 01/03/17	**UNDP**	Policy Associate Resident Representative Programme Team Country Programme Manager Policy Advisers	**Mr. Richard Kelly** **Mr. Bruno Pouezat,** **Ms. Ruth Clarke,** **Ms. Shelly Trim** **Ms. Stacy-Ann Tomlinson-Knox**
12 meetings March-May 2017	**Mines & Geology Division**	Commissioner, Mines and Geology	**Mr. Clinton Thompson** **Ms. Stacy Plummer** **Mr. Roy Nicholson**
24/03/17 01/05/17	**Ministry of Transport & Mining**	Technical Director, Minerals Minerals Policy Analyst/ Social Minerals Economist	**Dr. Oral Rainford** **Ms. Taniqua Callam** **Mr. Dennis Miller**
24/03/17 02/05/17	**Mining and Quarrying Association of Jamaica**	President	**Mr. Tony Morgan**
27/03/17 27/03/17 02/05/17 10/05/17 11/05/17 27/03/17 03/05/17 10/05/17 23/03/17 04/05/17	**Planning Institute of Jamaica (PIOJ)**	Director, Multilateral Technical Co-operation Unit, PIOJ	**Ms. Saskia Frater-Smith**
	Jamaica Business Development Corporation (JBDC)	CEO, JBDC	**Mr. Harry David,** **Ms. Marie Casserly,** **Mr. Colin Porter** **Ms. Tanisha Tulloch**
	Development Bank of Jamaica	Account Executive Loans	**Mr. Ernesto Wignall** **Ms. Paula Forrest**
	National Environmental Planning Agency	CEO, NEPA Applicn Processing (Member – Country Strategy Group) Engineer Environmental Permitting	**Mr. Peter Knight** **Ms Aisha Bedasse Jureidini** **Ms Sheries Simpson,** **Mr Damien Hall,** **Mr Errol Morris,** **Ms Monique Curtis**

DATE	ORGANISATION	ROLE	INTERVIEWEE
28/03/17 03/05/17	**Jamaica Promotion Agency JAMPRO**	Director, JAMPRO Consulting Officer, Manufacturing, Energy and Mining Manager- Market Development (Agricult/ Non-Food Manufacturing) Manager, Manufacturing, Energy & Mining Consulting Officer, Manufacturing, Energy and Mining Manager -Business Analysis & Research	**Ms. Diane Edwards** **Ms. Jo-Ann Ramsaran** **Ms. Berletta Henlon Forrester** **Mr. Ricardo Durant** **Ms. Jo-Anne Ramsaran** **Ms. Sandra Williams**
02/05/17	**Port Authority of Jamaica**	Executive Director Senior VP. Legal, Regulatory & Corporate Affairs VP – Harbours and Port Services VP – Business Development	**Prof. Gordon Shirley** **Dr. Carrol Pickersgill** **Capt. Hopeton DeLisser** **Mr Edmond Marsh**
02/05/17	**Water Resources Authority**	Managing Director	**Mr Herbert Thomas**
04/05/17	**EXIM Bank**	Managing Director Manager, Trade Financing Division	**Ms Lisa Bell** **Ms Valerie Crawford**
04/05/17	**National Commercial Bank**	Branch Manager, University of West Indies, Mona Campus branch	**Ms Karen Young**
08/05/2017	**MGD**	Deputy Commissioner Director Geology Branch GIS/IT	**Leighton Williams (LW)** **Suresh Bhalai (SB)** **Maurice Thompson**
08/05/2017	**MGD**	GIS/IT IT Manager	**Maurice Thompson** **Ahlete Ogilvie**
09/05/2017	**MGD**	Deputy Commissioner	**Ronald Edwards**
09/05/2017	**Jamaican Bauxite Institute**	GIS Manager	**Ian Wilmott-Brown**
09/05/2017	**MGD**	Slope Stability/Spatial Analysis Expert	**Odane Reid**
09/05/2017	**MGD**	Quarry Inspector	**Michael Jackson**
09/05/2017	**MGD**	Evaluation & Revenue Dept. Evaluation & Revenue Dept.	**Sidney Erwin** **Irvin Artwell**
10/05/2017	**MGD**	Director	**Dr. Parris Lyew-Ayee**
10/05/2017	**MGD**	Mining	**Marlon Simms**
10/05/2017	**MGD**	Economic Geology Department	**Tashane Boothe**
11/5/17	**Jamaica Railway Corporation**	CEO and his collaborators	**Mr. Fitzroy Williams**

DATE	ORGANISATION	ROLE	INTERVIEWEE
13/5/17	**New Jamil Ltd.**	(Sales Manager) Marble Show Room - Kingston	**Mr. Afua Thompson**
13/5/17	**Exotic Stone Ltd.**	(Sales Manager) Marble Show Room - Kingston	**Mrs. Juliana Velasquez**
15/05/17	**Jamaica Export Trading Co Ltd**	Managing Director	**Mr Hernal L. Hamilton**
12/05/17	**Power Gen Ltd**	Managing Director (UNDP Road Map author)	**Mr Norman Davis** **Mr Larry Henry**
5/5/17 11/5/17	**Lydford Mining**	Process Manager Operations Manager	**Ms Jackie Millington** **Mr Eddie Cousins** **Mr Leo Cousins**
08/05/17	**Jamaica Aggregates**	Plant Superintendent/ Manager – Agualta Vale	**Mr Carl Leamy**
10/05/17	**Jamaica Aggregates**	Managing Director- Jam Aggs/ Lafarge Holcim Plant Superintendent/ Manager – Yallahs Production Supervisor- Yallahs	**Mr Tom Brown** **Mr Joseph Davis** **Mr David Hearne**
10/05/15	**Earth Rocks Product**	Manager/ Owner	**Mr Bernard Chin**
4/05/17	**John's Hall Aggregates**	Financial Controller	**Mr Neil Blackburn**
5/05/17	**Kent Industries Ltd**	Sales & Marketing Plant Manager	**M. Shermain Tapping** **Mr Bonito Peart**
24/03/17	**Gold Mac Consulting**	Consultant – Mining Geology & Environment	**Noel McKenzie**
05/05/17 10/05/17	**Shaw's Quarry 1** **Shaw's Quarry 2**	Operations Manager	**Ms Michelle Shaw-Elliott** **Mr Wayne Shaw**
15/05/17	**Mahalla Treasures**	Jewellery	**Ms Maelle Johnson**
11/05/17 Artists' Focus Group	**Supersad Studios**	Potter – Leader UNDP Mission to Tanzania	**Mr Phillip Supersad**
		Potter/ Ceramicist - UNDP Mission to Tanzania	**Wazari Johnston**
		Ceramic Artist - UNDP Mission to Tanzania	**Ms Victoria Silvera**
		Jeweller /*comms only / text*	**Ms Lisa Callendar**
		Goldsmith/ jeweller / *by telephone*	**Ms Carol Campbell**
11/05/17 Women's Focus Group	**Story & Myth**	Jeweller	**Ms Kristie Stephenson**
	McCalla Marl	Manager	**Ms Paulette McCalla**
	McCalla Marl	Admin	**Ms Kimore Grant**
	McCalla Marl	Sales	**Ms Joan McCalla**
	Shaw's Quarry	Managing Director	**Ms Michelle Shaw**
	MGD	Senior Inspector	**Ms Stacey Plummer**
	Lydford Mining	Managing Partner	**Ms Jackie Millington**
	South Coast Aggs	Manager	**Ms Mitzie Smith**

DATE	ORGANISATION	ROLE	INTERVIEWEE
03/05/17	**Bureau of Gender Affairs**	Director	**Ms Sharon Robinson**
15/05/17	**Environmental Foundation of Jamaica**	Chief Technical Officer (*by telephone – had to cancel meeting due to heavy rains 16/05/17)*	**Allison Rangolan McFarlane**
22/05/17	**Jamaica Environment Trust**	Chief Executive Officer	**Ms. McCaulay**
22/05/17	**Statistical Institute of Jamaica STATIN**	Director, Administrative Statistics	**Ms Sharon Henderson -Willis**
03/0517	**Runaway Bay**	Environmental NGO	**Ms. Wendy Lee**
15/05/17	**Yallahs Community**	Yallahs Community Development	**Mr Wentworth Weir**
3/05/17	**Hodges Aggregates & Powders Ltd.**	Limestone Quarry and Agg. Factory / GM Office Manager	**Mr. Paul Ince (GM) or** **Mr. Jennifer Ince**
5/05/17	**Somerset Ent. Ltd.**	Limestone Quarry & factory	**Mr. Lindereeth A. Powell Snr.**
11/05/17	**Da Costa Construction & Heavy Equipment Ltd.**	Limestone Quarry / GM	**Mr. Ricardo Da Costa**
12/05/17	**Jamaica Gypsum & Quarries Ltd**	(Tech. Manager) Gypsum & Pozzolan and limestone quarry (Carribean Cement Co. JAM)	**Ms. Latoya Thomas**
10/05/17	**Chemical Lime Ltd.**	(T-Q-Manager) Limestone and Clay Quarry (Lhoist Group)	**Mr. Hugh A. Elliston**
5/05/17	**S&G Limestone Company**	Limestone (Dol.) quarry	
12/05/17	**Shagoury S&G Aggregates**	Owner Manager	**Mr William Shagoury** **Mr Albert Bailey**
08/05/17	**Shayton S&G**	Plant Manager/ River sand & gravel extraction	**Ms. Kamiel Marshall**
02/ 05 /17	**ABR Quarries**	Manager Admin Operator	Mr and Mrs Shankar Ms Blossom Mr O'Brian
02/05/17	**Ferris Quarry**	Manager	Mr Cecil Mac Kenzie
02/05/17	**South Coast Aggregate**	Manager	Ms Mitzie Smith Mr Noel Mac Kenzie
03/05/17	**Weverley Wagstaffe & Evelyn Pearce**	Owner-Manager Ticketing	Mr Pearce Ms Branda
04/05/17		Manager	Mr Clément Foster (1506)
04/05/17	**Middle Quarter**	Manager	Mr Dacosta (1693)
04/05/17	**James Quarry**	Manager Operator & watchman	Mr James Mr Nevene Kenroye Swaby
05/05/17	**Majorblac**	Manager	Mr Johns
08/05/17	**H. B. Stone and Sand Ltd**	Owner-Manager	Ms Booth

DATE	ORGANISATION	ROLE	INTERVIEWEE
08/05/17	**Mitchell Town School, Salt River**	Teacher	
09/05/17	**Jamaica Baptist Union**	Ex-manager	Mr Delroy Smith
09/05/17	**Peter Chin**	Owner-manager	Mr Peter Chin
09/05/17	**DaCosta Construction & Heavy Equipment ltd**	Owner - manager	Mr DaCosta

Appendix 4b: LISTING OF ALL QUARRY LICENCES/ OPERATORS VISITED DURING FIELD ASSESSMENT

Baseline Assessment of Development Minerals in Jamaica

ACP-EU DEVELOPMENT MINERALS PROGRAMME:				
NORTH COAST QUARRIES				
QL #	OPERATOR	QUARRY LOCATION	PARISH	MATERIAL
	Rhodes Hall Quarry (Robert Warren)	Rhodes Hall	Hanover	Limestone
QL1783	Delroy Pearce	Silver Spring	Hanover	Limestone
QL1032	Charles Wilson	Spanish Hill, Lucea	Hanover	Limestone
QL1702	Danmore Ltd.	Retirement (near John's Hall)	St. James	Limestone
QL1483	Crichton Quarries Ltd (Jason Watt)	Retirement	St. James	Limestone
QL1322	Johns Hall Aggregates (Mr. Baugh)	Johns Hall	St. James	Limestone
QL1408	Western Wheels (Henry Rhoden)	Sunderland, Flamstead	St. James	Andesite
QL1101	Trelawny Aggregates Ltd	Braco	Trelawny	Limestone
QL1859	Amaterra Jamaica Rio	Stewart Castle	Trelawny	Dolomite
	Kent Industries (Eric Morgan)	Kent Estate	Trelawny	Limestone
QL1875	Southfield Development Corp. Ltd	Southfield, Perth Town	Trelawny	Limestone
QL1822	Cranlin Farms (Mr. Blake)	Cranbrook	St. Ann	Limestone
QL1636	Earth & Roads Ltd. (Ryan Levy)	Llandovery	St. Ann	Limestone
ML131	Lydford Mining Ltd.	Belmont, Lydford	St. Ann	Limestone
QL1245	Warren Shaw & Michelle Shaw-Elliot	Lydford	St. Ann	Limestone
QL1831	Jamaica Aggregates Ltd	Agualta Vale	St. Mary	Sand & Gravel
QL1712	Donald Mitchell	Dry River, Enfield	St. Mary	Sand & Gravel
QL1695	Israel Transport & Equipment Co Ltd	Grays Inn, Fort Stewart	St. Mary	Sand & Gravel
QL1811	Headley Moore	Robins Bay, St. Mary	St. Mary	Limestone
	Shayton Sand & Service	Friendship Gap	St. Mary	Sand & Gravel
QL1678	Joseph & Ian Wallen	Springfield, Swift River	Portland	Sand & Gravel
QL1635	Oliver and Bernice Scott	Hope Bay	Portland	Limestone
Ql1894	Neal Scott Ltd	Spring Gardens	Portland	Sand & Gravel
QL1623	Norman Ogilvie	Johnston River, Seaforth	St. Thomas	Sand & Gravel
QL1902	Earth Rocks Ltd.	York, Morant River	St. Thomas	Sand & Gravel
QL1898	Jamaica Aggregates Ltd	Poor Man's Corner	St. Thomas	Sand & Gravel
QL1883	Original Coast to Coast (Mr. Johnson)	Yallahs River	St. Thomas	Sand & Gravel
QL1710	Warren Shaw & Michelle Shaw-Elliot	Cane River, Newstead	St. Andrew	Limestone
QL1287	Ja. Gypsum & Quarries Ltd. CCL	Bito	St. Andrew	Gypsum
QL1791	Jamaica Gypsum	Bito	St. Andrew	Pozzolan
SOUTH COAST QUARRIES				
QL1723	Cecil Mckenzie	Ferris	Westmoreland	Marl
QL1872	ABR Quarries Ltd. (Mr. Sankar)	Mount Eagle, Grange Hill	Westmoreland	Limestone
QL1704	Weverley Wagstaffe & Evelyn Pearce	Old Hope, Little London	Westmoreland	Marl
QL #	OPERATOR	QUARRY LOCATION	PARISH	MATERIAL
QL0938	Neville and Mitzy Smith	Brompton	St. Elizabeth	Limestone

QL1556	Michael R. James	Baptist	St. Elizabeth	Limestone
QL1922	Hodges Minerals & Powders	Luana	St. Elizabeth	Limestone
QL1693	Karl Dacosta	Craigie Top, Middle Quarters	St. Elizabeth	Limestone
QL1506	Clement Foster	Content Mountain, Lacovia	St. Elizabeth	Limestone
QL1247	Somerset Quarry (Mr. Henry)	Somerset	Manchester	Limestone
QL1927	S&G Limestone Ltd. (Bob Maher)	Dunsinane	Manchester	Limestone
QL1682	Marjoblac Ltd (2 sites)	Chudleigh	Manchester	Limestone
ML152	Chemical Lime Co. of Jamaica	Braziletto	Clarendon	Limestone
QL1837	Chemical Lime Company of Ja. Ltd.	Salt River	Clarendon	Clay
QL1869	William Shagoury	Rio Minho	Clarendon	Sand/Gravel
QL1221	H. B. Stone &Sand Ltd (Mrs. Boothe)	South of Glenmuir Bridge (Rio Minho)	Clarendon	Sand & Gravel
QL1301	Howard Brown	Woodleigh	Clarendon	Sand & Stone
QL1924	DaCosta Contruction &Equipment	Hill Run	St. Catherine	Limestone
QL1952	Peter Chin	Hill Run	St. Catherine	Limestone
QL1763	Jamaica Baptist Union (co-op)	Zion Hill	St. Catherine	Sand & Gravel
QL1578	L& B Mining Ltd	Guanaboa Vale P.O.	St. Catherine	Limestone
QL1587	L& B Mining Ltd	Guanaboa Vale P.O.	St. Catherine	Sand & Gravel
QL1920	Incomparable Enterprises Ltd (Coke)	Ferry Pen	St. Andrew	Limestone
QL2038	Albert Robinson	Ferry Pen	St. Andrew	Limestone

Appendix 5 - Proposed structure for new mining law

Presentation of a Structure for a Proposed New Mining Law

(The principles of the African Mining Legislation Atlas have been incorporated into this structure – please see https://www.a-mla.org/ for further guidance)

INTRODUCTION

The mining code of a country is the reflection of the policy it has developed. The trend towards the liberalisation of the economies of the developing countries and in those in transition pose many difficulties for Governments relating to regulation of the mining sector. In large part these difficulties are the due to the high-risk nature of the sector, its intersectoral nature, global markets, as well as nationalistic feelings about the exploitation of natural resources.

However, the continued evolution of the globalization of markets has resulted in significant changes in general, legislative and institutional policies. Governments prefer not to become partners in high-risk mining industries, and prefer to leave financial and operational risk to the private sector. The mining industry is a high-risk sector for various reasons:

- Mining exploration is a risky business, including a long period of expenditure and a high probability of loss if an economic discovery is not identified. On average, one economic mine is the result of a thousand exploration programs.
- The average period of exploration before making an economic discovery is 10 years.
- Mining depends on global markets and the fluctuation of prices of minerals may have a negative impact on the potential of a deposit to be developed to allow a return on investment.
- Regional and national stability is a key element in the decision to engage in mining activities, as mining development is a long-term investment.

Therefore, it is necessary to understand what assurances are sought by Mining Investors. They include:

- Secure Title to Mining Rights (this would include the principle of "first come first served" when an exploration licence is requested and the firm right to convert this to a mining licence if clear conditions are fulfilled)
- Satisfactory Fiscal Regime (a regime which is seen to treat mining investment in an equitable manner. This will usually take account of the fact that exploration expenditure and development costs are high risk and also allow the investor to recover his investment by the application of accelerated depreciation methods, for example.)
- Stability of Fiscal Regime (which gives confidence that there will not be sudden adverse changes in the fiscal regime: may be guaranteed by a stability clause.)
- Foreign Exchange Retention
- Right to Assign (i.e. the right of a licence holder to assign his rights to a third party as a guarantee, or to assign shares to another party who is ready to participate in financing the endeavour.)

- Right to Market Mine Product(s) (no restrictive conditions about to whom the mine product must be sold)
- Stability in Environmental Management (a clear and binding guide or regulation as to how the environmental impact can be managed)
- International Arbitration (for international investors)
- Freedom of Commercial Operation

The changes in general and legislative policy vary from country to country. However, there are a number of common options for countries wishing to improve their competitiveness. For international investors, it is clear that *in order to recognize the risky nature of the sector, in order to ensure that the companies that invest will receive a fair return on their investment and to ensure the equal treatment of national and foreign companies*, a transparent tax and legal regime is required.

The proposed structure of a New Mining Law for Jamaica reflects the principles set out above, as well as those set out in the African Mining Legislation Atlas Guiding Template (AMLA)[90]. The latter provides a generalised indication of subjects for inclusion in a legal framework be it in primary legislation (law, code or act) or secondary legislation (rules, regulations).

The development of a mining sector requires a clear and well defined exploration phase and a transparent phase of development and production. This proposed structure is indicative and the team contracted to draft the new Act would develop its own framework.

Structure of a Mining Law

This chapter sets out the basic principles of the proposed law. The general plan is described below:

Part I: General provisions.

Part II: Mining Titles.

Part III: Financial Provisions

Part IV: Administration

Part V: Health & Safety, Environment, Labour, Community

Part VI: Final Provisions

The following sections explain the reasoning behind the proposed sections of the Act.

Part I: General Provisions

Title I: Scope of application

The principle that the minerals belong to the State (or Crown) is maintained (as in the Minerals (Vesting) Act). This law does not apply to liquid or gaseous hydrocarbons or mineral waters, which

[90] www.a-mla.org/guidingtemplate - developed in partnership with the World Bank, African Union Commission, the African Legal Support Facility, UNDP and the ACP-EU Development Minerals Programme.

are subject to other laws and regulations.

Title II: Definitions

The definitions could be placed at the beginning of Act for ease of reading.

Of particular interest in Jamaica would be the definition of minerals (and thus mining) and quarry materials. The former belong to the Crown, the latter to the land owner or licensee.

Title III: Eligibility

Any physical and moral person can undertake mining activities, but they should have a title or authorization under the code.

The desirability of the State taking shares in large projects should be reviewed. This would not be applicable to small operations.

Title IV: General Guarantees

These guarantees would provide foreign investors for non-discrimination compared to Jamaicans. They would explain expressly the rights of mining operators to dispose freely of their products as long as they respect Jamaican regulations.

Title V: Mining Agreement

A specific Agreement (or Contract) could be established in order to set the economic and administrative conditions for the development. This would include, among other conditions for the participation of the State, if required. Specific tax or other fiscal conditions or advantages granted to the operator and which would then be subject to a stability clause, would be included.

If necessary, the value of any contribution in cash to the State could be treated there.

Any specific environmental and social actions to be carried out by the operator could be included.

Such an Agreement sets out specific conditions, but can in no way contradict the provisions of the Act.

Title VI: Mining Licences

The General provisions on mining licences make clear to whom the licences may be attributed.

The following are suggested:

- Prospecting Licence: allows a holder to enter land and to carry out superficial prospection, limited to shallow sample pits and simple remote sensing. No deep trenches, pits or borehole programmes allowed. This is a non-exclusive licence which cannot be transferred.
- Exploration licence: exclusive licence allowing the holder to explore the designated area for a specified number of years (might be 3 years renewable twice and might include releasing ground each time it is renewed).
- Mining Licence: valid for at least 10 years, depending on feasibility report. Might be divided into industrial and small scale mining if appropriate.

- Quarrying licence: validity to be discussed, but should be longer than 3 years for major quarries. It might be appropriate to distinguish between permanent quarries and temporary quarries and perhaps different commodities (e.g. differentiate between a dimension stone operation if it to be considered a quarrying operation and an aggregate producing operation).
- If appropriate and after consultations with stakeholders, a Quarrying Permit, which could be granted by a regional Authority, such as at Parish level, might be considered for very small operations – scale to be defined. This might be reserved for Jamaican nationals.
- Artisanal or Small Scale licence or permit: consultations with stakeholders should be initiated to define whether this licence or permit is necessary in the Jamaican context. This might be reserved for Jamaican nationals.
- Others: e.g. recycling/retreatment of wastes etc.

Part II: Mining Titles

Title I: Provisions common to all Mining Titles

Chapter I: Granting and renewal of Mining Titles

This Chapter describes the procedures for treating the application for mining titles. It specifies the administrative acts required and the maximum time allowed to treat the files. The responsibilities of the administration and the applicant are defined.

The notion that the first applicant has priority over all other applicants is defined.

The objective of this chapter is to explain the procedures so that they are transparent. By defining the responsibilities of the agents of the Administration and specifying a reasonable time frame, the applicant should have confidence that his application will be considered in an active manner.

This chapter also contains a section defining the actions to be taken if the Minister, for reasons of State interest, wishes to exclude land from mining activities

Chapter II: Registry of Mining Titles

This chapter describes the characteristics of the register of mining titles and functions of the Conservator, who is responsible to the Commissioner for maintaining the Register. The registry confirms the details of mining titles.

It would be specified that minor administrative errors in documents filed for registration would not be reasons for rejection, unless the regularisation of the documents is not possible. This decreases the possibility for an applicant to think that he is being prejudiced against, if his application is rejected.

Registration of an assignment of a title implies that rights and obligations are passed to the new owner.

The register is a very important task, because the registry confirms the ownership of mining titles and an updated and well managed registry gives confidence to potential investors.

It is recommended that a modern cadastral system is established to register all applications and titles and permits monitoring of the mining activities.

Chapter III: Legal Relations of Holders of Mining Titles.

Section 1: Relations with the landowners

This section defines the limitations and obligations of each party. The main principle is the owner of the land does not have right to an indemnity or compensation related to the value of the extracted ores, but is entitled to repairs related to the use of the ground.

The need of the mining title holder to comply with the regulations in relation to water and forests, especially regarding the cutting of wood and the use of the waterfalls is explained.

This section should clarify its obligations to the owner, but he is reassured that any dispute does not affect his title.

In the case of a Quarrying licence or permit, this section might not apply or define relations with adjacent landowners.

Section 2: Relationships with other Owners of Mining Titles

It is important for general rules to be established between neighbouring holders, partly to give the principles on which any repair or compensation can be calculated and partly for security reasons.

Chapter IV: Transactions on Mining Titles

All the mining titles, except the prospecting licence, may be the subject of transactions, including sale, transmission and use as collateral.

A decision should be made after consultation with the stakeholders as to whether a Quarry permit, if introduced, could be subject of a transaction.

Considering the point of view of international companies, exploration companies, whether of the «Junior» or larger companies, must be able to use the fact that they have mining titles to find funds in the banking or stock market. Therefore, it is necessary to give them the opportunity to use these securities as collateral.

Although any transaction must be approved by the Minister, who should not be able to object without clear reasons, declaring the possibility of such transactions is reassuring for the investor. A refusal of approval of a deal should take place only in exceptional circumstances and for good reason.

Another transaction that can be considered is that of the consolidation of mining titles. This transaction can be very useful, for example, if two adjacent licences cut across the same geological structure. In this case, it may be to the advantage of everyone to consolidate the two titles to make a more reliable project. The principles for conducting such consolidation would described in this chapter.

Chapter V: Extinction of Mining Titles

The titles may be extinguished by:

- Waiver of the owner of all or part of the perimeter of the title, for example because he believes that there are no viable targets.
- Withdrawal by the Administration for violations of one or the other provision of the Act;

- Expiry of the period of validity of the licence.

This chapter describes the procedures of extinction, by ensuring that all rights, annuities and other expenses and commitments of the holder are respected.

The Administration should cooperate with companies who give up or allowed the titles to expire, if they have fulfilled their commitments. Mining companies in general are well aware that they invest in risk. If they perceive that it would be difficult to give up a title that doesn't seem viable, it would be a negative when the decision is taken to invest or not.

Title II: Provisions specific to the different Mining Titles

is section would deal with any provision specific to any of the titles.

Part III: Financial Provisions

Title I: Tax provisions

Chapter I: Specific to the mining taxation

This chapter describes the rights, royalties and taxes specific to the mining sector, and which could be specified in a Regulation.

Chapter II: Tax and Customs Incentives

It would be useful to define any tax or import duty incentives specifically designed to prevent taxation of investment risk, to encourage exploration and mining development. For example, it may be that the import of equipment during the period of exploration and development/installation of mine would be exempt of import duties.

An Article providing stabilization of the tax base would allow the investing company to secure its investment.

Title II: Exchange Control

This chapter assures investors that they will have the right to repatriate their capital and dividends. It assures foreign nationals who invest or are employed in a mining company of their rights, under the condition that exchange control regulations are followed, to repatriate their dividends and other possessions.

Part IV: Mine Management

This part would relate to the qualifications of the Mine or Quarry management and would reference regulations in force in which define the particular standards to be followed.

Part V: Environment, Health & Safety, Labour, Local Development

Chapter 1: Environmental Standards

This part requires the operator to meet appropriate standards of environmental impact assessment, management plans, conservation, remediation and waste management.

The details of reports and activities requisite for environmental management are included in the Regulations.

This part should also make provision for standards in terms of access to lands, water and forestry. It also allows the designation of protected areas and conservation of archaeological sites. The details of reports and activities for appropriate conservation measures, rehabilitation and restoration requirements are included in the Regulations.

The necessary actions on the expiry of a mining title are prescribed to safeguard the area.

Chapter 2: Health & Safety

This part requires the operator to meet adequate standards of mine/ quarry operation in terms of health and safety, consistent with Jamaica's occupational H&S legislation and regulation.

Chapter 3: Labour

It requires operators to consider local development, through training and employment of local labour where feasible.

Chapter 4: Local Development

This part encourages the sourcing of locally procured goods and services where feasible.

Operators are urged that infrastructure related to quarry/ mine development should make provision for construction, ownership, control and long term use in terms of local / national value addition.

This part requires operators to undertake meaningful community engagement, with use of Community Development Agreements where appropriate.

Part VII: Penalties

This part defines matters of enforcement and non-compliance or sanctions applied in the case of offences against this code.

It might provide for reporting of violations of the provisions of the present law and its associated regulations. It could provide for civil and military authorities to lend assistance to officials of the Mines Administration upon first request.

Part VIII: MISCELLANEOUS, TRANSITIONAL AND FINAL PROVISIONS

Notably provides for the possibility that disputes relating to this Act opposing one or more mining investors and the State may be referred to international arbitration.

Appendix 6 - Proposed contents for commodity reports

(Draft) Commodity Report

(Typical) Table of Contents