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Responsible Mining for Guyana

El Dorado Gold Verification and Capacity Building Consultancy Final Report November 2022

Prepared for: El Dorado Project, Conservation International- Guyana

Submitted by: Patience Singo

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Preamble

Guyana adopted the Minamata Convention on Mercury in 2013 and has established that "artisanal and small- scale gold mining and processing in its territory is more than insignificant", in accordance with Article 7 of the Convention. Guyana completed development of National Action Plan and developed relevant strategies. The El Dorado Project is part of the GEF-funded PlanetGOLD program to assist Guyana to meet its commitment under the Minamata Convention. It involves business enterprises with a profit motive for leading the shift in the development of a mercury-free ASGM supply chain and downstream El Dorado Gold branded jewellery.

This Report is prepared in accordance with the Terms of Reference for the Consultancy Agreement between Conservation International Foundation (Guyana) Inc. and Patience Singo Service Agreement Number: 6008030. This Report presents the Final Consultancy Report with key recommendations and closure to this assignment.

Acronyms

ASGM	Artisanal and Small-Scale Gold Mining
ASM	Artisanal-Small Scale Miner
DD	Due diligence
CI	Conservation International
EPA	Environmental Protection Agency
ESG	Environment Social Governance
GGB	Guyana Gold Board
GGDMA	Guyana Gold and Diamond Miners Association
GGMC	Guyana Geology and Mines Commission
GRG	Gravity recoverable gold, a lab testing procedure for predicting gold recoverable
GoG	Government of Guyana
HHS	Occupational Health and Safety
HR	Human Rights
KYC	Know Your Customer
LBMA	London Bullion Market Association
ME	Mining Entity
FRM	Fugal Rehabilitation Method
OSH	Occupational Safety and Health
OECD	Organisation for Economic Cooperation and Development
QR	Quick Response
SMS	Small and Medium Scale Mining

1. Project Summary

The Project has successfully demonstrated and presented evidence that that the Cooperative Republic of Guyana has a unique, dynamic, and well-structured gold Industry which is governed by the Laws and supported by functional support institutions such as the Guyana Geology and Mines Commission. The industry has a yet to be fully tapped resource; the Stakeholders who are key players with existing mandates directly linked with reinforcing the success of the sector in adopting responsible mining practices. Interactions and engagements with Guyana's gold mining and SSM stakeholders further validates their willingness and commitment to the development of the subsector.

As part of its Terms of Reference, the consultancy focused on four (4) thematic areas in order to deliver on Verifiable Mercury Free gold by the El Dorado project:

Mercury Free Gold Production: Increasing efficiency in gold processing and advancing mercury-free technology adoption

Responsible Mining Standards: Supporting the implementation of planetGOLD Criteria/ Environmental Social Responsibility (ESG) Criteria and CRAFT Code.

Chain of Custody System: Recommendations on Supply Chain Due Diligence and gold traceability system for verifiable mercury-free gold supply chain that meets international standards.

El Dorado Branding: Supporting the El Dorado Gold Project with strategies for branding and marketing; recommending a path way for verifiable gold from mine to market.

During the implementation of the consultancy "The El Dorado Mercury Free Gold Verification and Capacity Building Project" the following issues became apparent to contribute to the success of El Dorado project:

- The role that successful implementation of mercury-free processing technologies plays in upscaling similar efforts in Guyana;
- The role of key stakeholders' support production and marketing of responsibly mined gold and need for their continued support;
- Existing capacity and level of development of the sector in supporting incorporation of the ESG Criteria (the CRAFT, and PlanetGOLD Criteria) into current practices;
- The role of stakeholders in supporting the gold Chain of Custody and due diligence according to OECD guidance;
- Deep understanding of the dynamics of Guyana's Supply Chain, gaps and proposition for strengthening transparency and efficiency along the supply chain;
- Trial exercise to learn and adapt on establishing a verifiable and transparent Hg free Supply Chain from mine to market.
- Exploring marketing strategies and identifying consumer market and preferred products for El Dorado mercury free gold jewellery

This report presents main conclusions and recommendations based on the implementation of the Consultancy. The recommendations are mearnt to inform/guide the El Dorado projects on key take aways, opportunities for intervention, replication and upscaling during implementation and much more for planned future phases of this project. The recommendations focus on the four thematic areas of the assignment.

2.1 Mineral Processing Summary: Meetings, activities, and key observations

The mineral processing segment of the Consultancy targeted increasing gold processing efficiency and advancing mercury-free technology adoption as a mechanism for capacity building and supporting stakeholders to transition to mercury free gold production. To achieve this objective, the main challenges for mercury free technology adoption were identified through information such as interactions with miners, GGMC officials, equipment suppliers and gold traders. Based on the interviews, it was clear that the challenges for adoption of mercury free technologies included high equipment cost, process bottlenecks (technology viewed as either slow or throughput limited) and a general misconception of what constitutes mercury free technology and mercury replacement components. To clarify the problem, we focused assessment on the Mahdia Demonstration site to distinguish Mercury and Mercury Free Technology.

One of the main observations from the field visit was clarification of the main distinction between mercury and mercury free technologies. The main distinction is the method of concentrate (black sands) cleaning, mercury technologies use amalgamation for upgrading the concentrate whilst mercury free technologies use non-mercury techniques for upgrading. Mercury flowsheet consists of gold concentration using a sluice box followed by concentrated cleaning/upgrading using amalgamation (addition of mercury to capture the gold). Once the gold is captured using mercury, the amalgamated gold is separated from the rest of the solids. Mercury is then recovered from the amalgam by heating in a retort to form sponge gold. The last step is smelting of the sponge gold to produce a gold dore. Mercury free technologies on the other hand can use the same approach (sluice box) for primary concentration, however the upgrading of the concentrates is achieved by mercury free techniques. There are several approaches for upgrading gold concentrates to a smeltable product but the ones applicable to the ASM sector are mainly gravity based. The Mahdia demonstration site uses a gold cube and shaking table to clean the gold concentrate (with sand rejected to the waste) yielding a concentrate ready for smelting which is then smelted to produce a gold dore using appropriate fluxes. General promotion of mercury free technologies has mistakenly considered the whole flow sheet inclusive of process improvement equipment such as trommels and centrifuges and thus viewed as very expensive.

For purposes of comparison the current flowsheet at the Mahdia Demo site was simplified to decouple the segment of the flowsheet which address mercury free processing and the segment meant to enhance gold recovery. Simplifying the flowsheet this way allows for comparison to be made on mercury vs. mercury free technologies without incorporating the recovery improvement segments of the flowsheet. This approach helps to address the equipment cost and throughput issues highlighted by several stakeholders as the main challenges associated with adopting mercury free technologies in the ASM

sector. Miners adopting mercury free technology would need to replace amalgamation with a gold cube and or shaking table for concentrate cleaning. One advantage of using the gold cube or shaking table over other technologies is the ability of the miner to see the gold during separation which can help address the "trust" issues also highlighted as a challenge by stakeholders when operating a centralised concentrate cleaning centre. This significantly reduces the required capital investment for transitioning to mercury free technology. For smaller operators with limited capital, transitioning to mercury free would require use of either the Gold Cube and or the Warrior with better matting or panning. Two follow up issues to be addressed for the Simplified Mercury Free Flowsheet are recovery and time taken to process the black sands (mostly smelting time). Unlike amalgamated gold which can easily be converted to sponge gold by mercury removal though heating, the product from the shaking table needs to be smelted to remove the impurities from the gold. This process requires the right type of flux and a good heat source for smelting. The presence of residual sand in the concentrate makes the smelting process more challenging and longer. Selection of a suitable heat source and flux will help resolve this challenge.

The rest of the flowsheet at the Mahdia Demo site, including: the crusher, Trommel screen, Gold Kachas and Mastas are aimed at improving recovery. Ideally, a cost benefit analysis is required to justify the increased capital expenditure compared with the conventional mercury flowsheet. Preliminary analysis of the performance of the sluice box only vs. the extended flowsheet (including crusher, Trommel, Gold Kachas, Mastas) showed that recovery more than doubles with the extended flowsheet. Miners would require training on basic economics including the benefits of increasing recovery vs. throughput to help justify an investment in additional equipment.

It is worth noting that whilst the recovery improvement segment of the flowsheet is not critical for mercury transition, the inclusion of this segment is required for improving recovery. Characterization (both by size and assay and GRG) for the Mahdia site indicates the recovery improvement segment is critical for maximising gold recovery from the ore. Whilst this cannot be generalised for all mine sites it is expected that inclusion of the extended (recovery enhancement) flowsheet will always result in an improvement in gold recovery.

The initial focus at the Mahdia Demonstration site was to help with process Debottlenecking. Discussions with the technical team on site regarding the Trommel screen bottleneck on plant throughput indicated that a reasonable solution to the bottleneck had been identified which included upsizing the Trommel feed pipe. Based on initial assessment of the Trommel screen and discussions with technical person on site it is evident that minor debottlenecking can be achieved by increasing the 4" feed pipe sections to 6". Implementation of the solution was pending authorization from GGMC. It is however understood that this will result in a temporal solution to the capacity limitation issue. Since miners are interested in higher throughput, it is necessary to evaluate alternative configurations to the flowsheet. Suggestions include but are not limited to:

- Complete bypass of the Trommel screen, such that sluice box tails goes straight to the crusher as a slurry and the crushed product directly feeds the Gold Kacha concentrators. Depending on the debris content of the stream it may be necessary to add a wet screening step before the Gold Kacha concentrators

- Alternatively, a screen can be added upstream of the sluice box, rejecting the coarse solids and debris prior to feeding the sluice box.
- Evaluation of the potential for early rejection of large lumps for the Mahdia Demo site showed that at most 3% of the gold is in the large lumps which accounts for ~20% of the total feed weight to the plant. Early rejection of this size fraction by using a grizzly screen upstream of the sluice box will help unlock the Trommel Screen capacity. Characterization of Trommel Screen rejects to determine gold content found the rejects were mostly barren. Based on data collected to date for the Mahdia Demo crushing the Trommel rejects to increase recovery is not beneficial, this fraction can therefore be rejected earlier in the process as waste. It is to be noted that this early rejection step may not be practical due to the presence of clays which potentially are gold bearing and would need scrubbing. If the clay lumps are found to be gold bearing, oversizing the Trommel screen maybe the only cost-efficient option for small scale mining operations

The second objective was to complete a Process Audit which included developing a mechanism and collecting process data on each process stream and performing data analysis aimed at assessing process performance and evaluating equipment utilisation and identification of improvement opportunities for both the Mahdia and Puruni Demonstration sites. It is worth noting that no analysis was done for the Puruni Demonstration site due to challenges with the site beyond the scope of this consultancy. For the Mahdia Demonstration site, size by assay ore characterization was completed by the Sample Collection Consultancy team and the data was provided to us for review. High level analysis showed gold is in the fine size fraction between (74-149 um). The data available to date shows more than expected gold recovery performance above 98%. This high recovery is requiring further validation supported with more data collection but what can be confirmed from the existing data is the additional recovery benefit due to addition of the enhanced recovery segment of the flowsheet which accounts for >36% gold recovery.

A unique opportunity exists at the Mahdia Demo site to complete an apple-to-apple comparison of Mercury free vs. Amalgamation technologies· Operating experience for the mercury free flowsheet is being utilised to evaluate performance of the technology. A qualitative comparison of the mercury free vs. amalgamation sluice box concentrate cleaning technologies showed comparable performance for the two technologies, showing no gold losses from the table recoverable by amalgamation and no gold loss from amalgamation recoverable by a combination of gold cube + shaking table. Follow up testing to generate quantitative data, including assaying of the tailings from the cleaning processes is recommended.

The next focus was evaluation of the suitability of processing approach used at the demonstration site. A qualitative assessment of the flowsheet shows a reasonable selection of unit operations but certain unit operations like the Trommel screen could have been eliminated from the design based on characterization of different process streams. It is worth noting the limitations of the current data based on a single grab sample with detectable gold by particle size. Ideally more samples are required to determine the gold particle size distribution.

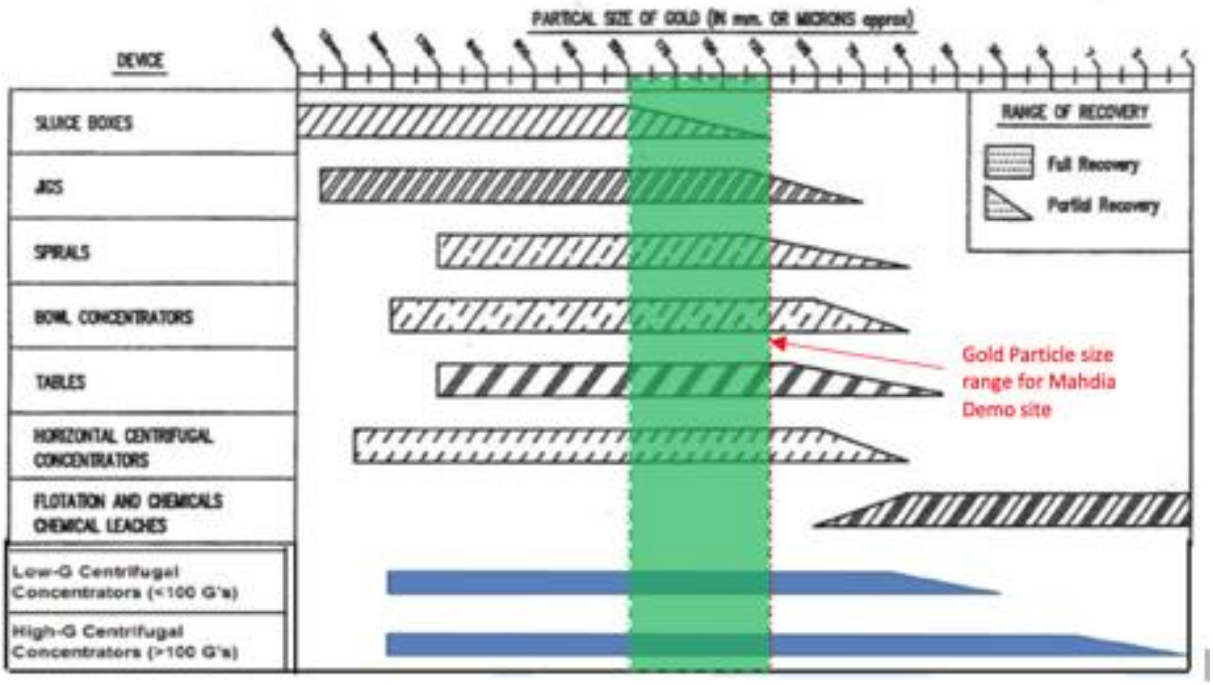

***Figure 1**: Graph showing suitable Gravity recovery technologies for Gold based on particle size*

Source: Adapted from Knelson & Sepro Concentrators [1]

The current results from gold assay by particle size shows gold is in the fine particle size fraction (between 74 – 149 microns), which would benefit from centrifugal concentration (Gold Kachas) in addition to just using a sluice box. Figure 2.1 plots the obtained particle size range observed in a sample collected from the Demo site (in green) on the chart that shows the capability of each concentrator to recover gold by particle size. The results show only partial recovery of the gold by sluices (<50%), whilst centrifugal concentrators can fully recover the proportion above 105 microns (which accounts to 70% of the gold) and partially recover the fraction between 74 - 105 microns. It is worth noting that the Demo site has observed more coarser gold particle sizes with depth and follow up sampling with depth and particle size assaying is recommended to better inform suitable concentration technologies.

The standard approach for determining gold recovery by gravity and specifically by centrifugal concentration is using the Gravity Recoverable Gold (GRG) approach developed by the late Dr André LaPlante to assess the recoverable gold/ gold amenable to gravity concentration (liberated or unliberated) using a laboratory centrifuge. This procedure can be modified to study gravity recovery from alluvial ores which do not require grinding. The results can also be used to select the combination of gold recovery technologies and guide the selection of cycle times for different ore types using centrifugal concentration. For the Guyana ASM sector GRG testing services are provided by the GGMC free of charge and should be utilised by miners.

2.1.1. Conclusions

Based on the work completed during this consultancy we conclude that ASM sector transition from Amalgamation to Mercury free processing is achievable and there are several support mechanisms that already exist to help miners to transition to mercury free processing. To make the transition sustainable there are sectoral and legislative (not in scope for the consultancy) reforms required to incentivize miners to transition to mercury free technologies given the challenges highlighted above. The basic mercury free flowsheet needs to be simplified to facilitate adoption by the ASM sector. We decoupled the segment of the CI Demo flowsheet required to increase gold processing efficiency by increasing recovery and we clarified the minimum kit flowsheet required to transition ASM to mercury-free gold processing in Guyana.

2.1.2. Recommendations

To advance mercury-free technology adoption it is recommended to decouple mercury free from recovery improvement technologies which will eliminate perceived hindrances for adoption by simplifying the pathway to transitioning from mercury use. To increase gold processing efficiency, we recommend debottlenecking of the recovery improvement flowsheet which includes:

- Increasing the feed pipe for the Trommel screen or use an oversized screen
- Elimination of the Trommel screen, complete bypass and just use the crusher to prepare feed for the Gold Kachas
- Moving the Crusher upstream of the sluice box and directing the sluice box tailings to an appropriately sized centrifugal concentrator (may need to consider using the ACOMAQUINAS which has higher capacity than the Gold Kachas)
- Replace the Trommel screen by a screen upstream of the sluice box
    - Miners were willing to replicate the gold cube and this should be promoted through working with champion miners across the country
    - Local fabricators should be part of the technology transition and supported to fabricate local versions of the gold cube and the Warrior.
    - Lessons from past technology transition efforts by GGMC and the GGDMA should be considered to build upon by the current generation of miners.
    - Incentives to mercury free transition should be developed inclusive of market consumption of mercury free gold by government and other financial incentives.

We also recommend evaluation of other approaches to promote mercury free technology utilisation for the ASM sector including use of modular relocatable plants and setting up centralised gold concentrate cleaning centres. These centres can be owned or operated by the GRB.

From a stakeholder perspective to mercury reduction;

- It was evident that sector stakeholders were ready and willing to participate in efforts aimed towards responsible use of mercury, reduction and eventually elimination. The good will should be explored and leveraged upon.
- There was consensus that realistically, mercury can be eliminated with

support mechanisms in place for miners to access finance, and technical assistance to acquire efficient mining equipment. GGMC leading effort should be complimented and miners made aware of technical assistance support for testing and possible equipment trials.

- Experience sharing amongst miners such as the Pilot site at Mahdia was eye opening and inspiring and should be used as a way to promote learning on working mercury free solutions.
- Expansion of mercury free efforts and lessons learned should not only lie with El Dorado Project and GGMC but should be promoted by Associations such as the GGDMA and the GWMO who have extensive membership and essential partners in the sector.
- Policy initiatives to promote mercury transition and responsible mining could be initiated by the Ministry of Natural Resources.

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[1] https://minerals.seprosystems.com/knowledge/

https://www.flsmidth.com/en-gb/products/knelson-semi-continuous-gravity-concentrator?gclid=CjwKCAjwu_mSBhAYEiwA5BBmfy2Y_0hJNbHMkWskc4tShurR9q8zZmvXyK1ENEbakA7BQfa1WI0GxBoC9eYQAvD_BwE#key-benefits

2.2 Environment and Social Governance (ESG) Standards

The Consultancy focus on Responsible Mining Standard and ESG targeted implementation of responsible mining standards according to the planetGold Criteria and CRAFT Code. The formalisation of Small and Medium Scale mining presents an enabling context for the implementation of the ESG criteria in Guyana. Implementation of responsible mining standards while improving environmental and social performance of the sector, would also enhance branding of El Dorado gold with positive and transformative messages. Risk assessment was conducted at the implementing site, Mahdia pilot site, and potential risks identified included gender mainstreaming and country reputational risks associated with proximity to Venezuela and Brazil. On the overall, the site performed well on compliance with OECD Annex II risk assessment due to the strong formalisation and implementation framework in place in Guyana. Where gaps were identified, mitigation measures including development of site policies, due diligence implementation and development of safety awareness materials were initiated.

The ESG criteria was implemented in collaboration with the ME, site workers, and support from CI. Implementation tools included, training materials, site posters, site tools, and a site risk mitigation plan. Documentation was done based on CRAFT code and the Planet Gold templates. The ME had already established safeguards on health, safety and workers welfare and scored well in compliance with PlanetGold Criteria up to the third level. Despite the high compliance with the Criteria, implementation

of (PlanetGold Criteria) was prioritized to achievement of levels one and two due to time constraints the consultancy had.
Guyana's SSM sector has a lot of potential to comply with CRAFT/ ESG Criteria. There were no major non-compliance issues at the Pilot Site related to Human Rights risks within the Annex II profile. Areas for improvement included mainstreaming gender equality in the workforce which is an area for improvement over time.

2.2.1. Conclusions

Implementation of the ESG Criteria revealed opportunities for out-scaling and upscaling the criteria across the country. The regulation of SSM in Guyana together with the existing support and efforts from GGMC, GGB, OSH (Ministry of Labour], and individual miners provide an opportunity for the implementation of responsible mining standards. Furthermore, the demonstration approach which involves a comparison of mercury–free and mercury technologies can be applied for upscaling mercury-free interventions to convince the SSM sector of the reality as well as the associated benefits of transitioning to the mercury-free standard.

Implementation of the ESG criteria demonstrated that miners have a human face, and with awareness raising and access to resources, miners can appreciate the need for responsible mining standards. The use of the miner-centred approach together with active participation, shown below, facilitated the process.

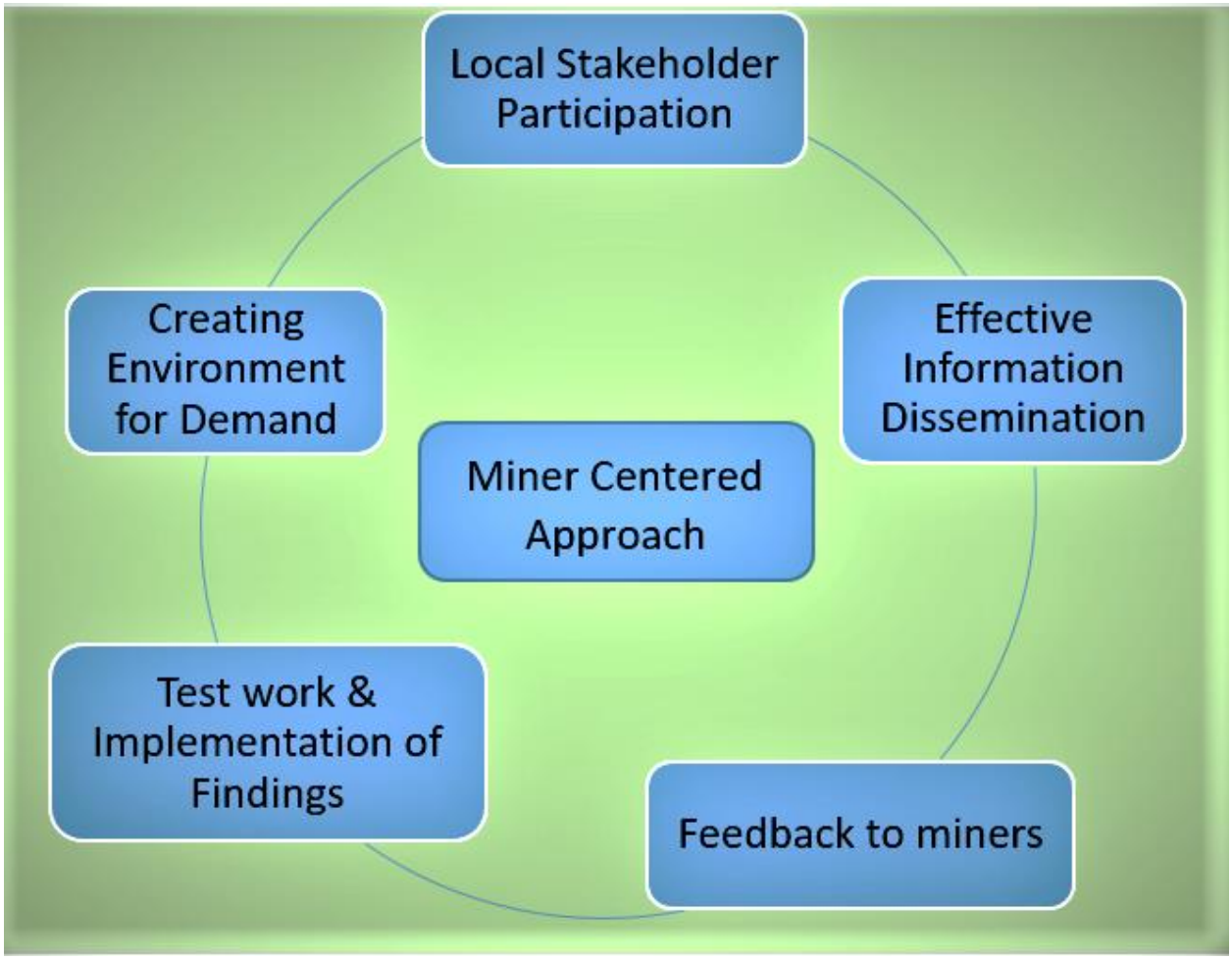

Figure 2: *Miner-Centred Approach*

Key stakeholders seemed to have a good relationship with each other, acknowledged the division of responsibilities to address potential risks associated with compliance to OECD Guidance on Responsible Supply Chains. There were several Memorandum of Understandings between and among key Stakeholders allowing collaboration and delegation of relevant duties and responsibilities. Stakeholders were enthusiastic on supporting the project activities and goals, a key ingredient for sustainability of project outcomes. In addition, incentives associated with marketing of responsibly mined gold such as premiums, and a positive image of the sector were perceived as potential drivers to influence implementation of standards amongst miners during a training in Mahdia.

Furthermore, communicating directly to the miners and [1]tailoring training material, could stimulate a sense of ownership and positive attitudes towards responsible standards. The draft training material developed by the consultancy were shared with the miners for inputs and suggestions to adapt to their realities.

Figure 3: *5-Points of Safety, Tailor-made for the Site*

[1] PlanetGold Good communication practices in ASGM https://www.planetgold.org/asgm-comms-best-practices#one

Rehabilitation of mined out land is an important part of the standards as it protects biodiversity values, restores ecosystem services and aligns with livelihood priorities of indigenous communities. While mine rehabilitation requirements as specified by the Guyanese legal framework is regarded as expensive by most SSM operators, the frugal rehabilitation[2] method (FRM) can be applied. FRM involves two steps: physical and biological rehabilitation using simple tools and methods. Earthmoving equipment can be used where large- scale disturbance has been created. Indigenous flora can be promoted to restore biodiversity and reduce adverse impacts of mining on biodiversity. Environmental experts in Guyana confirmed that biological rehabilitation may not be necessary for Guyana, given the high rate of natural regeneration/revegetation after the restoration of the topsoil. However, to ensure species continuity, mining operators can collaborate with host communities to set up tree nurseries and promote propagation of indigenous species.

While social responsibility is critical to protecting the rights and the heritage of the Indigenous people, mining sites located in designated mining areas away from residential areas have limited social impacts on the Indigenous community. It was also noted that indigenous communities who engage in mining, might experience adverse health, safety, and environmental impacts from their own mining activities. There is therefore need to raise awareness on responsible mining standards among the indigenous communities involved in mining as well. Local leaders interviewed during the assignment indicated their commitment to implement the standards and safeguard their communities.

To raise awareness on mercury health impacts due to chronic mercury intoxication, good health and safety practices could be introduced illustratively as shown below in the context of family, health, and a safe environment. This wholistic and family approach tends to have more impact as it communicates to different levels of family structure. Family speaks to more than one individual (the mine worker) but the other members who can be impacted due to exposure of one or more.

[2] Fugal Rehabilitation Method (FRM)
https://asiafoundation.org/wp-content/uploads/2016/04/Frugal-rehabilitation-methodology-FRM-eng.pdf

Figure 4: *Contextualising Health and Safety*

Incentivising responsibly produced gold could be effective at the level of production, if actors in the chain such as jewellers and consumers are willing to pay a premium for mercury-free gold. The local jewellers in Guyana were prepared to pay a premium of up to 5% -10% for responsibly mined gold. This of course means that the cost of jewellery produced by this gold will carry a higher cost.

2.2.2. Recommendations

- The potential for implementation of responsible mining standards in Guyana is very high, with most operators already scoring high due to the existing formalisation framework.

- There needs to be continuous effort to implement and upscale responsible mining standards within upcoming programs and projects. This will have positive effect of mitigating negative human rights effects, promote health, safety and environment and improve the reputation of the sector in the country.
- Render support to miners committed to implementation of responsible mining standards at their own sites. There are cost elements associated with standards implementation such as training,

development of policies and compliance. These can be supported at the beginning of the miner's compliance journey.

- Gender mainstreaming should be prioritised by improving access to mineral rights, training, finance, mercury-free technology for women.
- For better outcomes, ESG criteria should be introduced at project planning stage, rather than during the course of project implementation. This ensures a fully integrated approach within the project in terms of resourcing, monitoring and evaluation.
- An understanding of Responsible Mining Standards amongst stakeholders and support institutions is required to support continuity and upscaling. Institutions requiring support and training include the GGMC, Ministry of Labours OSH Department, Miners Associations, Environmental Protection Agency, GGB, Traders and Jewellers.
- Multi-stakeholder synergy and partnering with GGMC, and OSH departments, and training enables the division of roles for different stakeholders to address relevant risks within the supply chain and support standard implementation.
- Incentives to increase responsible mining and production of mercury free gold from SSM operations should be developed to increase investment in appropriate technologies and standard implementation.
- GGMC and other Agencies can consider integrating ESG Criteria requirements as part of their routine check lists for mining sites. This will speed up integration of responsible mining standards through institutional dynamics.
- Despite the current limited production of mercury free-gold, there is an opportunity to establish an international market for responsibly mined Guyanese gold to motivate and incentivise implementation of the ESG Criteria and behaviour change
- Collaboration between stakeholders and the Guyana Mining School to conduct training and sensitization on best practices in mining and environment should be considered.
- Guyana can learn lessons from implementation of the Kimberly Process in the areas of standards and due diligence in supply chains. A solid framework for standards implementation exists from participation in the Kimberly Process.

2.3. Chain of custody system

This component targeted the development of a guaranteed responsible, transparent and traceable supply chain from mine to market. Guyana's gold chain supply ranges from simple to complex depending on the production capacity of the miner and the intermediaries they have to deal with. In most cases the actors in the supply chain are formalised and legal. It is the level of dependency and business transactions between actors that influence the complexity or simplicity of the supply chain. The gold sector in Guyana is heavily influenced and controlled by state actors since all licenses are issued by the GGMC and the GGB as State institutions, and the GGB is the authority and oversight body for gold trading in the country.

Examining the dynamics of the supply chain it is evident add the rolls and responsibilities of all actors are well distributed and respected. GGB is the entity in charge of trading and purchases at the end of the chain, but it is also the one that authorizes licensed dealers to act as its agents. On the other hand, the

GGMC is responsible for monitoring and providing technical assistance to the production and operation side of this chain. GGMC also provides support to the GGB and other government agencies and stakeholders. While the GGB grants the licenses for Dealers who can also export, Trading licenses are granted by the GGMC.

Within the framework of this synergy, the site visits enabled us to note the responsibility of of GGMC in monitoring of sites and production. The GGMC production sheet, is also taken in hand by the GGB, which collaborates in this sense to collect the data from these sheets for records, reference, and verification. It is not certain that this practice is efficient for the operation and monitoring of the chain, but one certainty is that it demonstrates a synergy of the different services of the State of Guyana in the management of the gold supply chain**.**

The knowledge on international priorities on responsible supply chains and chain of custody was limited amongst actors, demonstrating the absence of formal international players in the Guyanese supply chain. OECD Due Diligence Guidelines, gold traceability techniques were still at infancy or relatively unknown amongst most actors. The GGB had changed its refinery due to some pressures from the Canadian mint due to due diligence issues and risks associated with money laundering and sanctions linked to Venezuela.

2.3.1. Conclusions

The Actors

Throughout the consultancy, we defined the different actors in the chain according to two important criteria. The direct actors as those who intervene directly in the supply chain by producing or trading gold and the indirect actors as those involved in the management of the chain.

The identified direct actors of the chain are:

- The miners who are the permit holders, and are responsible for the production aspect of the Supply Chain
- Traders are the most sensitive elements of the chain, as they are very mobile and can present themselves in different ways. During the field study we were able to define this category of traders who go to the site and or stay in gold buying stores. However, stakeholder consultations at the end of the study revealed the existence of intermediary actors who play the same role and must be acknowledged. They are the miners and shopkeepers who obtain special authorizations allowing them to buy gold from the sites or in the mining areas
- The dealers who are also licensed to export are an important financial link in the supply chain, as they often pre-finance the traders enabling them to purchase large quantities of gold from miners without many limitations
- The GGB is the buyer of the gold from miners, traders, dealers, and any other sellers. The GGB by its nature has the two hats of direct and indirect actor since it is directly involved in purchases and manages the Supply Chain

- The jewellers who are not a direct part of the supply chain, but are essential stakeholders depend on the GGB for supply gold mined in Guyana for their operations.

Figure 5: *Scheme of Various Key Actors in Guyana's Gold Supply Chain*

Due Diligence (DD)

During the study, we focused on DD in the supply chain. Notably, the lessons learned from this study lead us to clarify that DD is a complex process of documentation to demonstrate a proactive approach to implementing good practices for a responsible and transparent supply chain.

In the case of Guyana, the various mechanisms that are within the chain were observed. By mechanism we mean the procedures put in place to monitor and track the chain. The GGMC as the regulatory body responsible for management has a good monitoring system at two levels. A monitoring system of the site with a system of questions and answers made for the site and a form that records the production and sale of gold. Looking at the overall mechanism, Guyana's supply chain is well monitored by the GGMC, although it could be better if more human resources were made available. However, it must be said that these procedures need to be more adapted to the site conditions. For example, management of production and sales data is risky as this information, passes through the hands of several actors up to GGMC forms. This would not be adequate for a good follow-up in matters of due diligence along the supply chain. The consultancy proposes that the procedures for monitoring the supply chain for better DD should be detailed and set according to the stage of the supply chain in question. To be more concrete, the study proposes implementation of DD according to Figure 6.

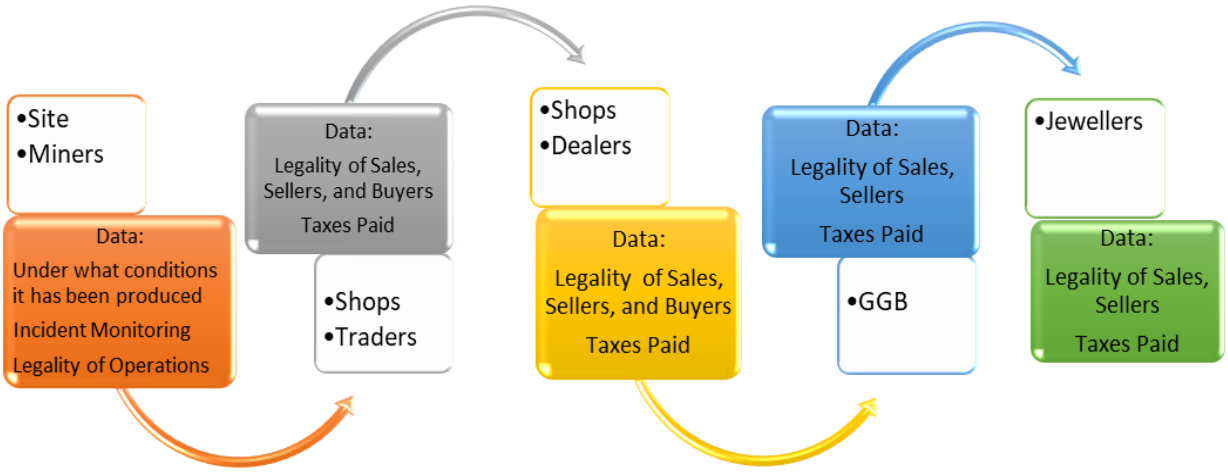

Figure 6: *Due Diligence Process according to the position in the Gold Supply Chain*

1. Gathering documents on the legality of the activities and legality of persons taking part in the supply chain at production level, i.e., miners, their site (Know Your Customer)
2. Monitor the production phase by setting up a data collection mechanism for the following categories Site legalities/Occupational Health and Safety/Human Rights conditions (such as Child labour, wages of workers, trafficking, etc)/environment/community/and transparency of operations.

- KYC of the traders: In Guyana the legality is enough as traders are submitted to a full verification process before they get authorization from the state/ Legality of the shop/Environment/HR (such as Child labour, wages of workers, trafficking, etc)
- KYC of the Dealers; The legality is adequate as traders are subject to a full verification process before authorization by the state/ Legality of the shop/Environment/HR (such as Child labour, wages of workers, trafficking, Money laundering, etc)
- KYC of the jewellery stores to define their legality in the trade. In the case of jewellery stores further verification of origin of funds to ensure that they are in compliance with the banking system of Guyana, and international finance norms.

GGMC could be responsible for monitoring the Miners and Traders, while the GGB monitors the Dealers and Jewellers as they are GGB clients. Thus, they will be able to apply a ranking system to the different actors or the different chains, for example assigning colours (black-red-orange-yellow-green and white) that will define the quality of DD of the actor.

Given that the channels in Guyana are relatively clean, it will be a matter of choosing an adequate frequency which could be for example monthly or quarterly for the monitoring. A significant part of due diligence is to monitor infiltration of Venezuelan gold in the supply chain.

Traceability

If we consider the entire chain in Guyana, then it may be important to define traceability system that is robust enough but responds to the challenges that we were able to identify during the study including the actors. Many of the mining sites in Guyana are in areas where the internet and telephone connection are very difficult thus making it more difficult for the implementation of an electronic system. Preferably the use of a simplified but comprehensive paper-based traceability system that will be transmitted throughout the chain can be employed in this instance.

Setting up tracking stages is not a problem in Guyana, the problem lies in the mobility of the actors who might not be able to keep these papers dedicated to traceability.

For this reason, the consultancy proposed to set up a hybrid tracking system that proposes a paper recording system and an electronic system that is based on the use of an application that could be used both on and offline. The application can be provided to the different actors who will record their transactions while tracing characteristics of the lot.

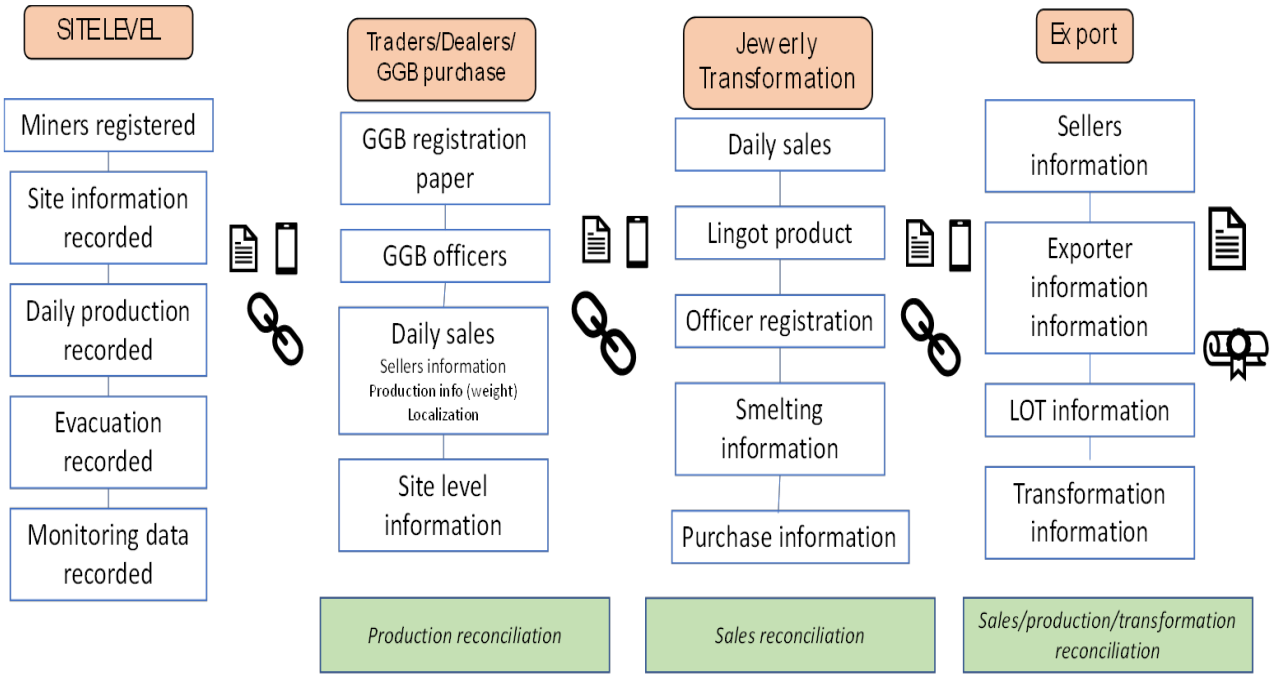

Figure 7: *Scheme showing the data collected and at which step traceability is taking place*

The structure of the chain presented to stakeholders and CI Guyana consists of miners selling mercury free gold directly to GGB and then having GGB supply refined gold to jewellery stores according to the following model:

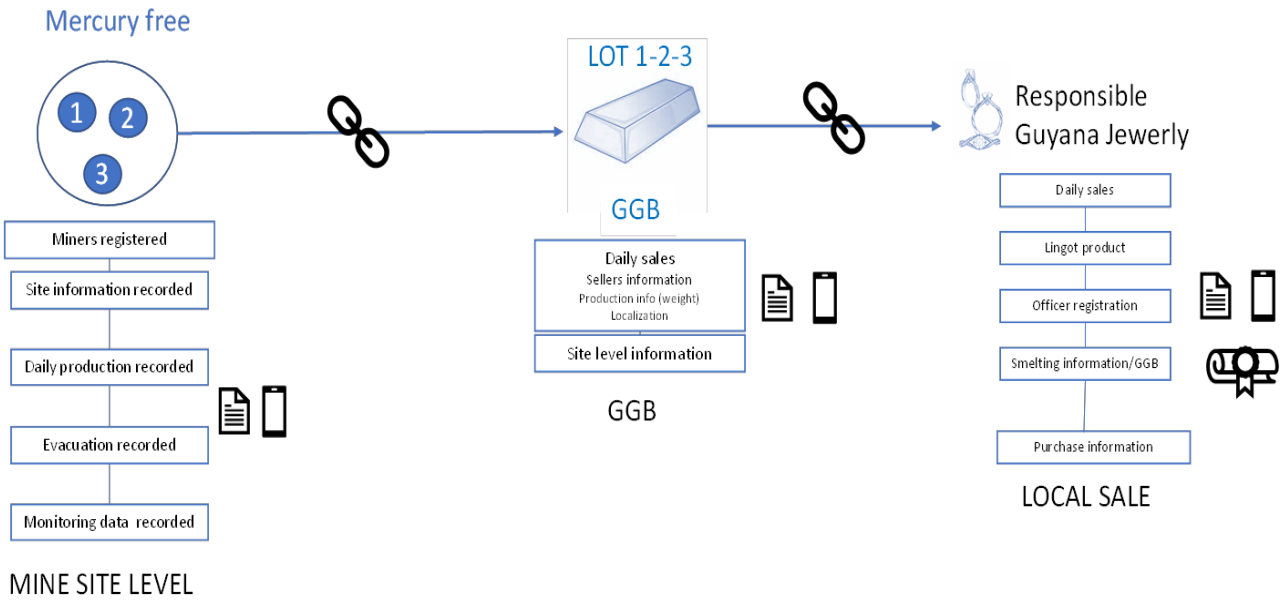

Figure 8: *Scheme showing the DD and traceability process in the chosen CI mercury free Supply chain*

The traceability data produced through this system is copied with the DD data.

2.3.2. Recommendations

Due Diligence

- The aspect of Due Diligence in supply chains in new and complex to Guyana and players require capacity building. The GGB in particular indicated that even within the institution capacity was limited to very few and more information needed to be shared.
- The way forward for global supply chains is implementation of Due Diligence. While Guyana currently deals with a refiner in Dubai, institutions such as the LBMA, WGC and others are increasing demanding their stakeholders to implement OECD Due Diligence.
- The template used to collect on-site data and sales data should be revised into more documents with specific objectives such as monitoring activities, production, and separate sales, to suite due diligence tools. This provides a starting point from existing systems.
- There is need to establish a mechanism to verify legality of the actors before the sale of any gold lot. It was considered to be very difficult to verify source of gold.
- A regular monitoring mechanism should be implemented through which the GGMC can verify authenticity of information at multiple levels.
- Synergy between the GGMC and GGB should be strengthened.
- The GGB should consider adapting the LBMA DD questionnaire to the Guyanese context

Traceability

- Traceability systems used in mineral supply chains were new to stakeholders and a lot of work is required to streamline them in Guyana. Traceability will be an important part of a verifiable gold supply chain and branding.
- To implement traceability, templates at each level of the chain to capture flow of the gold or its changed form must be introduced. Documentation of the Chain of Custody is a key aspect of traceability.
- A hybrid electronic and paper traceability system based on self-registration with verification should be developed and implemented in the context of Guyana. Some traceability systems were presented during training and the most appropriate can be tested and adapted to context.
- There is no one size fits all solution; The different systems should be adapted to local conditions and realities.
- Training will be an integral part of traceability implementation and requires adequate resourcing.
- Traceability service providers should be engaged to enable selection of best system for Guyana.

2: 4: Branding and Marketing of Eldorado Gold

Branding communicates to the market and consumers the value proposition, uniqueness and key message about the product and its values. It makes the product memorable and helps potential customers to confirm if the proposition fits their demand and appetite. Branding in jewellery sector can be expressed through patterns or shape, colour, size, and other design elements such as symbols. Compliance with consumer values such as fair production, respect to human rights and ESG is increasingly becoming important for consumers. It is no more adequate to focus on quality and price alone, but linkages to natural heritage, responsible and sustainable practices create an appeal amongst certain segments of consumers both in Guyana and abroad.

Developing a great brand for the El Dorado Hg free gold requires the following to be taken into consideration:

- Emotions that the brand evokes
- Culture of consumers
- Values of greening the economy
- Socio-economic impact at the local level

Emotions are powerful and strongly drive consumers' decision making. As a brand, the aim will be to cultivate a strong emotional connection with customers and the source of the Hg free gold. While we may not be able to tell an entire story in the pattern or design, it is essential that a creative way is found to share the narrative of how the gold is mined and all the ways in which it benefits the host people, environment, and country.

Cultural associations are also very important when developing a brand that speaks to sustainability, and environmental and social responsibility related to mining and the Hg free gold jewellery. Changing the way that the public or the consumers view miners and mining for instance, could be strategic.

Brand association is also critical in creating a market drive. Having high profile individuals or institutions identifying of promoting the brand generates goodwill. This may include endorsements by celebrities, government agencies, tourism authority as well as local leaders. The face or voices of host communities on the positive impact of a brand could go a long way to build market confidence on the brand.

Jewellery Brand Communication

"Facts tell, but stories sell" is a very popular and taught phrase in the world of marketing and sales. The meaning behind this saying is obvious. The best way to get a person to purchase your products or services, is by telling them a story that is emotionally, morally, or culturally relatable or appealing.

Story elements can be used everywhere for instance, in advertising, blogs, posters, descriptions, vlogs, email communications, product titles, and customer/ consumer support. By communicating more, the chance of desire for the product and sales increases. Every brand has its own standards, value, and style, which must be aligned with the communication and marketing methods.

It is, therefore, recommended that branding could include the following words or phrases:

***Figure 9**: Considerations & Ideas to be communicated during Branding & Marketing*

Marketing – Social media platforms, posters, brochures, advertisements, and promotions

The best way to get the brand and product recognised is through collaborative efforts with stakeholders across the industry.

The following partners and stakeholders could have information about the El Dorado Hg free gold on their social media platforms, posters, or brochures on their premises, and where it can be accommodated in advertisements and other promotions:

- Conservation International
- Topaz
- Guyana Gold Board
- GGDMA
- GGMC
- EPA
- Ministry of Labour OSH

- Ministry of Natural Resources

While these are technical institutions associated with mining and the environment, the main consumers of jewellery are not really from such institutions. Collaborative efforts with fashion brands, cultural marketing companies, nature enthusiast and high-volume product names could be beneficial to brand promotion.

Information on all the above-mentioned platforms and communication instruments should include brief summaries on the best practices employed during production of the Hg free gold such as prospecting to prevent unnecessary deforestation, reclamation practices, technologies used, support of the various agencies and stakeholders, safety and health standards, transparent chain of supply, etc. A virtual tour of the mining communities or mining area could be enabled so the consumer gets in touch with the source of the gold and virtual appreciation of the activities. It's important that in a context of "bad mining buzz", consumers see something different, encouraging and giving hope for green mining.

Marketing - QR Codes

A QR code (an initialism for quick response code) is a type of matrix barcode (or two-dimensional barcode) invented in 1994 by the Japanese automotive company Denso Wave. A barcode is a machine-readable optical label that can contain information about the item to which it is attached. In practice, QR codes often contain data for a locator, identifier, or tracker that points to a website or application. QR codes use four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji) to store data efficiently; extensions may also be used[3]

The below QR Code was created as an example. By scanning with a phone or smart device, it takes the viewer/user directly to planetGOLD webpage.

***Figure 10**: QR Code created for planetGOLD website*

Tagging the jewellery with QR codes, and including the codes on all posters/flyers, ads, and social media networks is recommended.

Using the scanner of a mobile device, this digital code could take the customer directly to the planetGOLD webpage where they will be able to access the details of the El Dorado Mercury Free Gold including how it is mined, the story of the miners, responsible and transparent chain of custody, ESG Criteria and best safety practices, supporting stakeholders, life stories and images and videos on environmental protection and restoration.

When the QR code is scanned, the number of times the site was accessed can be tracked. This in turn will accurately inform on product popularity and purchases.

1.4.1. Conclusion

Guyana's Stakeholders are extremely cooperative and continuously demonstrate their commitment towards the improvement and development of the Mining and Gold Industry. It is without doubt that they are very supportive of the concept of producing and marketing Hg free gold jewellery. Stakeholders equally agree that the production and marketing of Hg free gold should be incentivised for the benefit of the miners who need to make significant investments in acquiring technologies that would enable production of mercury free gold, while observing high safety and health standards at their mining sites.

The cooperation and collaborative efforts of miners (the Hg free ME), GGB, GGMC, and the jewellers (Topaz) makes it possible for the consumer market to access authentic and verifiable Hg free gold jewellery. The trial exercise through this collaboration will help stakeholders understand opportunities and constraints on Hg fee production, chain of custody issues, supply chain due diligence, management at the GGB, market tastes and marketing strategies.

We can further conclude:

- The branding and marketing of mercury free gold jewellery for the local market is a good starting point to assess and address any identified successes and challenges
- Guyana has an established local jewellery market with trusted suppliers and products which is advantageous for the project to commence a trial exercise.
- The formalised and structured industry is also an advantage when attempting to gain the attention and trust of potential customers both locally and internationally
- Consumers of jewellery products expressed interest in hand-crafted artisanal gold jewellery produced in Guyana and in the Caribbean as it is known for being mostly conflict-free and is of a high standard and quality
- Once miners are convinced that their production can improve and they can financially benefit from producing Hg free gold, it will be easier to convince them to invest in the necessary equipment

[3] https://en.wikipedia.org/wiki/QR_code what is a QR Code

- Jewellers currently purchase their gold from the GGB at 1% above the world market value. Although the GGB has guaranteed that the cost for Hg free gold will not be impacted by separate processing methods, and jewellers will continue to purchase Hg free gold at 1% as normal, the jewellers themselves indicated that they would pay as much as 5 % above the market value if it meant that miners are benefiting directly or being incentivised from the GGB

1.4.2. Recommendations

- Market based incentives for the production (increased supply) of Hg free gold should be discussed and identified by the Guyana Gold Board and Government of Guyana. This will facilitate making Hg free mining both profitable and operationally sustainable.
- A market focused study needs to be undertaken to develop marketing strategies for Guyana, region and internationally.
- Explore the role Government can have as the main consumer for Hg free gold jewellery.
- Ensure involvement of key actors and champions during the launch of the trial jewellery.
- The development of a baseline for contamination may become necessary since many areas are reworked which could increase the possibility of gold mined entirely without Hg having traces of the chemical that was already present in the soil/blacksands
- Although the local market was identified as the pilot starting point, enabling Guyana's jewellery industry to access the international markets through sales (online credit card sales for example) and export will be extremely beneficial in the effort towards providing Hg free gold products. The GoG along with international agencies and partners should therefore create the needed policies and regulations to make this possible and without extreme difficulty or 'red tape' for the jewellers
- Future efforts concerning Hg free branding and marketing should include input from key stakeholders and jewellers. This will ensure that the project teams are given the needed guidance and advice in all essential areas including what appeals to consumers, what sells, and the best possible representation of the efforts and products