

A decorative graphic on the right side of the page. It features three concentric circles in shades of blue. Two circles are positioned higher up, and one is lower down. Thin blue lines intersect these circles and extend across the page.

# **Guyana's Extractive Industry Sector (EIS)**

*A Synopsis of Issues and  
Recommendations for the mining sector  
as a Sustainable Element of Guyana's Low  
Carbon Development Strategy (LCDS)*

**July 2013**

# Guyana's Extractive Industry Sector (EIS)

*A Synopsis of Issues and Recommendations for the mining sector as a Sustainable Element of Guyana's Low Carbon Development Strategy (LCDS)*



# Contributors

**Conservation International Guyana** – D. Singh, C. Bernard, P. Rampersaud, T. Laing (Consultant), D. Balraj

**Projekt-Consult GmbH** – M. Priester and T. Hentschel

**WWF Guianas** – P. Williams, A. Williams, O. Davis, and L.C. Watson (Consultant)

**Conservation International Foundation Guyana Inc. (CI-Guyana)**, a subsidiary of Conservation International Foundation (CI), is a Guyanese not-for-profit Non-Governmental Organisation. Established in 1987, CI has developed global experience and skills in linking human development with the conservation of the earth's living natural heritage. Building upon a strong foundation of science, partnership and field demonstration, CI empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity.

Since 1996, CI-Guyana has been deeply committed to assisting Guyanese to embrace healthy, sustainable economic development. The organisation recognises that while the reasonable and legitimate needs of people must be met, sustained economic growth can only be realized if nature and the services which it provides for the security of human well-being are maintained from generation to generation. CI-Guyana therefore works at the critical interface between conservation and development. Through partnerships with government, private sector, local communities and civil society, the organisation deploys its global networks and partners to support the sustainable development aspirations of the country, and uses these experiences to help inform and influence international policy related to the conservation and sustainable use of natural resources. CI-Guyana's strong experience on the ground, especially engaging local ecosystem dependent communities, and its approach of engaging to enable and build capacity have led to key successes in integrated natural resource management and planning.

**Projekt-Consult GmbH**, a Germany based consultancy company, has been working in the field of international co-operation for more than 30 years, gathering extensive experience in this field. Among our clients are German and international development cooperation agencies, bilateral and multilateral donor institutions, and regional development banks. Thematically Projekt-Consult GmbH focuses on two fields: Renewable Energies and Energy Efficiency, and Mineral Resources and the Environment.

Since 1988 Projekt-Consult GmbH has systematically developed competence and excellence in the mineral resources and environment sectors. We focus on artisanal, small and medium-scale producers and have evolved from technical projects towards holistic project approaches. This includes, besides technical issues, the consideration of socio-economic aspects, the legal administrative framework, organisational and managerial issues, environmental performance as well as policy dialogue. Our project partners are in the private, civil and public sector. In the private sector we focus on producers, mineral traders, as well as on financing agents and the suppliers of mining equipment. Partners from the civil sector are foundations, associations, and umbrella organisations as well as representatives of mining communities. Our partners in the public sector are mining and geology departments, environmental agencies, local and regional governments and administrations.

**WWF** has been active in the Guianas since the nineteen sixties, starting with conservation work on Marine Turtles. The Guianas office opened since 1998 and currently has offices in Guyana, Suriname and Fr. Guiana. WWF Guianas works in partnership with governments, the private sector, non-governmental organizations and semi-autonomous bodies to protect the ecological landscape of the region. Over the past ten years WWF Guianas has been the only conservation organization involved in conducting research and promoting education and awareness in the mining sector across the Guianas. WWF Guianas' mission is to conserve the distinct natural communities, ecological phenomenon and maintain viable populations of species of the Guianas in order to sustain important ecological processes and services that maintain biodiversity, while supporting the region's socio-economic development.

*This report has been produced with the kind assistance of the Federal Republic of Germany (represented by the Federal Ministry for Foreign Affairs through the agency of the Embassy of the Federal Republic of Germany, Port-of Spain). The contents can in no way be taken to reflect the views of the Government of the Federal Republic of Germany. The report has also been financially supported by the WWF-NL and Royal Dutch Embassy through the WWF-Guianas programme and by Conservation International.*

## Contents

Process Note .....	i
Foreword.....	ii
1. Introduction .....	1
1.1 Problem Statement.....	1
1.2 Defining Total Wealth (and Implications for Sustainable Development) .....	3
1.3 Contribution of the EIS to Total Wealth Growth .....	4
2. The Resource Curse Phenomenon .....	8
2.1 Economic implications .....	8
2.2 Political or Governance Implications .....	9
3. The Extractive Industry Sector in Guyana .....	11
3.1 Mineral Production and Income .....	11
3.1.1 Gold .....	11
3.1.2 Other minerals .....	12
3.2 Economic importance .....	13
3.3 Policy context.....	16
3.3.1 Low Carbon Development Strategy (LCDS).....	16
3.3.2 National Forest Policy .....	17
3.3.3 National Land Use Policy.....	17
3.3.4 Natural Resources Legislation.....	17
3.4 The EIS in Relation to Total Wealth of Guyana .....	19
3.4.1 Direct Reduction in Natural Capital .....	19
3.4.2 Indirect Impacts on Natural Capital .....	19
3.5 Ecological Considerations .....	21
3.5.1 Implications of River Dredging on Maintenance of Ecosystem Services .....	21
3.5.2 Environmental Issues and Associated Regulatory Framework of River Mining .....	25
3.6 Social Considerations .....	26
3.7 Examining Cases .....	28
3.7.1 North West: The new mining frontier.....	28
3.7.2 Linden: Learning from history .....	29
4. Tools for boosting the contribution of mining to a Low-carbon, healthy sustainable economy .....	31
4.1 Mitigation Hierarchy .....	31

4.2 Growing Wealth .....	32
4.2.1 Sovereign Wealth Funds .....	32
4.3 Initiatives focused on mitigation and wealth funds.....	34
4.3.1 United Nations Environmental Programme Global Response.....	34
4.3.2 Private Sector Initiatives .....	35
4.3.3 Other Initiatives .....	36
4.4 Integrated Natural Resource Management .....	37
4.4.1 Mapping Critical Natural Capital.....	38
4.4.2 Implications of Growth in Mining (Business as Usual).....	39
4.4.3 Critical Natural Capital and Mining.....	39
5. Recommendations .....	41
5.1 Points of Convergence – Charting a Set of Fundamental Principles.....	42
5.2 Driving forces and barriers for low carbon mining in Guyana .....	43
5.3 Push-pull Scenarios that Frame Future Action .....	45
6. Conclusion .....	48
7. List of Citations.....	49
8. APPENDICES .....	53

## Process Note

This work is a contribution to the ongoing dialogue on how Guyana can grow sustainably as a People and Nation. It provides a synopsis of issues facing the increasingly important extractive industry sector (EIS) as it moves to secure its place as a responsible partner in the growth of a healthy, sustainable society in Guyana. This document attempts to lay out a case for the integration of the EIS as a prime element of Guyana's Low Carbon Development Strategy (LCDS) framework, through the outline of issues, arguments and recommendations to help inform a strategic vision on how the sector can contribute towards a low carbon economy.

Contributors to the paper have benefitted from interactions with stakeholders in industry, government, local communities, academia, and business. The team includes experts with several decades of accrued experience in the sector in South America and beyond, and experts who have worked and conducted research in varied fields at local and national scales in Guyana.

Authorship of the paper rests with the contributing team. The paper is evidence-driven, contemporary, and presents factual information and current thinking on issues that affect the EIS. It is framed by our current knowledge and understanding of sustainable development as expressed by the United Nations Conference on the Environment and Development 1992 (the Rio Summit), Guyana's National Development Strategy (2002), and most recently Guyana's Low-Carbon Development Strategy (LCDS). Our accountability is to the Constitution of Guyana. Through generous funding from the German Government (through its embassy in Trinidad and Tobago), Conservation International – Guyana (CI-Guyana) and Projekt-Consult GmbH have partnered with WWF Guianas to prepare this synopsis paper. The findings of the paper were presented at a meeting on February 1, 2013 and opened for comments from stakeholders. Feedback from stakeholders was used to prepare this final paper. A summary that places together the key issues of the paper in a 4 to 8 page format is also being compiled.

CI-Guyana, Projekt-Consult GmbH and the WWF Guianas look forward to continued meaningful participation in the ensuing discussions and are eager to support the Government and People of Guyana grow a healthy, sustainable society.

## Foreword

Guyana launched its Low Carbon Development Strategy (LCDS) in 2009 as the national response to the global problem of climate change. Guyana faces major risks from climate change, through increasing sea levels and changing weather patterns. However, Guyana can also play an important global role in mitigating the problem through demonstrating how to sustainably manage its carbon-rich forests while growing its economy along a sustainable path. The LCDS outlines a means to tackle both of these issues, harnessing returns from Reducing Emissions from Deforestation and Forest Degradation (REDD+) to adapt and transition towards a low-carbon economy.

Prior to the 2009 launch of the LCDS, the Extractive Industry Sector (the EIS, or mining sector) was expanding and presently, it is an increasingly important part of Guyana's economy. Increasing gold prices coupled with increases in production and technological improvements have pushed made gold Guyana's most important export. Investment has grown in the country, not just in gold but also in other minerals, such as bauxite. However, the small- and medium-scale mining that accounts for all of Guyana's current gold production is also the major driver of deforestation, and can bring a range of environmental and social concerns. The generally informal nature of the industry may conflict with the formal sector, and upcoming global changes such as any future international ban on mercury could present significant challenges unless the industry can adapt and respond appropriately.

The responsibility of any economic sector increases in direct proportion to its contribution to the national economy. For the mining sector, this should be manifested particularly in its stewardship of the natural capital which underpins the sector itself.

Mining in itself is not necessarily a generator of "wealth" were this term to be taken into a larger context than simply earning or revenue generation, unless these revenues are invested. Applying a "Total Wealth" perspective, mining can be seen as the draw-down in non-renewable natural capital, converting this into very valuable income and foreign exchange returns. It can, however, foster and generate wealth if the returns from the draw-down are well-invested, and any indirect damage to renewable natural capital is minimised or compensated for. An EIS that can achieve this will play a pivotal role in Guyana's transition to a low-carbon economy.

This paper examines these issues, drawing on data from Guyana, and international experience, and presents a series of recommendations to contribute to the discussion on how best to integrate Guyana's important mining sector into its innovative LCDS.



## **1. Introduction**

For over 20 years now, climate change has been recognised as a global environmental challenge. Rising levels of greenhouse gases (GHGs), especially carbon dioxide produced from the burning of fossil fuels and clearing of forests, increases the greenhouse effect by trapping more heat within the Earth's atmosphere. This is causing unprecedented changes in temperature, variations in rainfall, increases in severe weather events, and other climatic problems. Climate Change is now recognised as the single most important challenge of this generation [1], the major global response to which has been the United Nations Framework Convention on Climate Change (UNFCCC) and its supporting protocol.

Climate change is also an important issue for Guyana. Rising sea levels and changing rainfall patterns are likely to impact Guyana's economy and society dramatically, affecting especially urban areas and agricultural production on the coast. On the other hand, Guyana's intact rainforests contribute to reducing carbon dioxide emissions. Tropical deforestation contributes nearly one-fifth of annual anthropogenic greenhouse gas emissions [1], thus avoiding and reversing tropical deforestation is an important and potentially least-cost response to mitigating climate change.

It is within this context that Guyana has taken the important step to demonstrate to the world how a highly forested country can re-orient its economic development along a low-carbon trajectory while at the same time strengthening its capacity to adapt to the impacts of climate change. The Low-Carbon Development Strategy (LCDS) by which this transformation is to be achieved, is partly funded through performance-based payments under Reduced Emissions from Deforestation and Forest Degradation (REDD+) agreements [2]. One such agreement has been signed with the Government of Norway for the provision of up to US\$250 million over five years based on Guyana's maintenance of its low deforestation rate. Under this framework, Guyana plans to grow its economy, boosting development, whilst maintaining its intact rainforests.

Guyana's economy has demonstrated strong growth over recent years, despite the global financial crisis. It has been boosted, at least in part, by high international gold prices. The Extractive Industry Sector (EIS) has attracted investment, both domestic and international, fuelled increases in exports, and developed related sectors. Because of the nature by which the EIS operates, it causes ecosystem loss through deforestation or ecosystem degradation, and impacts on the ability of nature to deliver essential services. Given the underpinnings of the LCDS, and the fact that mining has been recognised as the major driver of deforestation in Guyana [3], integrating mining - the major driver of economic growth - into the LCDS, then presents a critical development challenge.

### **1.1 Problem Statement**

The EIS in Guyana is playing a crucial role in raising incomes and driving economic growth. Exports of minerals represent over half of all exports by value, and mining, predominantly of gold, continues to be the major driver of economic growth. It is a key contributor to employment, both directly and indirectly through stirring demand in complementary sectors such as transportation and agriculture. At the same time Guyana is embarking on a series of innovative international partnerships and developing national strategies to grow a low-carbon

economy, as described within the country's LCDS [2].<sup>1</sup> This raises questions related to the inter-relationship between the EIS and the LCDS, how this important productive sector can be aligned within the overall framework of the LCDS, and how the LCDS can be further implemented to ensure that mining better contributes towards the growth and development of a low-carbon economy.

Recognition of the importance of the extractive sector's role within the LCDS is highlighted by Verification Indicators<sup>2</sup> for assessing Guyana's progress in implementing the Joint Concept Note (JCN)<sup>3</sup> with the Government of Norway<sup>4</sup> directly and indirectly related to mining and other extractive resources. Progress towards these indicators is an important element in the achievement of the objectives of the LCDS, and recent reports have highlighted that whilst action has been challenging, the Government of Guyana (GoG) has undertaken recent action to address this [4]. The synopsis presented here serves to support this action by helping to bring together the issues through which the EIS can be better integrated within the LCDS.

The LCDS aims to provide insights on how to stimulate the creation of a low-deforestation, low-carbon, climate-resilient economy. The strategy grew out of the findings of the Economic Value to the Nation (EVN) theory which produced a scale of the economic value of Guyana's forests [5].<sup>5</sup> The concept can be extended upon by drawing on the Total Wealth framework that has been described in a number of different ways. In this paper we use the framework that has been described by the World Bank [6].

The EIS can impact on Total Wealth in both positive and negative ways. It provides finance for investment into infrastructure – boosting produced capital. It provides finance and increased opportunities for human resource development. The earnings mining generates can provide investments for strengthening human and social capital by improving governance, systems, institutions and human capacities. The EIS can however entail negative implications for social capital, creating or exacerbating social issues such as bribery, prostitution, social dislocation and sexually transmitted diseases, potentially eroding intangible capital. Further it reduces the national stock of non-renewable natural capital (i.e. minerals and other non-living materials) and can reduce and degrade renewable forms of natural capital (e.g. forests, water and biodiversity) depending on the means of extraction and processing.

Whether these impacts represent an overall increase or decrease in total wealth, or a simply a conversion from one type of capital to another depends on how the total earnings from extraction are utilised – whether they are invested or consumed by the state, private operators, and other beneficiaries.

---

<sup>1</sup> In addition to the LCDS, there have been a number of relevant official communications from the Government of Guyana, including the Joint Concept Note (December, 2012) between the Government of Guyana and the Government of Norway, REDD+ Enabling Activities Reports (2011) Interim Measures Reports on Guyana's REDD+ Monitoring, Reporting and Verification System (2011 & 2012), the Concept Paper for Developing a Framework for an 'Opt in' Mechanism for Amerindian Communities (2010) and Guyana's REDD+ Governance Development Plan (2010).

<sup>2</sup> The Governments of Guyana and Norway have agreed on a number of indicators, detailed in the JCN, in which Guyana reports annually on performance.

<sup>3</sup> The Joint Concept Note (JCN) operationalises the Memorandum of Understanding between the Governments of Guyana and Norway.

<sup>4</sup> Of most relevance is Indicator 9: Measures by the GoG to work with forest dependent sectors to agree on specific measures to reduce forest degradation, although also relevant are indicators 3, 7 and 8.

<sup>5</sup> The EVN has four main components: standing timber value, post-harvest land use value, avoided protection costs and loss of local ecosystem services. The EVN approach has been used to balance the view regarding the true worth of tropical rainforests, not only because of their climate services, but also because of the opportunities that may be foregone by leaving forests standing.

All three impacts outlined are important in understanding mining's place in a green, low-carbon economy and the ways in which it can be integrated into the LCDS. This paper starts from the point of reference that the EIS represents a draw-down on natural capital, discusses the implications of drawing down on non-renewable natural capital and the impacts on renewable natural capital, then discusses how growth in Total Wealth can be achieved.

The role of the EIS in growing Total Wealth, whilst at the same time minimizing its negative social and environmental impacts, is a complex issue that has occupied decision-makers across the globe for generations. It requires action from society as a whole, especially those directly engaged in the mining process, government and civil society. A mechanism and set of tools to best facilitate this under the framework of the LCDS will allow Guyana to use the income streams from natural resource extraction to create a healthy and sustainable low-carbon economy, boosting Total Wealth. Moreover, such an initiative will continue to reinforce the LCDS as a global model for economic transformation and green growth.

## **1.2 Defining Total Wealth (and Implications for Sustainable Development)**

Income rather than wealth is often in the focus of economic arguments and discourse. Gross Domestic Product (GDP) places more emphasis on income and changes in income rather than wealth. Human well-being – intimately linked to development – however, is more appropriately measured by the Total Wealth associated with the individual, household, community, region or nation, as opposed to income. In World Bank terminology, total wealth can be described as having three components, Natural Capital, Produced Capital, and Intangible Capital.

**Natural capital** is the natural resources that are available to a country. It consists of a wide range of resources including non-renewables such as minerals and fossil fuels and renewables such as timber, non-timber benefits of forests, cropland, pasture land, protected areas, fisheries, water resources, and biodiversity.

**Produced capital** is the manufactured assets and machinery such as factories, capital plant, and infrastructure. It includes urban lands and the buildings they contain.

**Intangible capital** captures the resources that people possess inherently – human resources – their intelligence, education and skill, and also includes social capital – the cohesion that exists in social structures in a country, the institutions that it has developed and its social and political environment. Thus intangible capital represents the value that humans bring to assets, through their individual or social skills. [6]

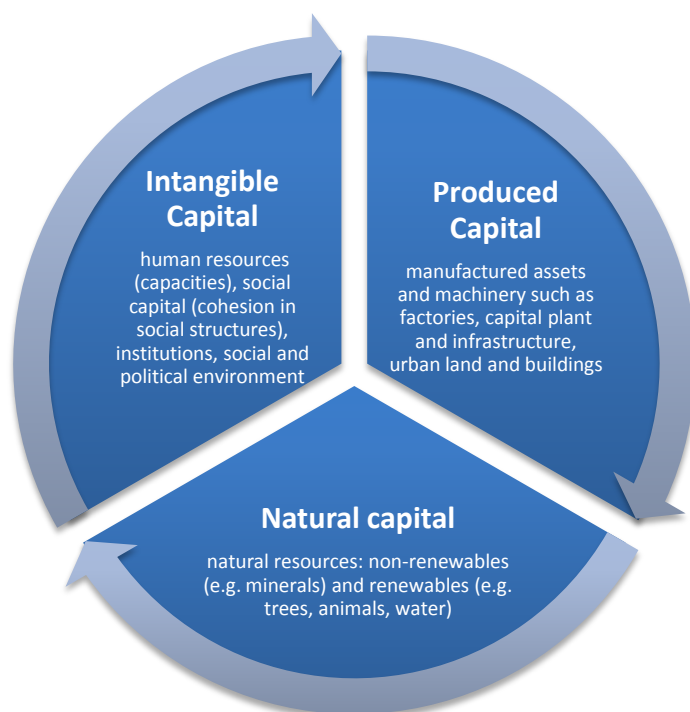


Figure 1: Components of Total Wealth

Within the context of Total Wealth, the EIS can then be examined to understand how it affects growth in total wealth through its impacts on stocks of the three forms of capital. These impacts can be positive or negative depending on the context, method of mining and management of revenues, and the policies and capacities to enable these. For realization of healthy sustainable development the contribution of the EIS, and other sectors, to the growth in total wealth of a country must be maximised.

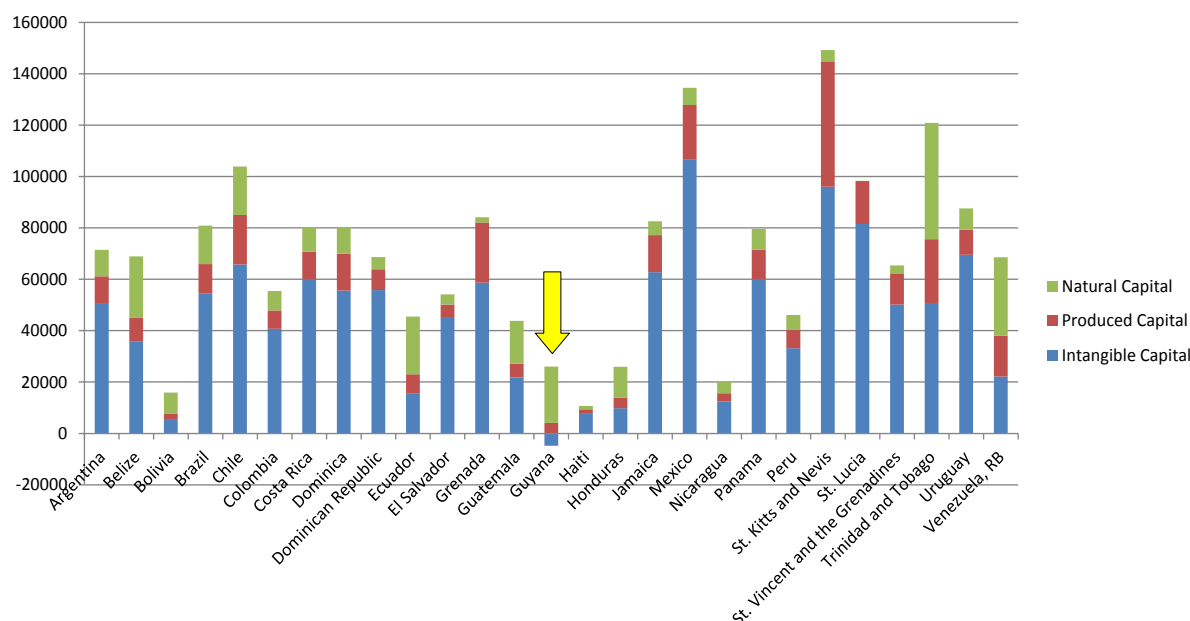
### 1.3 Contribution of the EIS to Total Wealth Growth

The EIS is wide and varied, encompassing a number of different activities in several industries. The sector is an important component of Guyana's economy, particularly the forestry and mining industries. Gold mining is important in both the EIS and the Guyanese economy as a whole, hence in discussing the issues in this paper the specific focus is on the mining component of the EIS, particularly gold mining.

Guyana is traditionally defined as a low-wealth country, generally determined by its GDP per capita of approximately US\$3,000 [7].<sup>6</sup> This more reflects the country's income per capita (flow of wealth) rather than its absolute wealth. The World Bank estimates Guyana's total wealth in 2005 at US\$14 billion, up from US\$11 billion in 1995. On a per-capita-basis this equates to US\$19,210 [6], essentially implying that the well-being of an average person in Guyana is supported by this level of wealth. The composition of this wealth highlights Guyana's strengths and weaknesses. The level of natural capital – US\$21,882 per capita [6] – is greater than Total Wealth per capita implying that the summation of the other two capital stocks – produced capital and

<sup>6</sup> The IMF estimates GDP per capita at current prices at US\$3,333.25 in 2011. They estimate GDP per capita based on purchasing-power-parity at US\$7569.14 in 2011.

intangible capital – are negative. Guyana's Total Wealth is subsidised through a draw-down of its natural capital. Determining how this natural capital can be invested to grow produced and intangible capital stocks, effectively increasing Total Wealth, is the central challenge of development, and is dependent principally on growing its human and social capital to match the trend in other countries in the hemisphere (see figure 2).



*Figure 2: Total Wealth of countries in the Caribbean and South America [6]*

Traditional measures of GDP can be useful in highlighting changes in components of wealth as it highlights how produced capital, along with short-term consumption, is being created. Guyana has experienced solid growth in GDP over the last decade, highlighting growing trends in production of these components. When the components of this GDP growth are examined, the source of creation of this income and whether it represents changes in the level or simply the composition of wealth can be better understood. Essentially, the extraction of non-renewable natural resources results in development if it increases Total Wealth rather than merely converts natural capital to the same level of other types of capital stocks or consumes it.

The contribution of the EIS to Guyana's recent GDP growth, results in valuable financial flow for public and private actors alike, though in itself, it is not necessarily an increase in wealth. Rather, it represents the economic value associated with the draw-down of natural capital. The returns on investment of the profits and revenues from the sector will reflect whether this draw-down in natural capital adds to Total Wealth or results in decreases through mere short-term consumption. If profits and revenues are invested in the growth of produced or intangible capital of greater value, then the EIS can contribute to increase in Total Wealth, especially if indirect losses in natural capital are minimal. If however, mere increases in short-term consumption result from these revenues and profits, the Total Wealth of the country can be negatively affected – this is analogous to spending cash from a savings account to maintain a current lifestyle without planning for future contingencies and longer-term needs. This understanding of the mining sector's interplay with income and

wealth demonstrates that it can be positive in the short-term, yet either positive or negative in the medium to long-term depending on how the assets are invested.<sup>7</sup>

As much of the mining profits in Guyana accrue to private operators, investment decisions largely lie with private actors. However public policy plays a crucial role in guiding and enabling desired investments of both private and public proceeds of the EIS, providing for long-term sustainable investments that boost the other capital stocks to ensure increase, rather than reduction, of total wealth. Essentially, the contribution of the EIS to growth in total wealth, development, of a country depends mainly on:

1. how much reduction in the natural capital occurs during extraction and processing through direct reduction of non-renewable capital by extraction and indirect reduction in renewable natural capital through mining and processing methods; and
2. how the proceeds of this activity are invested in growth in the other capital stocks – intangible and produced capital – versus how much is converted into consumptive activities, or exported.

Ensuring that the extractive sector fuels the growth of total wealth is crucial in the development of a low-carbon and healthy sustainable economy and requires deliberate planning from both economic and geographic perspectives.<sup>8</sup>

The EIS has substantial positive economic impacts in many countries, providing valuable foreign currency earnings; and revenues for investment, job creation, and strengthening of governance. On the other hand, under certain circumstances high reliance on the EIS within an economy has also lead to challenging macroeconomic impacts known collectively as the 'Resource Curse' (outlined in more detail in Section 2). One manifestation of the resource curse is the so-called Dutch Disease where a rapid surge in revenues from natural resource extraction leads to a decline in other sectors that rely on international trade. Volatility<sup>9</sup> of natural resource revenues can also lead to macro-economic and fiscal instabilities, and the ability to access capital markets can result in over-extension of foreign debt. High reliance on natural resource extraction has also been linked to governance issues and political instability in a number of countries across the world with direct and indirect impacts on the functioning of other sectors in the economy [8].

In similar manner, the EIS can have both positive and negative effects on intangible capital. The income streams from mining provide opportunities for investment in human capital for communities in which such investments may not be possible otherwise. It provides livelihoods both directly and indirectly for many communities, often in remote areas where there is limited access to other income streams. The negative impacts on human and social capital include physical dislocation of miners from their families causing the breakdown of family units and relationships [9], with spin-off impacts on the community's capacity to carry out other economic activities such

---

<sup>7</sup> This is a simple exposition of the Hartwick Policy Rule, which essentially states that, under a restrictive set of assumptions, natural resource rents should be invested in order to offset declining stocks of non-renewable resources. The rule depends on the assumptions made, including the degree of substitutability of natural and produced capital.

<sup>8</sup> One approach to maximising the overall benefit of mining to Total Wealth is to add value to the extracted products. Moving up the value chain from mere production of raw minerals to some level of processing can help to boost the income stream from the draw-down on the natural capital – helping to maximise benefit. This is especially relevant to minerals for which a greater amount of processing is required such as bauxite. Value adding can be difficult as it requires development of complementary industries, skills and infrastructure, emphasizing the need to develop long-term plans for the sector and the economy.

<sup>9</sup> Exhibiting a constant state of flux.

as agriculture. The remoteness of mining areas also often results in difficulties with law enforcement, encouraging crime and other deviant behaviour.

Apart from the reduction in the stock of non-renewable natural capital, the EIS tends to reduce renewable elements of natural capital, for example forest cover and freshwater. This is especially important where the industry coincides with areas where the ecosystems are considered to be critical for the survival of nature and human society.

In recognition of the positive benefits that can accrue from mining, along with the potential negative impacts on Total Wealth, a number of international initiatives have been undertaken to improve the sustainability of the mining industry, the transparency and management of the supply chain, and the environmental consequences of mining. These provide a framework and guidelines for the integration of mining into low-carbon sustainable economies.

Mining's role in growing a healthy, sustainable, low-carbon economy that generates total wealth will also depend on addressing other issues such as energy use within the sector with an aim to reducing its overall carbon-intensity.

## **2. The Resource Curse Phenomenon**

Guyana is not unique in its increasing economic dependence on the mining and other natural resource extraction sectors – many countries around the world face similar or more extreme dependence on one or a small number of minerals or commodities. In many regions such dependence has created a phenomenon known as the 'Resource Curse'. This term is used to describe the empirically observed situation in which countries or regions with high natural resource assets underperform and in extreme cases, do worse than countries without such assets.<sup>10</sup> The resource curse manifests itself in economic, political or governance challenges. The importance of understanding and avoiding conditions of the resource curse in Guyana was highlighted in a recent United Nations Development Programme workshop on the subject.<sup>11</sup>

### **2.1 Economic implications**

Although natural resource assets such as oil, gas or large mineral deposits offer substantial potential economic benefits they can present a range of economic challenges especially, though not exclusively, in the medium- to long-term. The first and foremost of these is the so-called Dutch Disease<sup>12</sup> [10, 11]. This is the phenomenon whereby an emphasis on the natural resource extraction sector causes declines in other sectors of an economy that trade on international markets. The essential logic behind the effect is that increase in (or discovery of) natural resources assets leads to higher demand for a country's currency leading to an appreciation in its real exchange rate.<sup>13</sup> This appreciation makes it more difficult for other sectors to export goods whilst at the same time imports become cheaper. These effects can squeeze the other sectors of the economy that engage in international trade. Simultaneously, the increased demands in the natural resources sector (and other non-traded sectors, such as construction) drive up wages and the costs of other factors of production, creating a further squeeze on the other traded sectors. The result is that the economy becomes overly dependent on natural resource extraction and non-traded goods.

The impact of the Dutch Disease can thus be potentially devastating for a country if the natural resource extraction on which the economy is built has a short lifespan – either due to temporarily high prices, or exhaustion of the mineral resource. It may leave an economy unable to cope once the high value natural resource extraction comes to an end.

Various solutions have been posited for the Dutch Disease phenomena, the most prominent including managing flows of natural resource income, through controlled and steady release into the economy over time, and promoting public and private investment into the wider economy to mitigate the dominance of the sector.

Revenue flows from natural resources assets also tend to be unstable, from volatility of both the resource itself and the commodities on which the sector depends. Oil and gold are good examples of this phenomenon. This volatility presents long-term economic challenges for economies dependent on these flows. Governments face the danger of uncertain income patterns, while the private sector can be caught in patterns of boom and bust.

---

<sup>10</sup> The phrase was coined by Richard Auty in 1993 in *Sustaining Development in Mineral Economies: The Resource Curse The Analysis*.

<sup>11</sup> The workshop was held on November 14 and 15, 2012. The presentations are available at: [http://www.guianashield.org/index.php/publications-home/cat\\_view/75-gsf-publications/81-extractive-sector-in-guyana](http://www.guianashield.org/index.php/publications-home/cat_view/75-gsf-publications/81-extractive-sector-in-guyana)

<sup>12</sup> So called after a situation which occurred in the Netherlands following the discovery of North Sea Oil in the 1970s.

<sup>13</sup> Real exchange rate is the purchasing power of a currency compared to another.



Government can play an important role in mitigating some of these effects by using funds to better manage the flow of resources, saving when price or production is high and releasing income when prices or production falls.

Most importantly when discussing growth and development in natural resource extractive dependent economies is the establishment of the distinction between income and wealth. As discussed earlier, natural resource extraction such as mining can boost income without necessarily increasing wealth. In order to ensure overall wealth creation, revenues from natural resource extraction can be used to fund long-term public investments and establish incentives to encourage private operators in the EIS to invest their profits in real wealth creation (for example investing in their children's education, or in businesses in other sectors). Essentially ensuring focus on long-term increase in total wealth through investment rather than consumption of revenues from natural resource extraction, lest a short-term consumptive bubble is created, undermining the development of a healthy sustainable economy.

The use of suitable incentives by government to promote education and build intangible capital can also help to overcome another economic implication associated with high dependence on natural resource extraction. It has been observed in many natural resource rich countries where the extractive industries are overly dominant that there is underinvestment – both public and private – in education and the building of human capital. The reasoning behind this is that there is generally a lower demand for education in the extractive industries than in other sectors such as manufacturing and services, especially where there is little conversion of the natural resource to value added products. When investment in education does occur it tends to be in the skills suitable for extraction, which may not be transferrable if that industry declines. This lack of broader human capital development can hinder the long-term development of economies once natural resource extraction declines.

Revenues from natural resource extraction often have the welcome effect in many countries of opening access to capital markets. Many countries are constrained from these markets due to their credit risk and their lack of foreign exchange to validate lending. Natural resource rents can have the worthy impact of relaxing these constraints, but there is an associated danger in over-reliance on these capital markets and over-investment through foreign borrowing. The economy becomes vulnerable to foreign debt instability through price volatility or resource depletion. This is analogous to accessing a large mortgage based on short-term high income; if the income suddenly stops or reduces the mortgage becomes unsustainable and may lead to debt default. It is therefore important for countries to balance the risks of borrowing on natural resource rents against the benefits from capital investment, for the purpose of growing a more stable and robust economy. While there are a number of negative economic implications of an over-dependence on natural resource extraction, most of them are solvable with good policy, long-term development planning, a stable macro-economic climate and good incentives for the private sector. This highlights the importance of the use of innovative policy tools in the natural resource sector to allow it to play the positive role it can in contributing to a healthy, sustainable economy.

## **2.2 Political or Governance Implications**

Empirical observation suggests that economies dependent on natural resources experience more challenging governance issues. The often large gaps between international prices and the costs of extraction for many natural resources offer large surpluses or 'rents'. These lend themselves to "rent-seeking" behaviour by the owners or controllers of the natural resource. A "rent seeker" tries to accumulate "rent" built around the costs

of extraction balanced against market value. This compromises the ability of the owner or controller of the natural resource to perform his primary role as custodian of the resource, leading corruption, and even conflict [12-15]. This can be somewhat mitigated through more transparent institutions and processes.

In countries where natural resources are heavily concentrated in a small number of regions, increases in inter-regional conflicts have been observed – with even demands for secession in a number of cases. Balancing the revenues from natural resource extraction for both national and regional level development is a challenge facing governments in this situation. The need to improve the infrastructure and reward the region where the resources are based must be coupled with providing overall benefits to the country for both economic reasons, and for reasons of social justice.

### 3. The Extractive Industry Sector in Guyana

Guyana has experienced rapid growth in its mineral sector in recent years both in terms of production and value, especially in the gold industry, booming. Exploratory activities have increased dramatically both in the traditional areas of gold, diamonds and bauxite, and new minerals such as Uranium and Rare Earth metals. Simultaneously, and in some instances consequent to this growth, there have been changes in the regulatory and policy environment that have direct and indirect impacts on the sector. As of 2012, the value of mineral production is estimated to be \$175.8 billion, almost a 30% increase from the \$136 billion declared in 2011.<sup>14</sup>

#### 3.1 Mineral Production and Income

##### 3.1.1 Gold

Gold production in Guyana has experienced significant growth since the early 1990s (Figure 3). A significant factor in the sharp increase in production was the operation of Guyana's only large-scale mine to date at Omai. Omai created rapid growth in production from its inception in 1993 with overall production peaking in 2001. Production dropped off with Omai's closure in 2005, but has carried on rapid growth since, with year-on-year increases in production, from small and medium scale operators. Declared gold production rose 48% in the 5 years between 2007 and 2011 all from small- and medium-scale production [16].<sup>15</sup> Provisional numbers for 2012 indicate that declared production has increased still further<sup>16</sup>. Small scale mining claims reached over 15,000 in 2011, increasing by almost 5% from the previous year. Medium-scale mining permits topped 1,100 increasing by 57% from 2010.<sup>17</sup> This increase is part of a continuing trend; small-scale claims have increased by almost 50% in the last five years. Since 2005 there has been a substantial increase in the number of river operations and records indicate almost a three-fold increase between 2005 and 2011. Currently 12,039 dredges are registered.<sup>18</sup>

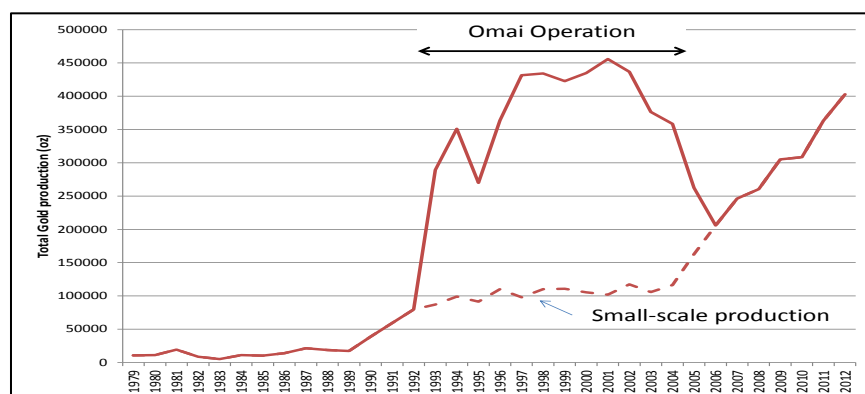


Figure 3: Gold production in Guyana 1979-2012 (Source: GGMC)

<sup>14</sup> LCDS Update—Transforming Guyana's Economy While Combating Climate Change' March 2013, OP

<sup>15</sup> This surge in gold production can be anticipated in the next few years when at least two large-scale gold mines commence operations.

<sup>16</sup> Guyana has issues of high undeclared production, therefore true production is most likely well above the declared production indicated here. Addressing this challenge is a priority of the Ministry of Natural Resources and Environment (MNRE).

<sup>17</sup> This includes gold, gold and precious stones, precious stones and river clair Alluvial production

<sup>18</sup> Guyana Geology and Mines Commission (GGMC), 2013.

This increase in declared production has been driven by a number of factors, not least the rapid increase in the international gold price, but also the availability of mining properties, improvements in technology and practice. The increase in declared production coupled with rising prices has led to a rapid increase in the importance of gold in Guyana's economy – the contribution of the Gold sector to GDP rose from 7% in 2007 to 12% in 2010 to over 15.5% in 2011. Total revenue from the gold sector (revenue net of costs) has increased dramatically – growing around 30% year on year in the last five years from a nominal value of approximately US\$170 million in 2007 to over US\$570 million in 2011 (see Figure 4).<sup>19</sup>

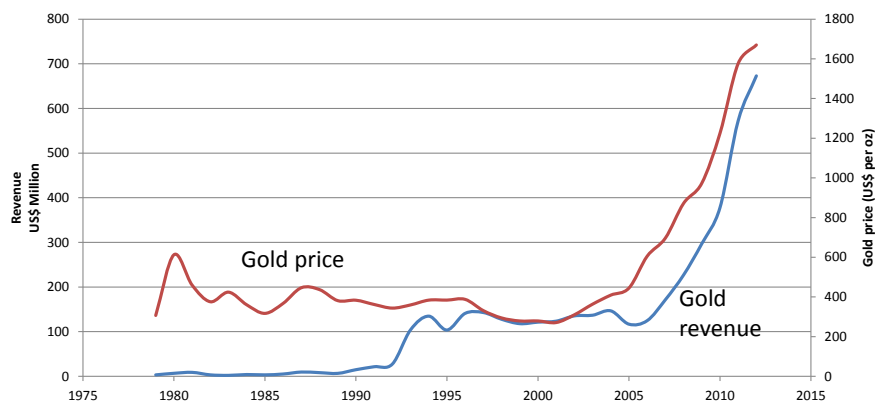


Figure 4: Gold price and Gold revenue 1978-2012 (Source: GGMC and [www.kitco.com](http://www.kitco.com))

Although there is little data available on costs of production in Guyana the range of estimates indicate that, with the increasing market prices, profitability has increased along with revenue and production.<sup>20</sup>

### 3.1.2 Other minerals

Guyana is also an important producer of other minerals, notably bauxite, diamonds, sand and stone.<sup>21</sup> Diamond production has fallen recently, in all likelihood as a result of the expansion of the gold industry, however it still constitutes a substantial export industry, generating over US\$10 million in export value in 2011 [17]. Sand and stone production and value has increased in recent years, partly as a result of a growth in construction activity. Quarry stone has increased by 32% annually over the last decade, whilst sand production has grown by a factor of two over the same period [16]. Bauxite production has fluctuated over the last 20 years, experiencing periods of growth and decline in response to both economic and technical circumstances. Production historically focused on the town of Linden, but there are also important facilities at Kwakani and Aroiama. Bauxite generally faces a different set of challenges than the small and medium scale production in the other mineral sectors. However, as the oldest large scale mining operation in Guyana, it may provide valuable lessons in terms of environmental, social and economic issues for planned development of large-scale manganese, copper and gold mining operations. Guyana is actively pursuing exploration of a number of other minerals that could help further expand the EIS, and diversify it away from gold and bauxite. Exploration is on-going for rare earth metals,

<sup>19</sup> Calculations of authors from GGMC production data and global gold prices from [www.kitco.com](http://www.kitco.com)

<sup>20</sup> Production costs of between US\$240 and US\$300 per ounce have been made by the Guyana Gold Board and almost US\$2,500 per week in 2005 by the GGMC. Sandsprings estimate costs at US\$600 per ounce for their planned mine at Toroparu<sup>20</sup> and the Guyana Goldfields Aurora project has similar cost estimates.

<sup>21</sup> For more details see Appendix 2.

manganese and uranium. Notably Reunion Manganese is exploring the possibility of re-opening an old British operation at Mathews Ridge in Region 1. As the bulk of manganese production is used in the steel industry, projected growth in global steel consumption in 2013 and 2014 will likely generate significant revenue and diversify the sector's extractive portfolio.

In addition to exploration for minerals a number of companies are exploring for potentially large offshore and onshore oil and gas reserves in Guyana. Finding commercial quantities of oil and gas have the potential to dramatically increase the dependence of the Guyanese economy on the EIS.

Although Guyana's mineral sector is diversified, recent rises in gold price have increased gold's importance compared to the other minerals. The industry has been described as 'Too big to fail' [18] and thus the remainder of this piece will examine the gold mining sub-sector. The issues discussed can be transferred, within reason, to other minerals and fossil fuels as well.

### 3.2 Economic importance

The increase in value of the mining industry has played a major role in boosting Guyana's economic growth. The total value of the industry has increased dramatically in recent years, increasing by 76% in nominal terms between 2009 and 2011, and increasing by 42% in 2011 alone (Figure 5). The vast majority of this growth (86% of the growth in 2010 and 2011) has come from the gold mining industry [19]. Despite fluctuations in production, the bauxite industry also grew in value over this time and the diamond industry declined in value between 2009 and 2011 most likely due to the growth in the gold industry.

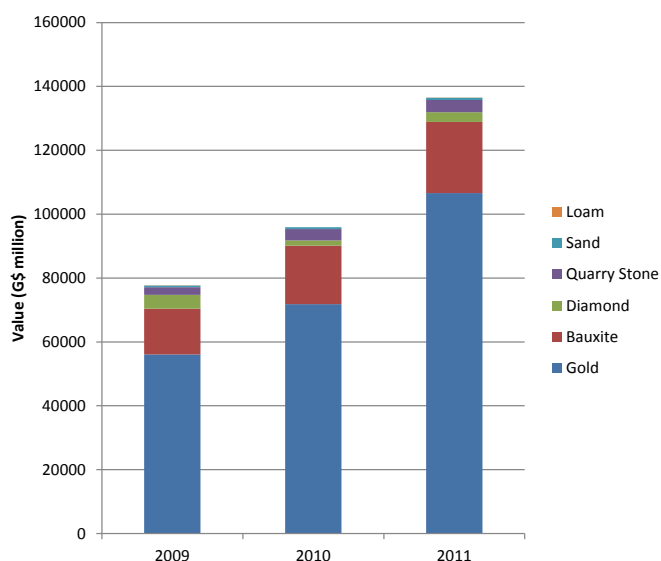


Figure 5: Value of the Mining Industry 2009-2011 (Source: GGMC (2012))

Between 2007 and 2011 gold's share in nominal GDP has increased dramatically (Figure 6). In 2011 growth in gold mining represented over one-third of all nominal growth in GDP.<sup>22</sup> Since 2006 mining has grown from its contribution to GDP being smaller than that from manufacturing to contributing nearly as much as Agriculture,

<sup>22</sup> Data from Guyana Bureau of Statistics

Forestry and Fishing. This contribution to GDP is almost certainly an underestimate of the actual contribution of the industry owing to undeclared production and the indirect effects of the growth in the Gold industry on services sectors such as transportation.

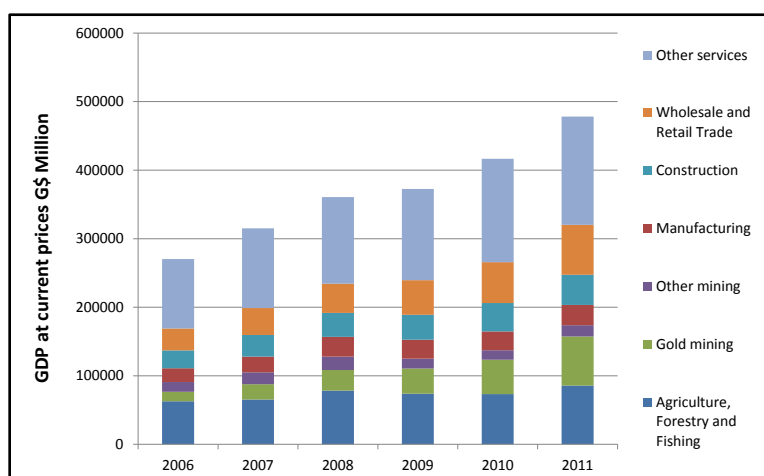


Figure 6: Contribution of sectors to nominal GDP 2006-2011 (Source: Guyana Bureau of Statistics)

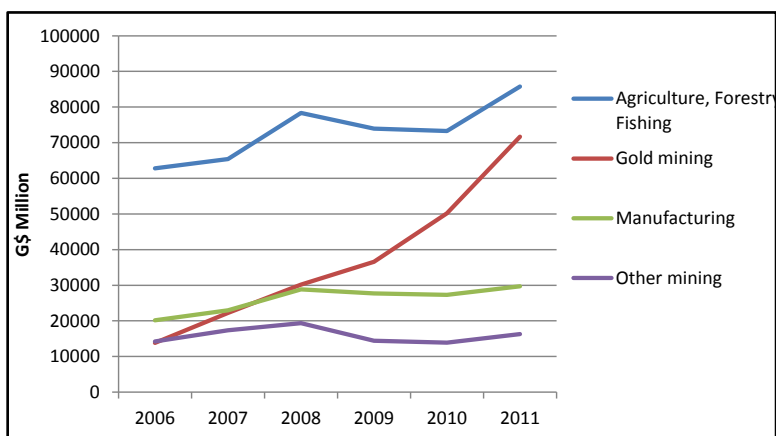


Figure 7: GDP in current prices Agriculture, Forestry and Fishing, Gold mining and Manufacturing 2006-2011 (Source: Guyana Bureau of Statistics)

Mining has also made an important economic contribution as a provider of foreign exchange, being the major export industry in Guyana. Its role in generating foreign exchange is even more prominent given the nature of the industry. As all the gold produced today is from small and medium scale producers, the majority of which are Guyanese, a larger share of this foreign exchange most likely remains within country than if it was generated by large, international operators. This is an important fact to take into account should the industry evolve in the future away from small local producers to large international operators.

Along with providing foreign exchange, mining is also a valuable contributor to employment in Guyana, both directly and indirectly. There are few studies of the total employment effect from mining, although Thomas (2009), using the 2008 GGMC estimate of direct employment of 14,130, computes a total of 90,412 individuals who are directly and indirectly dependent on the industry [18]. In 2012, it was estimated that the industry directly employs 16, 500 persons.<sup>23</sup> Mining also provides important sources of demand for various inputs, notably transportation and food, boosting demand and therefore employment in these sectors – providing jobs across both the economic and geographic landscape of Guyana.

**Box 1: Previous studies on mining in Guyana**

There are few previous studies examining the importance of mining in the Guyanese economy and its socio-economic effects. Two notable exceptions are the 2009 study by CY Thomas and the 2006 study by Sherwood Lowe.

In a wide-ranging study Thomas (2009) draws on data from GGMC and primary sources to examine the socio-economic and environmental impacts of mining in Guyana along with a discussion of the legal framework. Thomas then draws a series of recommendations for policy-makers. The study highlights both the growing importance of mining in the Guyanese economy, reflected in its title: 'Too Big to Fail' and also the need for further study and data collection on the industry in order to improve its economic and environmental performance and the need to align the sector with Guyana's LCDS. [18]

Lowe (2006) provides a thorough situational analysis of the small- and large-scale mining sector in Guyana. It outlines the social, environmental and regulatory framework in Guyana and highlights several important elements: the social importance of mining in providing livelihoods – especially through ASM—the importance of compliance, monitoring and enforcement for improving the sector, the importance of improving recovery rates, and the scope for improving technologies, remediation and reducing mercury use. The paper echoes the conclusions of Thomas (2009) in highlighting the importance of further studies in providing data on the industry and understanding the needs of the various stakeholders. [20]

Crucially, mining is an important provider of employment in remote areas, and provides employment to relatively low-skilled labour in particular. As pointed out by Lowe, small operators tend to be more labour-intensive and require less skilled operators than large operators, who depend on more trained staff. [20] Thus, small operations can provide an important source of unskilled labour, and an important source of livelihoods, although the lure of the wages can affect traditional activities in indigenous and other communities. The employment and livelihood impact of mining is important to factor in any policy affecting either the scale or scope of the industry, or its balance between large and small operators.

---

<sup>23</sup> LCDS Update—Transforming Guyana's Economy While Combating Climate Change' March 2013, OP

## 3.3 Policy context

### 3.3.1 Low Carbon Development Strategy (LCDS)

Guyana's LCDS is a national level policy that articulates the overarching vision for sustainable development of the country, built around the maintenance of its ecosystems. The strategy, launched in 2009, promotes sustainable (economic) development through a green or low-carbon model [2]. In many respects the LCDS refines the NDS, in which the long-term sustainable development plan was outlined [21]. The LCDS describes how the country will grow along a green, low-carbon, sustainable path while maintaining its forests and specifically, how this economic transformation will be fuelled by a new revenue stream obtained from the climate services provided through sustainable management of its forests [2]. For successful implementation of the LCDS, and recognising also the sustainable development underpinnings of the NDS, it is critical that the concept of "low-carbon, or green" development is mainstreamed across all sectors of the economy. This is especially crucial for the natural resource sector, in which land is the basic asset for economic activity. In particular, for example, the LCDS recognises the importance of reform in the existing forest-dependent sectors, inclusive of forestry and mining [2].

Reducing Emissions from Deforestation and forest Degradation, including conservation, sustainable management of forests and enhancement of forest carbon stocks, (REDD+) is a central component of the LCDS [2], especially when noting the country's approximately 85% forest cover (approximately 18.39 million hectares) contains an estimated 5Gt CO<sub>2</sub>e [22]. The country thus provides a critical global public good. The Government of Norway has committed, through a Memorandum of Understanding (MoU), to providing financial support up to US\$250 million by 2015 for results achieved by Guyana in limiting emissions from deforestation and forest degradation in recognition of the significant potential for contribution to the global effort to mitigate climate change. In 2009 the Governments of Guyana and the Kingdom of Norway agreed *"to cooperate on issues of climate change, biodiversity and sustainable low carbon development"* [2]; and to demonstrate to the world *"a replicable model for how REDD+ can align the development objectives of forest countries, like Guyana, with the world's need to combat climate change"* [2]. The JCN (revised 2012) operationalises the MoU and sets out how Norway provides financial support to Guyana on a performance-based system. This JCN has evolved along with the operationalisation of the agreement. A key component of the JCN is Guyana's goal of maintaining 99.5% of its forest for the period of the Guyana Norway Partnership and beyond 2015 – though the degree of forest protection will depend on a number of factors, such as international climate finance.

Guyana's progress is assessed against a number of performance indicators stipulated and agreed upon in the JCN. Specific indicators point to the integration of mining into the LCDS and REDD+ programmes. Integrated land-use planning and management for a transparent, accountable, rules-based, inclusive forest governance system is a key element of the JCN. It references short and long-term actions within the broad framework of REDD+ governance and recognises the need for the land use sectors to strengthen collaboration, especially in the mining and forestry sectors, in order to meet Guyana's international commitments (JCN 2012). The JCN specifies the following short-term actions specifically targeting the mining sector (JCN, 2012):

- Application for Extractive Industry Transparency Initiative (EITI): Candidacy presentation to the EITI board by May 2013 and application for EITI compliance at the final EITI board meeting in 2015;
- Continuation with the enforcement and implementation activities outlined by the Special Land Use Committee (SLUC)<sup>24</sup>
- Management of degradation from extractive activities through capacity-building and enhanced dialogue with the relevant sectors and stakeholders towards ensuring the application of best practices in mining;

---

<sup>24</sup> The SLUC has been reconstituted in 2010 and is tasked to resolve particular issues in the mining and forestry sector as well as to make recommendations, as appropriate, to the Government of Guyana on optimizing the mineral and forest reserve utilization [23].



- Formalisation of a public access system of planning, mapping and management to highlight planned concession and reconnaissance areas for industrial agriculture, forestry and mining, titled Amerindian lands, areas under protection identified as intact forest landscapes, and priority areas for biodiversity.

### 3.3.2 National Forest Policy

The NFP has been revised as part of Guyana's efforts to improve forest governance and to reform the sector as required for the implementation of the LCDS. The policy has been approved in 2011 with the aim to ensure the *"conservation, protection, management and utilization of the nation's forest resources while ensuring that the productive capacity of the forests for both goods and services is maintained or enhanced"* [23]. The policy also aims to address the cross sectoral challenges in managing land use and emphasizes that deforestation and degradation occur in forests where activities associated with logging, mining and agriculture co-exist. It further addresses the integration into the national land use plan, recognizing the sometimes conflicting but legitimate interests of various stakeholders, particularly the conflicts between mining and forestry. Moreover, the NFP addresses the country's national and global responsibility for the sustainable management of the forest and recognizes the critical role of forests in maintaining the ecosystems and life supporting services.

### 3.3.3 National Land Use Policy

Prepared in 2005, the draft National Land Use Policy (LUP), aims to streamline land use planning and create conditions necessary to achieve types of uses on state lands which are sustainable, socially desirable and environmentally compatible. It provides the framework for coordination among land uses, as well as, facilitates integration of land use and the preparation of a National Land Use Plan. In the interim of a finalized National Land Use Policy, a National Land Use Committee and subsequently a Special Land Use Committee have been established, recognizing the complexity of the land use issues and the need to optimize the mineral and forest reserve utilisation.

### 3.3.4 Natural Resources Legislation

Legislation is the key policy instrument governing the land use and natural resource sectors and supports the implementation of the LCDS. The importance of establishing an integrated approach to natural resource management has been recognised by the GoG, and this has been one of the focuses of the initial capacity-building efforts to develop a national Monitoring, Reporting and Verification (MRV) System.[24] An independent IDB study on applying REDD+ in Guyana suggests that there are "clear advantages in harmonizing forestry and mining laws, especially regarding the administration of concessions, as well as more integrated land use planning, an integrated hinterland road network, and rehabilitation of a publicly accessible integrated geographic information system such as GINRIS." [25] The report also suggests that existing legislation lacks provisions for dealing with the resolution of conflicts and disputes among competing concessionaires.

***The Mining Act and its supporting Regulations***<sup>25</sup> — The mining industry in Guyana is principally governed by the Mining Act No. 20 of 1989. The implementation of the Act is supported by Mining Regulations (1979) which outline provisions related to the prospecting for, and mining of, metals, minerals and precious stones, and the regulation of their transport (Mining Act, 1989). The GGMC is responsible for the development and implementation of all regulations related to mining in Guyana. The 1989 Mining Act has been amended several times since its enactment in 1991 with the most recent amendment occurring in 2005. The 2005 amendment incorporated several new points of compliance including regulations related to the environment.

---

<sup>25</sup> Of note, there have been recent rulings in the High Court concerning the authority of the State in exercising its policies and decisions through the GGMC in relation to mining leases issued on areas of overlapping Amerindian Village titles and interests. These rulings have not been described or accounted for in this report, given that they have been very recent, and their implications have not yet been reviewed by independent legal experts.

Part II, Section 6 of the Act defines the Right of the State and vests all mineral rights to the State. Part II further allows for the issuance of permits or licenses for mining operations based on the scale of operation: small-, medium- and large-scale<sup>26</sup>. Moreover, the Act provides the authority to the subject Minister to constitute any part of Guyana as a mining district (Mining Act 1989). There are currently six (6) designated mining districts in the country.

Environmental provisions applicable to the mining industry including the regulation of the use and control of poisonous substances, requirements for environmental management for small, medium and large scale mining, pollution control, and protected areas are stipulated in the Mining (Amendment) Regulations, No. 3 of 2005. Part XXVII of the regulations stipulate a number of restrictions on mining, in particular, no mining (dry) within any watershed without the permission from the Commissioner of the GGMC. Further, the regulations mandate every mine operator to prepare an environmental management plan, inclusive of a closure and reclamation plan.

The Commission in 2009 made an Order under Section 10 of the Mining Act 1989 for Prospecting and mining for minerals and metals (Reservation Order 2009). It reserves specific sections of the Rupununi River, Rewa River, Kwitaro River and upstream Essequibo River from the confluence of the Rupununi River located in the Rupununi Mining District for prospecting and mining of minerals and metals by the GGMC.

**Other Key Legislation** – There are a number of other natural resource Legislation with implications for mining. These are the Forest Acts (2009), the Amerindian Act (2006), the Protected Areas Act (2011) and the Environmental Protection Act (1996). The Forests Act governs issues within Guyana's state forest and stipulates restrictions of activities in state forests, such as, any kind of exploratory operations unless with approval provided under the Petroleum Act 1986 (exploration and production) and Mining Act 1989. Under the Amerindian Act, communities maintain exclusive rights over their titled lands and allow for a village to be governed by a Village/Community Council that is a body corporate. The Act also provides for mining to be conducted on Village lands either through a third party arrangement or through traditional mining privileges. In the former case, the miner is required to seek the necessary permissions, inclusive of permission from the Village Council. At least seven percent of the value of any minerals obtained from the Village Lands from small- or medium-scale mining must be paid to the village. In the latter case, the resident is required to obtain consent from the Village Council as well as comply with the national mining obligations. While the mineral rights belong to the state, Amerindians are required by the legislation to be consulted before mining can occur.

The Protected Areas Act outlines the requirements for establishing national protected areas inclusive of assessing the existing rights and claims, as well as, the mineral and petroleum potential of the area. It further provides for steps to be taken to settle claims or terminate such rights as permitted by law.

The Environmental Protection Act provides for the assessment and regulation of the impact of economic developmental activities on the environment and promotes the sustainable use of natural resources. Moreover, the issuance of mining permits from the GGMC for medium- and large-scale operations require as prerequisite the completion of environmental and social impact assessments of which pollution prevention and control are central elements.

---

<sup>26</sup> The subject Minister is mandated to determine what constitute these scales through regulations (Mining Act 1989).

### 3.4 The EIS in Relation to Total Wealth of Guyana

#### 3.4.1 Direct Reduction in Natural Capital

Minerals are a non-renewable natural resource; therefore the extraction of every unit represents a direct reduction in natural capital. Using the gold sub-sector to illustrate, Guyana has extracted close to 7 million ounces of this mineral since 1979. The rate of this extraction has increased tremendously in the recent years. While the first million ounces were extracted over a period of 15 years, the last million ounces – worth over US\$1.5 billion at today's prices—has been extracted over a period of only 3 years (Figure 8).<sup>27</sup> With increased investments intended in large open-pit operations and no indication of a downturn in the growth of small and medium scale activities, this rate of extraction is likely to continue to increase.

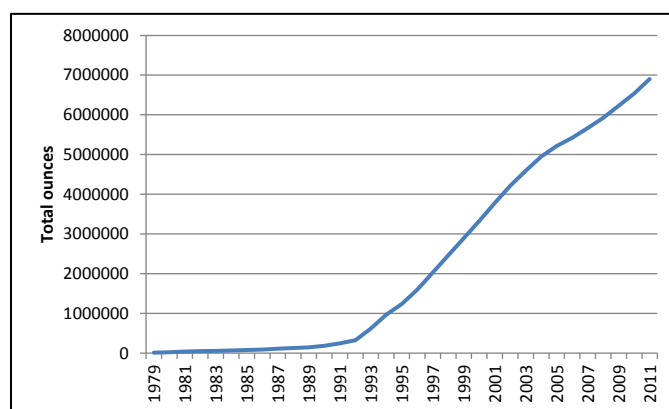


Figure 8: Cumulative gold production 1979-2011 (Source: GGMC)

A severe restraint to effective planning for the utilisation of Guyana's non-renewable natural capital is the lack of data on the size of reserves. There are no clear estimates of the level of deposits of gold and other minerals, especially alluvial, in Guyana. It is therefore difficult to determine how much of Guyana's total mineral reserves (its natural capital) has been depleted, much less to plan for a strategy for the sector to contribute to medium- to long-term economic growth. Under traditional planning approaches, in order to maximise the contribution of the EIS for a future healthy sustainable economy, the estimated total amount of reserves would be considered against the anticipated medium- to long-term commodity price of minerals and this information would be used to plan the expansion of the EIS sector over the medium- to long-term.

#### 3.4.2 Indirect Impacts on Natural Capital

Along with the direct reduction in natural capital, the EIS also results in indirect depletion of natural capital, especially renewable natural capital, such as forest loss, freshwater pollution, and general degradation of ecosystems and their functions also results from extraction.

Mining has been identified as the main driver of deforestation and the cause of a significant amount of forest degradation in Guyana. Between 2010 and 2011 94% of identified deforestation was attributed to mining,

<sup>27</sup> This estimate excludes the amount of undeclared gold, which is considered to be substantial. For example, in January 2012 Minister Robert Persaud estimated actual production in the region of 600,000 ounces per year compared to official declared gold of 360,000 ounces in 2011.

dwarfing all other drivers (see Figure 9). The importance of mining as a driver of deforestation has increased rapidly in recent years.

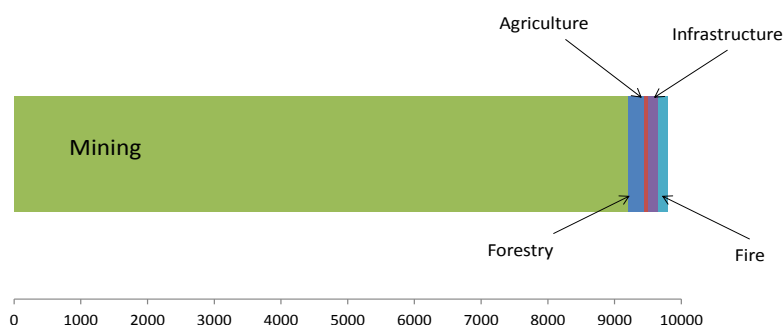


Figure 9: Drivers of deforestation 2010-2011 (Source: [3])

Annual deforestation attributable to mining and related infrastructure has increased from just over 1,000 ha per year between 1990 and 2000 to nearly 10,000 ha in 2010, before falling slightly to 7,000 ha in 2011 (see Figure 10).

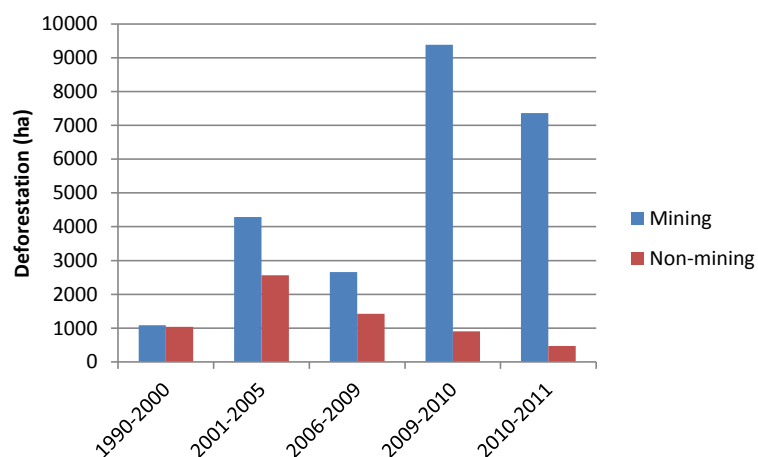


Figure 10: Annualised deforestation rates from mining 1990-2011 (Source: [3])

Indirect loss of natural capital from gold mining is avoidable to an extent, or can be partially mitigated through implementation of best-practices and adoption of new technologies and through improving efficiency and encouraging backfilling, rehabilitation and reforestation.

There have been recent efforts at reforestation of mined sites but the over whelming majority of the areas cleared for mining receive no attention at restoring ecological function.

### **3.5 Ecological Considerations**

Mining is currently acknowledged as a major threat to freshwater ecosystems particularly in developing countries where the greater portion of the sector is made up of smaller-scale operations, which tend to be less efficient in processing. Degradation of freshwater systems reduces their ability to provide many of the critical ecosystem services required to maintain biodiversity upon which human populations depend. Freshwater ecosystem services include clean drinking water, food, medicines, filtration, transportation, and flood regulation [26]. Approximately 70 percent of all anthropogenic use fresh water is for agricultural purposes and a significant portion of the world's energy generation is provided by freshwater systems [27]. The aesthetic and recreational services that freshwater ecosystems provide are mirrored in local and national economies.

Guyana's gold mining industry is dominated by small- and medium-scale mining of alluvial deposits of gold in river beds, on river banks and on land. The mining of river beds involves underwater excavation of deposits and is usually carried out from a floating vessel. The gold bearing ore is suctioned from river beds with powerful suction hoses and transported to the surface for processing. The mining of river banks or land is done primarily by the hydraulic method, which involves the use of high pressure water jets to disintegrate soil particles. The sediment-water mixture or slurry from both river and land dredging is washed in a series of sluice boxes to trap the dense gold-enriched fractions. Gold is recovered from the heavy fractions of the sediment by amalgamation with metallic mercury. Waste slurries from the recovery processes are often discharged directly into watercourses or may seep into rivers and streams. The extent and nature of the impacts will depend on the size and location of the operation, the method used for extraction, and importantly the number of dredges operating in the area that will create cumulative impacts.

#### **3.5.1 Implications of River Dredging on Maintenance of Ecosystem Services**

Prior to the upsurge in gold mining within the latter part of the last decade, it was estimated that approximately 650 km of riverine habitat was affected by small- and medium-scale gold mining [28]. Freshwater disturbance has a significant impact on the country's biodiversity and while there has been no conclusive assessment of the permanence or level of ecological impact in Guyana, the existence of this impact must be acknowledged. Guyana's freshwaters support an exceptionally rich biota with more than 800 fish species, at least 130 amphibian species, numerous macroinvertebrates, aquatic reptiles, and mammals including several endemic and threatened species. Stream bed dredging that breaks up the catchment is particularly damaging to the on-site and nearby watercourses and their associated aquatic life. Healthy freshwater ecosystems are a balance of hydrology and biological communities. Thus the loss and alteration of natural habitats caused by dredging operations may have great short to long-term impacts on the ecology of rivers and streams.

One of the major impacts of river dredging is increased sediment load in the water column from excavation of the stream bed and direct release of tailings into watercourses. High sediment load causes a significant decline in habitat quality, leading to reduced primary productivity, reduced faunal diversity, and species abundance. In extreme instances, high suspended solids and sediment deposition can cause the almost complete elimination of aquatic life from reaches of streams and rivers where they previously occurred [29]. A more detailed description of these impacts can be found in text box 2.

**Box 2: Impacts of Increased Sediment Loads in Watercourses**

*Primary producers* – the impact of suspended solids and sedimentation on primary producers in watercourses will likely be manifested across the entire aquatic community since producers form the base of the food chain. Primary producers such as phytoplankton (free living algae), periphyton (attached algae), and aquatic macrophytes serve as food sources for many aquatic organisms including fish. Primary producers also play an important role in aeration of the water column by producing oxygen during photosynthesis [29]. Sediment suspension and deposition affects primary producers mainly by:

- Reducing light penetration in the water column and hence photosynthetic activity and primary productivity within the stream or river [30].
- Damaging macrophyte leaves and stems due to abrasion [31]. Both marginal and instream macrophyte influences flow velocity and secondary flow patterns creating areas of slow and fast flowing waters and increasing habitat diversity for fish and invertebrates [32, 33]. Macrophyte stands also serve as important nursery grounds for many fish species.
- Preventing algal cells to attach to substrates, and by smothering and eliminating periphyton and aquatic macrophytes in extreme cases [34].

*Macroinvertebrates* – play an important role in the food chain as larger organisms such as fish and birds rely on them as a food source. They are sensitive to changes in the water column and the community composition of macroinvertebrates can be used to provide an estimate of water body health. Macroinvertebrates should be able to tolerate short-term increases in sediment load but continuous high levels of sediment input—generally associated with mining activities—may completely change the natural invertebrate assemblage [31]. Macroinvertebrates are affected by increased sediment suspension and deposition in four main ways by:

- Coating substrates and thus changing the suitability and reducing the number of attachment points for many species [35, 36]. Some species are adapted to living in crevices beneath and between stones and sediments can block interstitial spaces, causing oxygen-depletion and hence mortality [35].
- Increasing drift due to sediment deposition or substrate instability thus reducing populations in the dredged reach and possibly also downstream [37, 38].
- Affecting respiration due to the deposition of sediments on respiration structures [39].
- Interfering with feeding activities due to clogging of food filtering and trapping apparatus [40, 41].

*Fish* – are important food sources for humans and wildlife and are essential for the maintenance of a healthy ecosystem. High sediment loads can cause drastic decreases in species diversity [42] and in extreme cases complete collapse of local fish populations [29]. There are at least six ways in which high concentrations of fine sediment adversely affect fishes:

- The abrasive nature of suspended solids can directly kill fish by clogging or damaging their gills, and decreasing their tolerance to disease [43].
- Reducing the suitability of spawning habitat by smothering gravel spawning beds containing fish eggs that require sufficient supply of oxygen from the overlying water column and hindering the development of larvae and juveniles. These earlier developmental stages are more susceptible to suspended solids than adult fish [44, 45].
- Modifying the natural migration patterns of fish [46]
- Reducing growth rate due to reduced food supply, which is caused by a reduction in light penetration and as a result primary production and invertebrate food items [43, 47].

In 2010, annual global mercury emissions from ASM gold mining accounted for 35 percent of total anthropogenic emissions (727 tonnes) [49]. Mercury is used extensively in artisanal, small- and medium-scale gold mining operations in Guyana. Prior to the very burgeoning of gold production, it was estimated that 2.5 tonnes was being released into the environment annually from gold mining activities [50]. Mercury can be discharged directly into water bodies during different stages of gold extraction and concentration or released to the atmosphere as vapour during the burning of the gold amalgam. Mercury released to the atmosphere is subsequently returned to rivers and streams through precipitation. Mercury also occurs naturally in the environment and can be released into the water column as a result of seasonal erosion of soils and through dredging operations [51, 52].

***Box 2: Impacts of Increased Sediment Loads in Watercourses (cont'd)***

- Affecting the efficiency of hunting and mating especially for fish that require low-turbidity waters to locate food and mate [43, 48]. Most fish species will migrate under increased turbidity conditions.
- Destroying shelter and hiding places (e.g., smothering of aquatic macrophytes) or burying of physical structure (e.g. woody debris, leaf litter) under layers of sediment, thus exposing fish to predators [42]. Woody debris, leaf litter and root mats are important habitats for many small-sized Neotropical fishes [42].

*Other Wildlife* – reduced primary productivity and reduced invertebrate and fish populations can affect local mammal and bird populations which rely on these sources of food.

**Box 3: Effects of Mercury on Aquatic Organisms**

Miners use metallic (inorganic) mercury that can be converted into the highly toxic methyl-mercury by micro-organisms in rivers and streams. Methyl-mercury is absorbed from water more efficiently than inorganic mercury [53]. Low pH and high temperature, conditions that are common in water bodies in Guyana, also enhance absorption and accumulation of methyl-mercury [54]. Methyl-mercury thus enters the food chain and bioaccumulates as it moves up each trophic level with top-level predators harbouring the highest concentration. In general, the accumulation of methyl-mercury by aquatic organisms is rapid, and elimination is slow [53]. Mercury can therefore persist in contaminated areas and organisms long after the source of pollution has been discontinued [55]. Mercury adversely affects the reproduction, growth, behaviour, metabolism, osmoregulation, respiration, and ultimately kills aquatic organisms [53]. In fish, levels of 10–20 µHg/g or more in muscle tissues are found to have lethal effects while 1–5 µHg/g has sublethal effects [56, 57]. In Guyana, mercury levels of 5–20 µHg/g were found in carnivorous fish and 0.2–0.5 µHg/g were found in omnivorous and herbivorous fish flesh. Higher levels of mercury were also found in carnivorous fish from mining than in non-mining areas [51, 58]. Methyl-mercury affects reproduction in fish by reducing egg production, viability of sperm, frequency of hatching, and survival of offspring [56, 59]. Maternal muscle concentrations of > 1.35 µHg/g are associated with lower survival of the offspring [59]. In Guyana, average concentrations for carnivorous fish exceeded the level associated with lower survival of offspring (1.35 µHg/g). Reproduction problems undoubtedly would have larger effects on the population demography of these species than the death of a few individuals. Mercury pollution also affects the health and reproduction of wildlife particularly those that rely heavily on fish for food such as otters [60].

River dredging may have profound effects on stream and river morphology. Dredging degrades stream beds, changes the channel, slope, bank stability, and causes channel widening, causing stress on aquatic organisms that have adapted to the natural flow regimes and the distinct suite of habitats associated with individual rivers and streams. Channel destruction means the elimination of a relatively stable landform condition that would have been established after hundreds of years of interaction with their environment under natural conditions [61]. Rivers and streams are often stabilized by bedrock or other natural controls which are usually eliminated during the dredging process and replaced with unconsolidated material that can readily degrade into unstable conditions [61]. After such changes, channel migration and bank erosion occur as the unstable stream attempts to reach stability.

Land dredges tend to operate close to rivers and streams to gain access to a constant supply of water. The main ecological impacts associated with land dredging include deforestation and forest degradation, topsoil removal, increased sediment in water bodies, and mercury pollution.



**Box 4: Effects of River Dredging on Aquatic Organisms**

- Crushing fish and macroinvertebrates with dredging equipment or burying them under disturbed materials.
- Destruction or alteration of physical habitat needed by fish and macroinvertebrates.
- Substrate removal results in a loss of spawning sites for many species of fishes.
- Removal or disturbance of bank vegetation cover and shade makes fish more susceptible to predators.
- Possible inhibition of upstream migration by creation of deepwater low velocity areas that cause a behavioral barrier for migrating fish.
- Deposition of dredged material on the bankside effectively creates a barrier between the floodplain and the river. Dredged material deposited on river banks may also contribute to longer term sediment load in the river if it erodes back into the river when left unconsolidated.

**Box 5: Impacts of Land Mining**

1. Deforestation and forest degradation – The main causes of deforestation include: clearing of forest for mining operations (mine pits, processing facilities, tailings pond), living quarters, wood for fuel, and construction of access roads. In Guyana, an estimated 45,000 has of forest was cleared for gold mining activities between the years 1990 - 2009 [62]. Studies conducted in Suriname indicate that forest recovery rates following small-scale gold mining activities are extremely slow and qualitatively inferior compared to other anthropogenic disturbances [63]. Deforestation and forest degradation results in the loss of wildlife habitat and/or a reduction of wildlife carrying capacity and ultimately in the reduction in local wildlife numbers. Threatened and endangered species are especially vulnerable to forest disturbance or removal because in many cases they share the common characteristic of having narrow ecological niche specialization, limited reproductive potential, and/or vulnerability to predation or disease at a critical life stage. Hunting will also contribute to reduction in local wildlife populations.
2. Topsoil removal – Land mining involves the removal of a large quantity of overburden to expose the ore carrying gravel. It is estimated that a single land dredge in Guyana can move up to 130 tons of material daily [64]. Material deposited on the river banks affects the hydrological continuity which exists between the river channel and the floodplain. Wetlands in the riparian zone and floodplain provide habitats for invertebrate and birds. Some species of birds make their nests in river banks. Dredging is therefore likely to disturb or destroy suitable feeding and nesting sites. Amphibians may also lose habitat diversity and spawning areas.
3. Sediments – Increased sediment load occurs from direct and indirect discharge of tailings into rivers and streams, soil erosion from dredging activities, and deforestation. The impacts on riverine ecology will be similar to those described for river dredging.
4. Mercury pollution – Pollution of watercourses occurs in the same way as those described for river dredging.

### **3.5.2 Environmental Issues and Associated Regulatory Framework of River Mining**

The increase in river operations experienced in recent years has been accompanied by a corresponding increase in environmental problems, with the most notable being elevated turbidity levels in watercourses. The issue of elevated turbidity was significant enough to warrant action by the MNRE through the temporary suspension of

river mining permits in the early part of 2011. The environmental issues associated with river mining and the regulations associated with those issues are summarized below:

**Increased sediment load in watercourses:** Tailings discharge from river operations is one of the main causes of increased sediment loads in rivers and streams. The mining regulations stipulate that river operations are allowed to discharge tailings into rivers and streams if the critical turbidity of the river or stream does not exceed 30 NTU (Nephelometric Turbidity Unit) and the critical turbidity of the tailings does not exceed 50 NTU. Discharge of tailings into rivers and streams should be done below the water surface through a conduit. Additionally, the commissioner will make a determination regarding the method of mining and the number of dredges allowed in areas affected or likely to be affected by tailings discharge.

**Mercury pollution:** With regards to mercury use the mining regulations states that: (i) small- and medium-scale miners are allowed to use mercury to recover gold but only during the final stages of processing; (ii) mercury should not be used in open systems on ores; (iii) mercury should not be used in sluice boxes or any other recovery system that discharges waste slurries into the environment; and (iv) burning of amalgam should be done in an approved retort.

### 3.6 Social Considerations

The EIS impacts significantly, both positively and negatively, on the intangible capital of Guyana through its impacts on employment, capacity-building, institutions, families and communities, especially those located in proximity of mining operations. These impacts vary greatly with the scale of the operations. Also, oftentimes the cumulative impacts of a number of small-scale operations in a confined area are greater than those of medium- or large-scale operations.

Mining provides valuable livelihoods to a large number and diverse set of individuals, groups and communities. It provides income streams for skilled, semi-skilled and unskilled workers alike and provides income streams in communities where few other opportunities are available. The salaries available in mining in Guyana (estimates of G\$ 1 million per month for excavator operators, and G\$200,000 per month for chefs have been made by the GGDMA) are much greater than in other sectors [64]. Although mining can provide valuable income streams, it is only if those income streams are used to produce sustainable long-term wealth can it be wealth-increasing. It potentially allows greater investment in education and development of human capital within families. Developing long-term wealth generating activities from the income streams from mining can help to reduce the dependency that can arise in situations where mining reduces or ceases (see the example of Linden below). Along with boosting direct incomes, the mining industry has also played an important role in generating employment in complementary sectors such as transportation. Mining has boosted demand for transportation, especially internal aviation, and for other important services needed as inputs to the mining process, for example those renting excavators.

Different scales of mining generally provide income and livelihood for people with different levels of skills. Artisanal and small-scale mining is labour-intensive and generally provides livelihoods for low-skilled workers whilst medium- and large-scale mining generally employ more semi-skilled and skilled workers. Therefore in terms of social capital it is important to ensure adequate consideration of this attribute.

Whereas ASM is a sector often viewed negatively by governments across the world, it produces roughly 20-25% of the world's gold [65] and roughly 85% [66] of the world's gemstones and thus contributes a significant amount of mining wealth and livelihoods to national economies. However, the informal nature of ASM has been linked to poor labour conditions, weak environmental stewardship, and inability to adapt to the pressures of increasingly stringent domestic and international standards for responsible production.

The sector has enormous potential to improve livelihoods in a stable and sustainable way, just as small-scale sustainable agriculture can similarly provide healthy and environmentally sound livelihoods. Formalization of the sector is linked to improved environmental mining practices, greater rights for miners and local communities, and overall increase in productivity and income generation.

The MNRE acknowledges ASM in its Draft Strategic Framework, 2013-2018, though greater support will be required within this sub-sector in order to contribute to an industry that is responsive to miners of all scales of operation and to those affected by mining activities. ASM has the potential to develop intangible capital and contribute to Total Wealth, though it will require sustained attention in order to transition into a formalized space within the industry.

Mining, not only ASM, presents challenges to the growth of human and social capital. The returns from mining dwarfs that of other sectors and tends to reduce the incentives to develop skills and capacities in non-mining sectors. This presents challenges to the supplying of human resources for growth in these sectors. Another major issue is the social dislocation of families. Often (but not always), male members of the household leave for jobs in remote locations from both coastal and hinterland communities sometimes presenting challenges to the maintenance of stable homes.

Lack of security is an issue that also arises out of an initial erosion of social capital, and can exacerbate the trend, leading to a vicious circle. The remoteness of most mining areas, coupled with high-value assets have led to an escalation in crime and violence in Guyana's mining communities. This pattern of insecurity erodes existing social relationships, leading to potentially more insecurity.

Mining can bring specific social challenges to communities, including indigenous communities, who live in and around mining areas. Employment from mining can be transitory, for the life of a mine. The impacts of mining can affect health in communities, especially (but not exclusively) nearby communities. Increases in instance of malaria, sexually-transmitted diseases, and pollution related illnesses are often associated with mining operations.

The degradation of water quality and biodiversity which is usually associated with mining can affect access by communities to adequate fresh water and food, and present several health challenges for these communities. Water quality in mining areas and downstream can deteriorate to the extent where it is unsuitable for human use and cause the loss of valuable fisheries affecting the major source of dietary protein, especially for Amerindian communities. Health issues can also result from the use of polluted water for domestic purposes. Hunting of wild game, another vital source of protein, is also often affected by loss or degradation of wildlife habitat, noise from mining activities, and hunting by miners.

Mercury exposure can create significant long-term health effects, particularly in small-scale mining operations. Mercury can enter the bodies of miners and nearby residents either as vapour, elemental liquid, or as water

soluble methyl-mercury. The greater portion of the intake is by consumption of contaminated fish (methyl-mercury) or inhalation of vapour. Long-term exposure to mercury can cause a range of health effects including fatigue, vision and hearing problems, memory loss, personality changes, spastic tremor, and in extreme cases coma and death [68]. Foetus and children below four years of age are especially vulnerable to the toxic effects of methyl-mercury. A recent study conducted in Guyana reveal elevated (up to 70.8 µg/g<sup>28</sup>) levels of mercury in indigenous populations close to mining areas [69]. Indigenous and forest dependent populations are more at risk to methyl-mercury ingestion because of their traditional fish-based diet [69].

Mining activities usually result in the creation of numerous stagnant pools and other prime breeding areas for mosquitoes and other vectors. During recent years there has been an increase in the number of cases of malaria in communities close to mining areas [70, 71]. Recent studies indicate that HIV/AIDS is related to the growth of the mining sector and can be a persistent issue in local communities, where the combination of widespread poverty and the mobility of miners established social conditions conducive to the rapid spread of sexually transmitted diseases [70].

### 3.7 Examining Cases

Mining can make positive contributions on diverse measures of development – for instance, economy, environment and society – when managed and operated in the best manner. The LCDS and related policies should thus seek to maximise the potential benefits from mining, whilst minimising the potential negatives, enabling mining to contribute to overall increases in Total Wealth and the realization of low-carbon development. Examination of the opportunities, challenges and lessons from various mining experiences in Guyana can help to shape how this can be achieved.

#### 3.7.1 North West: The new mining frontier

**Region 1 – Barima-Waini:** The north western region of Guyana provides a regional example of the issues discussed. The area has historically relied on natural-capital dependent industries as its main growth poles, first with mining of manganese at Matthews Ridge and then through the 1.6 million ha Barama logging concession. More recently the region has encountered rapid growth in gold mining, with overall claims doubling between 2005 and 2011 primarily in the Five Star area and along the Arakaka trench between Matthews Ridge and Port Kaituma. This activity is contributing towards localised deforestation, forest degradation and other environmental impacts. The region has, and continues to be, dependent on draw-downs on natural capital to generate income.

The region has also experienced a number of agricultural initiatives and developments including the Livestock Development company (LIDCO) at Arakaka in the 1970s looking to boost cattle production, to the more recent investment by Amcar in the collection and exportation of Heart of Palm and the development of North West Organics producing cocoa, cassava bread and casareep. This latter project grew out of projects to support the implementation of the Shell Beach Protected Area<sup>29</sup>.

---

<sup>28</sup> The World Health Organization (WHO) recommends that mercury levels in human hair should not exceed 25 µg/g of mercury in adults or 10 µg/g mercury in pregnant women and breast-feeding mothers (WHO 2003).

<sup>29</sup> The Beach is a major nesting site for endangered species of sea turtles and also has served as a tourist draw for the region.

The region is being extensively explored by a number of mining firms looking to develop new operations in the area. Chief amongst these is the exploration and feasibility activities of Reunion Gold through its subsidiary Reunion Manganese in regards to recommencing manganese mining at Matthews Ridge and the surrounding area. The company has already made a substantial investment in the region, employing close to one thousand staff from both within and outside the region. In addition to Reunion Manganese, there are a number of other firms prospecting in the region for gold, uranium and other materials.

The Region is rich in natural capital but it, like Guyana generally, lacks produced and human capital. Realizing low-carbon development in the region through expansion in mining activity is an important issue to address. An influx of workers from outside the region, especially from neighbouring states, may be required to meet the demand for some categories of workers due to the lack of human resource capacity. Such an influx can have negative consequences, as migrating workers can become dislocated from their families, creating conditions for poverty in single-parent households. The lack of human resources available in the region may also hinder the development of subsidiary industries, such as agriculture, both as alternatives to, and complements for, the mining industry. Mining operations in the region struggle to source food locally with the consequence that food has to be flown or shipped in from Georgetown and other places. The lack of human resources willing to work in agriculture in the region, coupled with the difficulties regarding infrastructure to facilitate agricultural development, could lead to an over-reliance on the mining industry for employment within the regions. This could possibly present long-term challenges should prices fall or reserves be exhausted.

Mining revenues can be utilised to create sustainable long-term wealth for the region, including building human, social and built capital and maintaining and rebuilding natural capital. The region has potential growth poles including agriculture for both domestic consumption and export, and tourism including in and around the Shell Beach Protected Area. The income stream from the mining industry can be crucial in helping facilitate their development.

### **3.7.2 Linden: Learning from history**

To realize the potential for Region 1 to utilise the revenue from mining to move to a healthy, sustainable, low-carbon economy we can draw upon the experience in Region 10 – Upper Demerara-Upper Berbice. Region 10 has had high levels of dependence on natural capital and has struggled to convert this natural capital to produced, and human and social capital.

The town of Linden in the Region has historically been dependent on major bauxite mining operations located in the town. Town was formed with the first mining activity in the area over a hundred years ago. The mine has been operated by a number of different companies starting with the British owned (Demerara Bauxite Company (DEMBA); the Guyanese state through Guyana Bauxite Company Limited (GUYBAU) and most recently, the Chinese owned BOSAI. This long history of natural capital extraction led to overdependence on bauxite mining, and when the international bauxite market faced slump, the downturn in the industry has presented challenges to the town.

There have been a number of projects set up to help transition the town and the region away from the economic dependence on the mining industry with little success. The European Union (EU)-funded Linden Economic Advancement Programme (LEAP) was launched in 2002 with the aim of enabling the emergence of a

viable entrepreneurial sector to compensate for loss of jobs in the bauxite industry, however is widely considered to have fallen short of its objectives.[72] The EU also funded Linden Economic Advancement Fund (LEAF), a complementary programme to LEAP, established to provide access to micro, small and medium credit for economic activities. LEAF has also struggled to achieve widespread success. A number of factors impacted on the failure of LEAF and LEAP to achieve their objectives and help diversify the town's economy. The governance arrangement of the programmes is just one example.[72] The result is that Linden remains economically dependent on the bauxite industry and continues to suffer from unemployment and widespread environmental degradation.

The LEAP and LEAF initiatives are valuable cases to examine when considering regional development relating to mining in other areas, and across the country as a whole. The economic, environmental and social contexts should be incorporated into future efforts, building on the knowledge from LEAP and LEAF regarding governance, policy structure and implementation.

## 4. Tools for boosting the contribution of mining to a Low-carbon, healthy sustainable economy

### 4.1 Mitigation Hierarchy

The Mitigation Hierarchy (see Figure 11) provides a conceptual tool for understanding how best to reduce mining's negative impact on natural capital. It can be applied at both a micro level for individual firms, and at a macro level for setting national policy frameworks for mitigating indirect reductions to natural capital as a result of mineral extraction. The hierarchy has been adopted by many companies across the mining industry. For example, Rio Tinto utilises the hierarchy to mitigate its biodiversity impacts.

The hierarchy highlights that in the first instance, alternative sites or technologies should be utilised in order to avoid impacts. This can be conceptualised as essentially avoiding any indirect reductions in natural capital from extraction and can include not mining in particular sites. In many instances impacts are not completely avoidable in which case the next desirable objective is to minimise such impacts through careful design, construction and operation. Development by Design – a science-based mitigation planning process that balances the needs of planned development, such as mining, oil and gas, and infrastructure, with those of nature conservation – is one possible tool that can be built into the feasibility, design and construction stages. The Nature Conservancy (TNC) has harnessed 60 years of conservation planning to create a tool that can help to identify conservation plans, determine project impacts, and evaluate offset opportunities [73].

Should there still be impacts on natural capital that prove impossible to avoid or minimise, the next desirable approach is to undertake rectification. This involves undertaking efforts to rehabilitate or restore some or all ecological functions in areas affected by extraction – undertaking reforestation, backfilling of mining pits, and building in rehabilitation plans into mining activities fall into this category.

Once all the above objectives have been examined and eliminated as options, compensation should be used to offset the indirect impacts on natural capital from extraction.

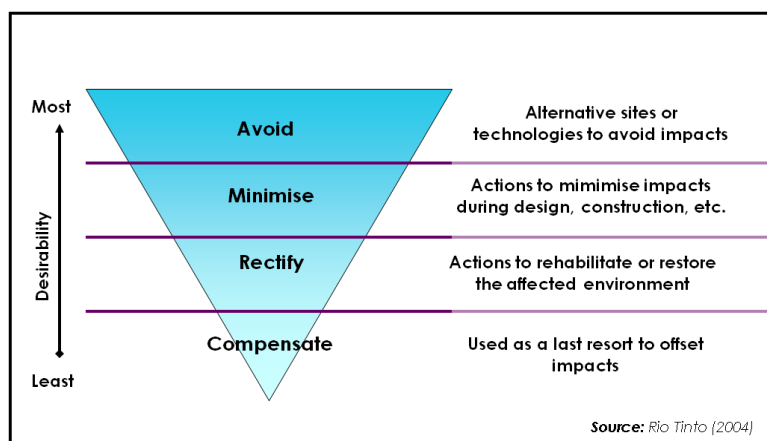


Figure 11: Mitigation Hierarchy Source: Rio Tinto (2004)

The use of offsetting to compensate for environmental disturbance relating to mining has emerged as an important tool in the industry to deal with environmental disturbance that cannot be avoided, mitigated or

rectified. It involves conserving and protecting areas away from the location of the mining activity in order to 'offset' any losses in ecosystem services at the point of mining. It has emerged as an important tool in the industry to reduce the depletion in natural capital as a result of mining activity. ICM has produced guidelines and a collection of case studies on best practice in this regard – with key examples from companies such as Rio Tinto and De Beers.

## **4.2 Growing Wealth**

### **4.2.1 Sovereign Wealth Funds**

Sovereign Wealth Funds have emerged as tools to address some of the macroeconomic and political issues that can arise from rapid influxes of revenue from extraction of natural resources. They are used by states to manage oil and mining revenues, and promote long-term development and growth in wealth by addressing issues that produce Dutch Disease and the volatility in revenues. Wealth Funds also serve to ensure investment rather than consumption of mining revenues. The first such instruments date back to the 1950s in Kuwait and Kiribati. Since then, they have emerged as key policy instruments in a number of developing, emerging and developed countries. The Norwegian Government Pension Fund—Global provides one of the best examples of such a fund; within the Caribbean, Trinidad has established and Suriname is establishing similar funds.

Wealth funds have also been created by mining companies to provide a base for their Corporate Social Responsibility (CSR) programs, helping to boost development in their areas of operation and at local, regional levels.

The rationale for establishing such funds is as much political as economic. They can help reduce the incentives for utilization of revenues for short-term gain rather than for long-term development. These funds are often context-specific based on the particular issues in the regions to which they apply. However, some common objectives (as proposed by the Sovereign Wealth Fund Institute) are usually to:

- protect and stabilise the economy from excess volatility in revenues or exports;
- diversify the economy from the export of non-renewable natural resources;
- increase intergenerational equity through savings for future generations; and
- fund social and economic development – development of intangible capital.

There is an emerging range of experience regarding sovereign wealth funds, heritage funds, green investment funds and environmental guarantee funds. A number of countries have started to experiment with targeted funds for low-carbon development or environmental protection, for instance Peru's Environmental Guarantee Fund and Indonesia's Green Investment Fund (see Appendix 6 for a summary of examples). There is great potential for Guyana to learn from the experiences of other state and private sector entities in utilizing wealth funds to effect development through prudent management of revenues from non-renewable resources for transition to a healthy and sustainable economy.

Review of the range of international examples and political economy theory has led some authors to a series of guides for the design of such funds. Three such guides, as identified by eminent natural resource economists Macartan Humphreys and Martin Sandbu, [74] are:



1. *Rules* – Rules should be established to govern the magnitude and composition of spending from funds. These help to remove incentives to use funds for short-term gain, and can help set out long-term investment incentives.
2. *Separation of Powers* – Wealth funds should follow the key constitutional doctrine of separation of powers. That is, separating the authority to determine what is spent from that to determine what to spend on.
3. *Transparency* – Transparent objectives and mechanisms can help reduce incentives for the funds to be used for short-term political objectives and provide for sound long-term investment decision-making.

**Box 6: Examples of Established Wealth Funds**

In South Africa, Anglo American operates a series of funds with the aim to create commercially viable and sustainable small- and medium-scale enterprises in its operational regions. The firm operates four funds with individual focus, including a Green Fund to target investments that play specific roles in mitigating environmental risk, reducing carbon emissions, reducing energy and water consumption, and improving waste and emissions management. The fund provides either debt or a blend of debt and equity along with access to a range of mentoring services to ensure sustainability. The Zimele model of combining financial support with mentorship has been adopted by a number of other local and global players including the International Finance Corporation (IFC) - a member of the World Bank Group, Mondi, De Beers and Barloworld.

In September 2012, AngloGold Ashanti launched the Ashanti Obuasi and Iduapreim Community Trust Funds. These funds were established in response to requirements under the 2004 Stability Agreement with the Government of Ghana. AngloGold Ashanti contributes 1 percent of annual post-tax profits from its Ghana operations into the funds with the contribution allocated to each of the community trust funds in proportion to the ounces produced at each site. The Funds will make investments based on response to proposals in the areas of social infrastructure, health, education, youth programs, art, culture and heritage in the communities.

Vale Florestar, one of Brazil's largest reforestation funds, is an interesting example of a mixed fund, using contributions from the natural resource extractive sectors to leverage further finance for the preservation and development of natural capital. Launched in 2010, the mining company Vale combined finance with the Brazilian Development Bank (BNDES), and the pension funds of the Federal Savings and Loans Bank (FUNCEF) and the oil company Petrobras (Petros). The fund has thus far raised in excess of US\$300 million with the aim to reforest a total area of 450,000 has in the Amazon by 2022. The fund will also offer strong rates of return to investors and generate employment for local communities. It demonstrates the advantage of collaboration between the mining sector and other players to achieve preservation and the strengthening of natural capital along with providing economic and social returns.

Guyana has legislative structures that mirror some of the elements of Sovereign Wealth Funds. Miners are required to pay royalties to the GGMC on any minerals extracted.<sup>30</sup> These funds are then held by the GGMC before transfer to the Consolidated Fund. However, the GGMC has the legislative power to operate a reserve fund, and can be mandated to 'transfer to that fund a sum equal to no less than such sum as may be fixed by the

---

<sup>30</sup> *Mining Act 1989 Section 68.*

Minister'.<sup>31</sup> It can also make loans, or invest in securities any funds or reserves it holds. Thus, the GGMC has the power to hold royalties, invest them, and disburse them to government. Moreover, the GGMC is legislated to transfer 20% of the total royalties collected from mining activities on Amerindian lands to a fund, designated by the Minister for the benefit of development in Amerindian villages.<sup>32</sup> The payment for the period 2006-2011, a total of G\$49 million, was transferred to the fund in March 2012. The money will be disbursed to villages based on specific requests from communities on special projects not exceeding G\$300,000.<sup>33</sup>

Although these legal provisions mirror the operation of a sovereign wealth fund there are important differences from the best practice prescribed by authors such as Humphreys and Sambhu. Firstly, governance of the funds falls solely within the realm of the government, with limited public information on the investment, management and rules for investment and/or disbursement from the funds. Secondly, it is not clear that there is separation of powers between those determining what is disbursed to those determining what it is disbursed from. However, these are important legislative steps that can be used to build towards a Sovereign Wealth Fund for Guyana that is based on identified best practices.

### **4.3 Initiatives focused on mitigation and wealth funds**

A number of initiatives have emerged promoting the adoption of policies and actions towards mitigation and the establishment of wealth funds. A few of these initiatives are briefly discussed below.

#### **4.3.1 United Nations Environmental Programme Global Response**

The United Nations Environmental Programme (UNEP) has taken the lead in charting a global path to address issues related to the supply, storage and use of mercury. Three parallel but interrelated processes have commenced: (i) the development of a Strategic Approach to International Chemicals Management (SAICM) - endorsed through UNEP's Governing Council as a policy framework to foster sound management of chemicals, (ii) the identification of UNEP's Global Mercury Partnership (GMP) as the key mechanism for the delivery of immediate actions on mercury whilst developing an international legal instrument, and (iii) the negotiation of a legally binding global mercury convention.

SAICM is a policy framework for sound management of chemicals, inclusive of mercury. Its main objective is to ensure chemicals are managed *"throughout their life cycle so that by 2020 chemicals are produced and used in ways that minimize significant adverse impacts on human health and environment."* [75]. SAICM is comprised of the Dubai Declaration on International Chemicals Management, a Policy Strategy and a Global Action Plan. These outline the political commitment, principles and tools for implementation, respectively.

The GMP is a voluntary and collaborative relationship between several stakeholders - government, non-governmental, public and private sector actors. These stakeholders work together to achieve the goal of GMP and support the objectives of SAICM. The goal of GMP is *"to protect human health and the global environment from the release of mercury and its compounds by minimizing and, where feasible, ultimately eliminating global, anthropogenic mercury releases to air, water and land"* [76]. There are seven areas for action or partnership

---

<sup>31</sup> *Guyana Geology and Mines Commission Act 1989 Section 20(1).*

<sup>32</sup> *Amerindian Act 2005 Section 51 (3).*

<sup>33</sup> <http://www.kaiaetnews.com/2012/03/20/49m-amerindian-fund-to-target-non-mining-areas/>

areas, some of which include: (i) reducing mercury in Artisanal and Small-Scale Gold Mining, (ii) Mercury Waste Management, and (iii) mercury supply and storage.

There is an international movement building toward ratification<sup>34</sup> of a legally binding global agreement on the reduction of global mercury emissions. This instrument applies to areas such as emissions from industries, trade and use of mercury and mercury-added products, waste management, and mercury use in artisanal and small-scale gold mining. It intends to restrict or otherwise ban the use of and exportation of mercury by 2020.

In light of the issues associated with mercury and the impending entry into force of the global agreement, the European Union (EU) in 2011 through its mercury export ban regulations prohibits the export of mercury [76]. The United States is expected to follow the EU and intends to institute a ban on export in 2013.<sup>35</sup>

#### **4.3.2 Private Sector Initiatives**

##### ***International Council on Mining and Metals***

The ICMM was established in 2001 with the aim of improving sustainable development performance in the mining and metals industry. It currently has 22 member companies (mining and metals) along with 34 national and regional mining, and global commodity associations. The ICMM brings together work programs such as Social and Economic Development, Material stewardship, Environmental Stewardship, and Climate Change to create a social contract for its members working together within the industry and with the broader mining community. It has published widely on topics related to mining and sustainable development. In 2003 ICMM has adopted ten sustainable development principles and these are referenced in Section 5 of this report.

##### ***IFC benchmarking for Corporate Social Responsibility***

The IFC has developed, in cooperation with the mining industry, a set of benchmarks for the large-scale mining sector distinguishing between ineffective, neutral, good and best practice for different aspects of CSR in the mining sector.

##### ***Traceability and supply chain management***

There have been a number of recent initiatives aimed at improving the transparency, traceability and management of the supply chain management relating to mining and metals. These initiatives aim to improve the transparency of the mining process to consumers, governments and those engaged in the supply chain. They address such issues as extraction in conflict areas, corruption, transparency and strengthening good practice throughout the supply chain. Three examples of such initiatives are the Organization for Economic Co-operation and Development (OECD) Due Diligence Guidance, the Extractive Industry Transparency Initiative and the Kimberley Process.

*OECD Due Diligence* - The OECD developed in a multi-stakeholder process, the Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas. A Supplement on Gold<sup>36</sup> which includes a special appendix for the artisanal and small scale gold sector has also been published. The Guidance for gold is intended to cultivate transparent mineral supply chains and sustainable corporate engagement with a view to enabling countries to maintain their artisanal, small and medium scale mining production in the formal supply chain and ensure benefits from mineral resources.

---

<sup>34</sup> Ratification by the required 50 countries may probably take about four to five years.

<sup>35</sup> The United States is Guyana's largest provider of mercury for gold mining.

<sup>36</sup> <http://www.oecd.org/fr/daf/investissementsinternationaux/principesdirecteurspourlesentreprisesmultinationales/mining.htm>

*Extractive Industries Transparency Initiative* - The EITI<sup>37</sup> aims to strengthen governance by improving transparency and accountability in the extractives sector. It is a voluntary multi-stakeholder initiative involving governments, companies, civil society groups, investors and international organizations. Essentially the EITI requires governments and companies to publish their financial transactions related to the extractive industries. Compliant status is achieved once a country is successfully assessed through a validation process. Currently 16 countries are EITI compliant including Peru. A further 21 have candidate status, including Trinidad and Tobago and Guatemala. Guyana signalled its intention to implement the EITI standard in 2010, with a re-iteration of this commitment in 2012. A multi-stakeholder group was created by the MNRE in 2013 to serve as the national committee for the EITI and the first meeting was held in January. A scoping study is to be completed in 2013.

*Kimberley Process* - The Kimberley Process Certification Scheme regulates the production and trade of rough diamond globally - currently 77 countries covering almost all of global production are involved. Members of the Scheme must take actions and meet requirements to certify that shipments of rough diamonds are conflict-free including the enactment of national legislation and institutions; implementation of export, import and internal controls; and commitment to transparency and exchange of data. Participants can only legally trade with other entities that have been certified. International shipments of rough diamonds must be certified as being Kimberley Process compliant.

The scheme has had a number of significant accomplishments, including encouraging the passing of relevant legislation in a number of countries. The removal of the Republic of Congo from the scheme in 2004 for failure to control its illicit diamond industry is a notable success. Challenges have included the self-imposed removal of Venezuela from the scheme in 2008 following a number of incidents of non-compliance, and the 2011 departure of Global Witness –a major international NGO—citing failings of the scheme.

Guyana has been a member of the scheme since 2003 and a member of the artisanal and alluvial working group, focusing on the production and trade of alluvial diamonds, since 2006.

#### **4.3.3 Other Initiatives**

##### ***BGR Certification of Trade Chains in Central Africa***

The Federal Institute for Geosciences and Natural Resources (BGR)<sup>38</sup>—the German Geological Survey—is currently implementing a bilateral and a regional project for the certification of trade chains for minerals coming from conflict areas (especially Democratic Republic of Congo). The projects target ASM operations and the targets are advised for implementation and audited for compliance with 21 standards for transparency and accountability, labor conditions and human rights, labor safety, community relations, environmental performance, and mine closure. The evaluation of the individual performance in these standards is assisted by clear level indicators.

##### ***Alliance for Responsible Mining Fair Trade Standards for Gold***

The Alliance for Responsible Mining (ARM) together with the FairTrade Foundation and FLO-Cert have established a system of positive certification of artisanal and small-scale gold mining operations that comply with environmental, social and other standards (standard zero). The Standard Zero was developed as a global

---

<sup>37</sup> <http://eiti.org/>

<sup>38</sup> Bundesanstalt für Geowissenschaften und Rohstoffe

multi-stakeholder initiative between miners, mining associations, civil society groups, and national and international experts.

Growth in so-called responsible mining has however been slow; just 1,400 miners in Colombia, Peru, and Bolivia have thus far joined the Fair-Trade and Fair-Mined movement. This is most likely because mining with less mercury is more time-intensive and costlier.

### ***Responsible Jewellery Council (RJC)***

For medium-scale mining the Responsible Jewellery Council offers the RJC Code of Practice, a responsible business practices standard, and the RJC Chain of Custody standard, which enables certification of gold along the supply chain.

### ***Swiss project initiatives in Ecuador, Peru and Bolivia***

The Swiss Agency for Development and Cooperation (SDC) has supported, since 1993, a series of promotional projects aimed at improving environmental performance in small scale gold mining in the Andean countries, Ecuador, Bolivia and Peru. Encouraging results have been seen regarding the improvement of environmental performance including significant contributions to mitigating mercury emissions. Generally the projects were hosted at Environmental Foundations (MEDMIN in Bolivia, CENDA in Ecuador) or as independent servicing structures (as in the case of GAMA in Peru), which collaborated directly with the mining operations in coordination with the local administrations and regional and national governments.

The projects have principally implemented appropriate measures through an integrated approach, which includes:

- transfer of simple techniques to reduce mercury pollution,
- training and awareness building,
- legalization of small-scale mining and organizational changes, and
- coordinated efforts of governments, NGOs, producers and service suppliers.

This has helped with overcoming not only the environmental problems but also the precarious economic and social situation of the small-scale miners and reducing the conflict between miners and other stakeholders. The learning and knowledge platform, Minero Artesanal, is an excellent example for knowledge sharing and distant learning for the mining sector.

## **4.4 Integrated Natural Resource Management**

Achieving development within Guyana's context, especially with its drive towards a low-carbon economy, will require prudent management of the capital stocks – natural (renewable and non-renewable), human and social, and built. Management of the natural capital stock in particular is required to ensure that extraction of non-renewable natural capital results in little or no loss of renewable natural capital. Integrated management of the stock of natural capital is needed to realize this.

Integrated Natural Resource Management (INRM) is a tool that can bring together the environmental, economic and social aspects of land and resource use into a systematic process for planning and management. INRM brings together scientific and local knowledge and technology to determine the best means of resource utilization, governance and management. The process essentially entails understanding and mapping natural

resources and determining how best to manage and utilize them in order to minimize losses and maximize returns.

Integrated land use planning is an essential component of INRM. In Guyana, integrated land use planning can help to determine the optimum spatial limits and governance and management measures for the uses to which our natural resources are employed. Importantly it should focus not only on the production of goods, such as food, timber, petroleum and minerals, but also on ecosystem services, such as climate mitigation, freshwater and biodiversity.

Applying INRM in the mining sector within the context of Guyana's LCDS would require understanding the spatial extent and use of both mineral deposits (non-renewable natural capital) and ecosystems (renewable natural capital). Using INRM, this knowledge would be deployed within a collaborative (and preferably participatory) process to allow holistic integrated land-use planning. This planning would entail determining spatially the best uses to which the natural capital can be put— mining, logging, tourism, protected areas, agriculture, housing, etc. —to realize the greatest returns to wealth. INRM would also help to determine what governance and management processes and measures would be necessary for land-use in each location, with the aim of minimising reduction in natural capital.

INRM has been identified as a key policy tool in Guyana's Monitoring, Reporting and Verification System Roadmap and in the revised JCN with the Government of Norway. The revised Note highlights a goal for Guyana of establishing a formal system for holistic area planning and management including having available area use maps including mining, forestry, agriculture and Amerindian titled communities. Building towards this system is a crucial component for integrating mining into the LCDS.

#### **4.4.1 Mapping Critical Natural Capital**

One means of spatially identifying the elements of renewable natural capital which are of greatest value to wealth (or, Critical Natural Capital) is to determine the elements which must be maintained for the provision of essential ecosystem goods and services. The loss of Critical Natural Capital (CNC) has greater impacts on wealth, such that the maintenance of CNC requires special management focus. In Guyana, CNC can be determined by examining our international and local commitments and requirements as it pertains to the maintenance of natural capital.

Guyana has made several commitments with regards to the maintenance of its natural capital primarily through the development path articulated in the LCDS and reflected in the agreement with Norway, and ratification of the United Nations Convention on Biological Diversity (CBD). These commitments influence the management of forests and biodiversity respectively. Additionally, portions of Guyana's population are almost exclusively reliant on natural ecosystems for their sustenance and the country possesses great potential for the further development of non-extractive economic activities such as nature-based tourism. Ensuring that these commitments and potentials are secured—securing CNC—is an essential aspect of growing the national wealth.

#### ***The Guyana-Norway Agreement***

The ground-breaking agreement with Norway and the associated JCN sets out Guyana's commitments for the maintenance of an annual deforestation rate below 0.056%, creating a limit for future deforestation. In effect, this has created an annual deforestation 'budget'—a stipulated number of hectares of deforestation that can

occur in a year. In order to ensure maximum benefit to the country, the distribution of this budget to the various uses which drive deforestation becomes of great importance. Also of great importance is the utilising of the allocated deforestation in each sector in a manner that delivers optimum returns. In the case of mining this can mean implementing measures to increase the level of production per hectare of deforestation.

The Norway-Guyana Agreement also sets out commitments to investigate, prioritize and monitor ecosystem services other than carbon storage within the REDD+ monitoring framework. In a recently completed study freshwater, biodiversity and landscape beauty were identified as the most important ecosystem services to be monitored [78]. Although the agreement does not set out specific commitments on parameters of acceptable levels of draw-down on these services, their identification—through a process which recognizes their value to Guyana—underscores the need for measures to ensure maintenance of their provision by addressing drivers which affect the quantity and quality of provision.

#### ***The United Nations Convention on Biological Diversity (CBD)***

Through ratification of the CBD, Guyana has commitments to, *inter alia*, establish at least 17% of its territory as protected areas. These areas will represent all the ecosystems found in the country as a means of protecting biodiversity, and avoid extinction of species found in the country. These commitments are outlined mainly in Article 8 of the convention. Guyana is therefore taking steps to enhance and expand its protected area system—current protected areas cover about 8% of Guyana—and ensuring representation of all ecosystems, and protect species.

#### **4.4.2 Implications of Growth in Mining (Business as Usual)**

The continued growth of mining along the current trajectory of increased activity and areal coverage, reduced efficiency, and increasing impacts can no doubt result in great challenges to meeting Guyana's commitments under the LCDS and Norway Agreement, the CBD, and jeopardize realization of potentials for non-extractive uses. Business-as-usual growth in mining will most certainly result in, *inter alia*, increased deforestation from the sector, utilizing a greater portion of the deforestation budget, and greater biodiversity and fresh water impacts as new areas are opened up for extraction.

In the case of small- and medium-scale gold mining, as discussed earlier, over the past two decades the efficiency (in terms of gold extracted per hectare of forest cleared) has decreased as production increased. If this trend continues, it would imply that further expansion in gold production would result in increased deforestation, thus threatening Guyana's ability to meet its commitments and realize future growth.

Mining as carried out currently results in direct impacts to biodiversity and competes for land with valuable biological resources, presenting challenges for the achievement of the commitments under the CBD. Current legislation allows for mining to be conducted in most of the country and competes with other land uses, such as the establishment of protected areas, sometimes resulting in major conflicts. In areas of valuable biological values, this competition results in higher costs of the establishment and management of protected areas.

#### **4.4.3 Critical Natural Capital and Mining**

Critical Natural Capital can be determined through mapping of the commitments (targets) for the maintenance of natural capital and utilizing decision support tools to determine spatially how they can be achieved at least cost. The result of this analysis would serve as a critical input for integrated land use planning.

To derive greater value from natural capital, CNC mapping can also guide policy and management considerations for resource utilization, including mining, by informing management requirements for particular areas. In the cases of mining a mapping of CNC can inform the regulation of mitigation actions, including the identification and quantification of offsets. As a hypothetical example, if a mining operation is proposed in a particular area, the regulatory agency and applicant can immediately identify the value of the particular area for the maintenance of natural capital—and hence wealth—through its CNC value. Required management actions for mitigation should be regulated based on the CNC values of the site in order to ensure securing of these values.



## 5. Recommendations

The recommendations outlined in this section address issues at the Policy and Operational (practical) levels to enable the EIS to serve its role as an essential element of Guyana's LCDS. They are geared towards enhancing the sector's contribution to growing Guyana's Total Wealth (natural capital, intangible capital and produced capital). The recommendations are intentionally set at a broad level to engender consensus among stakeholders. More specific and detailed options for consideration are then placed in Appendix 5. As the sector responds with increasing responsibility, it will be important to evaluate the broad range of related issues including from the institutional framework under which it operates, through to how it allocates resources to fulfill its responsibilities and provide improved practices, including safer worksites, in their operations.

These recommendations are guided by the following set of points, derived from on-the-ground experience in over 70 countries, and local and international studies and processes.

1. The policy approach for encouraging a low-carbon mining sector in Guyana along the lines of the objectives of the LCDS ought to focus on issues of implementation at the level of the mining operations themselves instead of on addressing the challenges only on paper. This implies the need for a certain action-learning process as the success of every potential solution will vary with, *inter alia*, the geological setting, socio-cultural context of people involved and impacted, infrastructural conditions, and the legal administrative and institutional framework.
2. Elements that become part of the final operational approach to a low-carbon mining sector in Guyana need to be selected according to an evidence-based evaluation. In many previous cases, solutions motivated exclusively by either social, political or technical interests have proven ineffective as usually the barriers are a combination of all three factors. This implies that the policy approach needed must consider all barriers and success factors for the desired changes in the mining sector.
3. The approach must be integrated in nature, requiring collaboration among national authorities in the various focal areas, such as mining, forestry, environment and Amerindian issues. Practically, this requires a thorough stakeholder mapping, including an analysis of interests, strengths and deficiencies of the different actors.
4. The approach requires an integrated vision, including the interests of the mining sector as well those of forestry, other livelihood opportunities, and traditional rights and customs of native communities.
5. Given the fact that most of the mining operations in Guyana are spread over large areas with difficult access, and taking into consideration the natural difficulties to control and fiscalize these operations, the approach has to build upon win-win solutions, which guarantee easy voluntary uptake by private sector players. These solutions must help with surmounting financial barriers, such as access to capital, and technological and regulatory barriers. An example of such a win-win solution is one to result in improvement in recovery rates that improves the economic efficiency of mining operations - boosting profits in the industry – and simultaneously aids in reducing indirect natural capital losses from production, as well as boosts the incentives to rehabilitate mine sites for future uses after mining.
6. The approaches should be based upon the polluter-pays principle, such that mining operations must be responsible for the consequences of their activities, including the loss of environmental and other values as defined with the total wealth concept.

## 5.1 Points of Convergence – Charting a Set of Fundamental Principles

There are immense opportunities for Guyana to utilize its natural resources to propel it towards the development a low-carbon, green economy. There are also some significant challenges associated with this non-traditional path of economic transformation. Land use conflicts have increasingly emerged over the past decade or so, and there is limited capacity at various levels of the society to support such low-carbon or green aspirations. Because of the history of development of the natural resource management sector from the pre-colonial period, there are inherent challenges in the legal and institutional framework for the management of Guyana's natural resources. At present, the Government is expending a great amount of resources towards improved integration in management of the natural resource sector. The creation of a Ministry of Natural Resources and the Environment and its continued work in bringing the various sector interests together need to be supported to guide optimal resource use in the country. Additionally, private actors in the mining sector have been taking steps to improve current practices in the industry, including improved business practices and worker relations, attempts and site recovery and after-use, diversification of investments, and improved capacity building for the management of operations.

The extractive industry will continue to occupy a central place in Guyana's future, especially with the prospect of offshore oil and continued high gold prices. There is no denying however that should business-as-usual persist, Guyana's prospects of a low-carbon, green economy will be severely challenged. Nevertheless, there is the opportunity for the current approach to the industry to be transformed to co-exist with other land uses such as the forestry, traditionally managed indigenous lands, and other sectors as part of Guyana's sustainable development framework under the LCDS.

### **BOX 7: ICMM Principles**

1. Implement and maintain ethical business practices and sound systems of corporate governance;
2. Integrate sustainable development considerations within the corporate decision-making process;
3. Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities;
4. Implement risk management strategies based on valid data and sound science;
5. Seek continual improvement of our health and safety performance;
6. Seek continual improvement of our environmental performance;
7. Contribute to conservation of biodiversity and integrated approaches to land use planning;
8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products;
9. Contribute to the social, economic and institutional development of the communities in which we operate; and
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

As a starting point, based on the ten Principles adopted by the ICMM in 2003 (see Box 7) and Guyana's policy framework and principles, we propose the following set of fundamental principles. We offer these as points of convergence to which consensus can easily be reached on their adoption as the guides to address the urgent needs of integrating the extractive industry sector into Guyana's sustainable development path.

As citizens and stakeholders in Guyana, we are committed to working together to build a healthy sustainable society. The commitment by Citizens and the State, are part of the underpinnings of the National Development

Strategy (2002) (NDS), and the ensuing LCDS (2011).<sup>39</sup> Based on the above points we recommend the following fundamental principles.

1. The EIS has always been and is increasingly an important factor in Guyana's sustainable economic growth. As the sector grows, both in terms of its size as well as its contribution to the national economy, it will have to ensure keen leadership, stewardship and responsibility as it successfully contributes to Guyana's sustainable development efforts.
2. The EIS, like all sectors of the national economy, must lead to a wealth increase for all of Guyana which can be defined as the sum of natural, produced, and intangible (human and social) capitals.
3. The international commitments to which Guyana is a party must circumscribe the EIS. These commitments help to demonstrate that Guyana is willing and capable to participate in the global economy as a responsible nation, are model in some instances, and supports the country's increasing leadership in the international community.<sup>40</sup>
4. The EIS and other relevant stakeholders can learn from the experiences from other regions about effective integrated management of natural resources. The EIS and other stakeholders are affected significantly by overlapping land uses that in many instances affect all land users. Mechanisms for promoting dialogue, information gathering, and planning can provide guidance on mitigation of these conflicts early leading to reduced costs of transaction and production, and increased benefits and sustainability.
5. The contribution of the EIS to the sustainable development of the country in recognition of the legitimate interest of all its citizens can only be achieved through the application of a spirit of responsible mining practice.
6. The EIS must consider how it will implement and maintain ethical, sound and equitable business practices at scales relevant to the operations leading to continual improvement in performance to meet national standards and affirm to international best practice.<sup>41</sup>

## 5.2 Driving forces and barriers for low carbon mining in Guyana

Processes of change are often, at least initially, met with resistance. This is despite the technical and economical feasibility of the changes proposed. Understanding these barriers, on one hand, and the success factors, on the

---

<sup>39</sup> The Guyana Constitution proclaims that the citizens of Guyana will "demonstrate our commitment to protect our natural environment," (Preamble to Constitution). The Constitution states that the "goal of economic development includes the objective of creating, promoting and encouraging an economic system capable of achieving and maintaining sustainable competitive advantage in the context of a global competitive environment," (Article 14). It declares that "every citizen has a duty to participate in activities designed to improve the environment and protect the health of the nation," (Article 25), and that "in the interest of the present and future generations, the State will protect and make rational use of its land, mineral and water resources, as well as its fauna and flora, and will take all appropriate measures to conserve and improve the environment," (Article 36).

<sup>40</sup> Some of these commitments refer to the principles of environmental and social responsibility. They include those under the Resolutions adopted by the United Nations Conference on the Environment and Development (1992) (the Rio Summit), and ensuing Conventions on Biological Diversity (UNCBD) (assented to in 1994), the Framework Convention on Climate Change (UNFCCC), the Convention on Desertification (UNCD); the United National Universal Declaration of Human Rights (1948); the United Nations Declaration on the Rights of Indigenous Peoples (2007); and the United Nations Decisions regarding global policies related to chemicals management and the development of a strategic approach to international chemicals (1995, 1997, 1999, 2001, 2002, 2003, 2005, 2006, 2007, 2011, 2013).

<sup>41</sup> The EIS is made up of small-, medium- and large-scale operators. For smaller operators, mining represents a livelihood; for larger operators, mining is principally geared towards the derivation of profits.

other hand, will enable greater success in effecting sectoral transformation. Knowledge of these barriers and success factors and their inclusion in the design of innovative solutions can pave the way for improved change management. Below we present an assessment of the barriers and success factors for change towards aligning the gold mining industry in Guyana with the LCDS.

	Public sector	Private sector	Civil society	Geology
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• Limited clear operational planning to “green” mining in Guyana</li> <li>• Limited Governmental capacity to assist and monitor the mining sector</li> <li>• Intrinsic conflict of interest experienced by national Government regulatory agency responsible for stewardship of nation’s mineral resources as it receives direct payments from royalties and fees from the sector</li> <li>• Conflict in mandates between national Government and local communities and representatives who depend on mining as income source</li> <li>• Institutional overlaps</li> <li>• Limited knowledge of good and best-in-class practice</li> <li>• Conflicts between natural resource management agencies’ mandates and missions through limited integrated natural resources management across sectors</li> </ul>	<ul style="list-style-type: none"> <li>• Informal character of large parts of the mining industry</li> <li>• Perception of higher costs when mining in a responsible manner; economic constraints/cost avoidance</li> <li>• Conflict in land use</li> <li>• Inefficient technology/technical constraints</li> <li>• Inefficient management</li> <li>• Lack of information about better practices</li> <li>• Lack of control and sanctions/enforcement</li> <li>• Difficulties in mobilization of equipment to mining sites</li> <li>• Severe limitations in prospecting and exploration to guide investments</li> <li>• Security of tenure</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of mandate and means to influence the sector</li> </ul>	<ul style="list-style-type: none"> <li>• Kind of deposit (primary, alluvial in active rivers, alluvial in dry sediments)</li> <li>• Parameters of the deposit (gold grain size, clay content etc.)</li> <li>• Location of the deposits in forested areas</li> <li>• Gold content per km<sup>2</sup></li> </ul>
<b>Driving forces</b>	<ul style="list-style-type: none"> <li>• LCDS</li> <li>• National policies on environment and forest conservation</li> <li>• Movement towards integrated management</li> </ul>	<ul style="list-style-type: none"> <li>• Avoidance of conflicts with Government and neighbouring communities</li> </ul>	<ul style="list-style-type: none"> <li>• Interest in maintaining the rainforest cover of Guyana</li> <li>• The rainforest is the livelihood basis for Amerindian communities</li> </ul>	<ul style="list-style-type: none"> <li>• Primary mining generally following international standards</li> </ul>

The contributors believe this report provides the basis for a common understanding amongst key stakeholders in the mining sector as similar views, as those presented here, underlined discussions with key stakeholders in the process of review of this report. The report outlines a recommended strategic approach for action, outlined below, intended as one input into a broader discussion and process towards the alignment of the EIS with the LCDS. The following key steps are recommended for inclusion in such an alignment process.

1. Building partnerships and networks, ideally in the form of a multi-stakeholder platform, to generate ownership, leadership and commitment amongst key stakeholders, including agreement on instruments and means for implementation. This platform should include high level representation from GGMC, GGDMA, the Ministries of Natural Resources and the Environment and Amerindian Affairs, indigenous groups, and local administration of the major mining districts. It would be useful to have the contributing organizations represented at such forum to generate continuity.
2. Identify and assess the work done in the framework of past projects to avoid duplication and encourage best practices and synergies. Adding value to the existing initiative would aid not only a resource efficient implementation but also contribute to ownership and commitment of the key stakeholders. The experiences of GENCAPD, the Global Mercury Project, WWF Guianas mercury-related activities, actions from the GGMC and GGDMA with respect to training of miners and the setting of standards for best practice, and good initiatives of individual miners should be the basis of future implementation.

In this context, recommendations the below should be seen as suggestions for future actions and not to preempt the recommended participatory approach.

### 5.3 Push-pull Scenarios that Frame Future Action

Based on the findings detailed, and building on international experience with mining projects, the contributors propose an integrated approach following a 'push-pull scenario' as detailed in the following table. The push-side approach contains recommendations that oblige/'push' compliance (e.g. though enhanced legislation or enforcement) to evolving standards, while the pull-side approach contains recommendations that encourage/'pull' compliance to changing standards (e.g. guidelines and manuals)

	Push-side	Pull-side
Approach	Empower Governmental stakeholders to effectively supervise and guide the sector	Empower miners to voluntarily implement safe and responsible working practice
Elements	<ul style="list-style-type: none"><li>• Review the policy framework to particularly address issues of the use of rents to fuel growth in key sectors of a low-carbon economy, decision-support tools for land use design, and enabling of systemic technical inter-agency integration.</li><li>• Commission a Sector Environmental and Social Impact Assessment (SESIA) that will address, among other elements, cumulative impacts of small- and medium-scale operations.</li><li>• Make information on legal stipulations and government policies related to the sector widely available.</li></ul>	<ul style="list-style-type: none"><li>• Develop guidelines and information on responsible mining practice.</li><li>• Train miners and entrepreneurs and strengthen training facilities (mining school).</li><li>• Influence the reorientation of tertiary education institutions to focus curriculum towards training relevant to the EIS within the context of the LCDS.</li><li>• Establish an enabling environment, including an incentive scheme, for green (LCDS compliant) mining practice.</li><li>• Support lighthouse (pilot) projects to test new ideas and initiatives.</li></ul>

*Guyana's Extractive Industry Sector (EIS)*

	Push-side	Pull-side
	<ul style="list-style-type: none"> <li>Strengthen governmental authorities to enable sustainable and integrated natural resource management.</li> <li>Incentivise prospecting and exploration as an economic activity within the sector.</li> <li>Strengthen monitoring capacities and implementation of supervision and control.</li> <li>Establish a coordination platform between national government agencies and local level administration. <ul style="list-style-type: none"> <li>Establish a monitoring and evaluation system on impacts of mining including the development of a database on mining.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Publish good and best practice examples widely.</li> <li>Establish mechanisms for the mediation of conflicts.</li> <li>Establish mechanisms for the exchange of information and experiences with good practices (e.g. forum on reforestation, rehabilitation, and after-use).</li> </ul>
<b>Binding element</b>	<p>Binding element between both sets of initiatives may be established to generate synergetic effects. This may include:</p> <ul style="list-style-type: none"> <li>A multi-stakeholder platform to exchange information and establish a common understanding and approach on the greening of the mining industry.</li> <li>Development and approval of benchmarks for responsible mining practice with respect to the LCDS.</li> <li>Academic support of the initiative.</li> </ul>	

Appendix 5 provides a non-exhaustive set of options to enable these recommendations. These options are meant to assist stakeholders to discuss specific ways in which to plan future action. Such measures would notably contribute to the increase of the total wealth of the country as outlined in the table below.

	Natural Capital	Intangible Capital	Produced Capital
<b>Recommended support for</b>	<ul style="list-style-type: none"> <li>Reduction of unnecessary clearing and openings by encouragement of prospecting and exploration.</li> <li>Rectification of the impact of mining through better organization and techniques for reclamation, rehabilitation and after use of mined out areas.</li> <li>Minimizing the impact of mining to the forest by upgrading the recovery using technologies such as concentration equipment.</li> <li>Avoiding and reduction of mercury emissions to the environment by fostering the transition to controlled amalgamation of concentrates only in closed cycle.</li> <li>Minimizing the impact to</li> </ul>	<ul style="list-style-type: none"> <li>Upgrading skills and competences of miners by: <ul style="list-style-type: none"> <li>Training in responsible mining methods</li> <li>Establishment of extension and advisory services for mining operations.</li> <li>Support of the mining school and other technical and vocational training facilities.</li> </ul> </li> <li>Reduction of detrimental health effects to miners and their families by introducing safe handling and usage of mercury and amalgam especially for artisanal miners.</li> <li>Invest public and private revenues from mining into the development of non-mining capacities.</li> </ul>	<ul style="list-style-type: none"> <li>Upgrading the assets in appropriate production technology by establishment of a hire-purchase scheme for mining equipment.</li> <li>Invest public and private revenues from mining into the development of supporting infrastructure for the functioning of non-mining intangible capital.</li> </ul>

Guyana's Extractive Industry Sector (EIS)

	Natural Capital	Intangible Capital	Produced Capital
	vulnerable riverine ecosystems by promotion of hard rock mining.		

## **6. Conclusion**

This paper presents a review and analysis of the current situation of mining in Guyana in the context of rainforest conservation and sustainable low-carbon development. It includes the examination of the issues from the perspective of increasing Total Wealth – which includes the political and global, economic, social, technical, and environmental perspectives – while at the same time considering the necessities of the different sections of the Guyanese society. Within this context, it can be concluded that the EIS should serve as key component of success of Guyana's LCDS and realization of sustainable development if the sector retools and reorients itself to fuel growth in total wealth by, firstly, minimizing losses in natural capital and, secondly, ensuring that it fuels growth in intangible capital and the produced capital to support a low-carbon economy.

This report effectively generates the beginnings of an integrated vision and a common understanding of the issue of integration of mining within the LCDS and its related challenges. Based on this analysis, and building on practical experiences from other countries, the report outlines a recommended strategic approach for action. Through the process of completing this study various meetings and workshops were held with key stakeholders. However, this contribution should be viewed as only a step towards the implementation of practical measures to build partnerships, and generate ownership, leadership and commitment within key stakeholders and agreeing upon instruments and means for implementation are the next steps, for which the present document provides important inputs.



## 7. List of Citations

1. IPCC, *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. 2007, IPCC: Geneva, Switzerland. p. 104.
2. OP, *A Low-Carbon Development Strategy: Transforming Guyana's Economy while Combating Climate Change*. 2010, Office of the President, Republic of Guyana. An update to this document was issued in 2013.
3. GFC, *Guyana REDD+ Monitoring Reporting & Verification System (MRVS) Interim Measures Report 01 October 2010 - 31 December 2011. Version 1*. 2012, Guyana Forestry Commission: Georgetown, Guyana.
4. Donovan, R.Z., K. Moore, and M. Stern, *Verification of Progress Related to Indicators for the Guyana-Norway REDD+ Agreement: 2nd Verification audit covering the period October 1, 2010 - June 30, 2012: Final Report*. 2012, Rainforest Alliance: Richmond, VT.
5. OP, *Saving the World's Forest Today: Creating Incentives to Avoid Deforestation*. 2008, Office of the President Republic of Guyana: Georgetown, Guyana.
6. The World Bank, *Where is the Wealth of Nations? Measuring Capital for the 21st Century*. 2006, The World Bank: Washington, D.C.
7. IMF, *World Economic Outlook*. 2012, ESDS International.
8. Humphreys, M., J. Sachs, and J. Stiglitz, *What is the Problem with Natural Resource Wealth?*, in *Escaping the Resource Curse*, M. Humphreys, J. Sachs, and J. Stiglitz, Editors. 2007, Columbia University Press: New York.
9. Spriggs, E. *A fly-in, fly-out workforce can test relationships*. 2012.
10. Ebrahim-zadeh, C., *Dutch disease: Too much wealth managed unwisely*. Finance & Development, 2003. 40(1): p. 50-51.
11. The Economist, *The Dutch Disease*, in *The Economist*. 1977. p. 82-83.
12. Bhattacharyya, S. and R. Hodler, *Natural resources, democracy and corruption*. European Economic Review, 2010. 54(4): p. 608-621.
13. Collier, P. and A. Hoeffler, *Greed and grievance in civil war*. Oxford Economic Papers, 2004. 56(4): p. 563-595.
14. Karl, T., *The Paradox of Plenty: Oil Booms and Petro-States*. 1997, Berkeley: University of California Press.
15. Ross, M., *What Do We Know about Natural Resources and Civil War?* Journal of Peace Research, 2004. 41(3): p. 337-356.
16. GGMC, *Mineral Industry Review*. 2012, Guyana Geology and Mines Commission: Georgetown, Guyana.
17. Guyana Bureau of Statistics, *Imports and Exports*, G.B.o. Statistics, Editor. 2012.
18. Thomas, C., *Too Big to Fail: A Scoping Study of The Small and Medium Scale Gold and Diamond Mining Industry in Guyana*. 2009, University of Guyana.
19. Guyana Bureau of Statistics, *National Account Data*, G.B.o. Statistics, Editor. 2012.
20. Lowe, S., *Situational Analysis of Small Scale Gold Mining in Guyana*. 2008, WWF Guianas.
21. Finance, M.o., *Guyana National Development Strategy 2001-2010*. 2000, Ministry of Finance Republic of Guyana: Georgetown, Guyana.
22. GFC, *Guyana Reddines Preparation Proposal (Draft)*. 2010, Guyana Forestry Commission.
23. GFC, *National Forest Policy Statement*. 2011, Guyana Forestry Commission.
24. GFC, *Terms of Reference for Developing Capacities for a national Monitoring, Reporting and Verification System to support REDD+ participation of Guyana: Background, Capacity Assessment and Roadmap*. 2009, Guyana Forestry Commission: Georgetown, Guyana.

25. Cl, et al., *Reducing Deforestation and Forest Degradation while Promoting Sustainable Development: South American Regional Infrastructure Development, Forests and REDD: Implications for Guyana* 2009.
26. WHO, *Ecosystems and human well being: health synthesis: a report of the Millennium Ecosystems Assessment*. 2005, Washington, D.C.: Island Press. 160.
27. UNEP, *Vital Water Graphics - An Overview of the State of the World's Fresh and Marine Waters*. 2008, United Nations Environment Programme: Nairobi, Kenya.
28. Colchester, M., *Guyana, fragile frontier : loggers, miners and forest peoples*. 1997, London; New York, NY: Latin America Bureau (Research and Action Ltd); Distribution in North America by Monthly Review Press.
29. Cordone, A. and D. Kelly, *The influence of inorganic sediment on the aquatic life of streams*. California Fish and Game 1961. 47: p. 189–228.
30. Van Nieuwenhuysse, E.E. and J.D. LaPerriere, *EFFECTS OF PLACER GOLD MINING ON PRIMARY PRODUCTION IN SUBARCTIC STREAMS OF ALASKA*. JAWRA Journal of the American Water Resources Association, 1986. 22(1): p. 91-99.
31. Wood, P.J. and P.D. Armitage, *Biological Effects of Fine Sediment in the Lotic Environment*. Environmental Management, 1997. 21(2): p. 203-217.
32. Armitage, P., *Faunal community change in response to flow manipulation*, in *The ecological basis for river management*, D. Harper and A. Ferguson, Editors. 1995, Wiley Chichester. p. 59–78.
33. Watson, D., *Hydraulic effects of aquatic weeds in UK rivers*. Regulated Rivers: Research and Management, 1987. 1: p. 211-227.
34. Brookes, A., *Response of aquatic vegetation to sedimentation downstream from river channelisation works in England and Wales*. Biological Conservation, 1986. 38(4): p. 351-367.
35. Richards, C. and K. Bacon, *Influence of fine sediment on macroinvertebrate colonization of surface and hyporheic stream substrates*. Great Basin Naturalist 1994. 54: p. 106–113.
36. Erman, D. and F. Ligon, *Effects of discharge fluctuation and the addition of fine sediment on stream fish and macroinvertebrates below a water-filtration facility*. Environmental Management, 1988. 12(1): p. 85-97.
37. Culp, J.M. and R.W. Davies, *Responses of Benthic Macroinvertebrate Species to Manipulation of Interstitial Detritus in Carnation Creek, British Columbia*. Canadian Journal of Fisheries and Aquatic Sciences, 1985. 42(1): p. 139-146.
38. Rosenberg, D.M. and A.P. Wiens, *Effects of sediment addition on macrobenthic invertebrates in a Northern Canadian River*. Water Research, 1978. 12(10): p. 753-763.
39. Lemly, A., *Modification of benthic insect communities in polluted streams: Combined effects of sedimentation and nutrient enrichment*. Hydrobiologia, 1982. 87: p. 229–245.
40. Graham, A.A., *Siltation of stone-surface periphyton in rivers by clay-sized particles from low concentrations in suspension*. Hydrobiologia, 1990. 199(2): p. 107-115.
41. Peckarsky, B.L., *Do predaceous stoneflies and siltation affect the structure of stream insect communities colonizing enclosures?* Canadian Journal of Zoology, 1985. 63(7): p. 1519-1530.
42. Mol, J.H. and P.E. Ouboter, *Downstream Effects of Erosion from Small-Scale Gold Mining on the Instream Habitat and Fish Community of a Small Neotropical Rainforest Stream*. *Efectos Río Abajo de la Erosión de Minería de Oro a Baja Escala Sobre el Hábitat Interior y la Comunidad de Peces en un Pequeño Arroyo en una Selva Lluviosa Neotropical*. Conservation Biology, 2004. 18(1): p. 201-214.
43. Bruton, M.N., *The effects of suspensoids on fish*. Hydrobiologia, 1985. 125(1): p. 221-241.
44. Chapman, D.W., *Critical review of variables used to define effects of fines in redds of large salmonids*. Transactions of the American Fisheries Society, 1988. 117: p. 1-21.
45. Moring, J.R., *Decrease in stream gravel permeability after clear-cut logging: An indication of intergravel conditions for developing salmonid eggs and alevin*. Hydrobiologia, 1982. 88: p. 295-298.
46. Alabaster, J.S. and R.L. Lloyd, *Water quality criteria for freshwater fish*. 1980, London: Butterworths. 297.

47. Doeg, T. and J. Koehn, *Effects of draining and desilting a small weir on downstream fish and macroinvertebrates*. Regulated Rivers: Research and Management, 1994. 9: p. 263–278.
48. Ryan, P.A., *Environmental effects of sediment on New Zealand streams: A review*. New Zealand Journal of Marine and Freshwater Research, 1991. 25(2): p. 207-221.
49. United Nations Environment Programme, *Global Mercury Assessment, 2013: Sources, Emissions, Releases and Environmental Transport*, 2013, UNEP Chemicals Branch: Geneva Switzerland.
50. Lacerda, L.D. 2003. Updating global Hg emissions from small-scale gold mining and assessing its environmental impacts. Environmental Geology, 43:308-314.
51. Couture, R., C. LaFleur, and J. Lambert, *Path of mercury in the environment of alluvial gold mining and pristine areas of Guyana*, in *GENCAPD I 2005*, Natural Resources Canada: Ottawa.
52. Roulet, M., et al., *Distribution and partition of total mercury in waters of the Tapajós River Basin, Brazilian Amazon*. Science of The Total Environment, 1998. 213(1–3): p. 203-211.
53. Eisler, R., *Mercury Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. 1987, U.S. Department of the Interior, Fish and Wildlife Service: Laurel, MD.
54. Lodenius, M., *The effects of peatland drainage on the mercury contents of fish*. SUO, 1983. 34: p. 21-24.
55. Rada, R., J. Findley, and J. Wiener, *Environmental fate of mercury discharged into the upper Wisconsin river*. Water, Air, and Soil Pollution, 1986. 29(1): p. 57-76.
56. McKim, J.M., et al., *Long-term effect of methylmercuric chloride on three generations of brook trout (Salvelinus fontinalis): toxicity, accumulation, distribution, and elimination*. . Journal of Fisheries Research Board of Canada 1976. 33: p. 2726–2739.
57. Niimi, A.J. and G.P. Kisson, *Evaluation of the critical body burden concept based on inorganic and organic mercury toxicity to rainbow trout (Oncorhynchus mykiss)*. Archives of Environmental Contamination and Toxicology, 1994. 26(2): p. 169-178.
58. Couture, R., C. LaFleur, and J. Lambert, *A comparison of mercury concentrations in mining and pristine areas of Guyana*, in *GENCAPD I 2003*, Natural Resources Canada: Ottawa.
59. Fjeld, E., T.O. Haugen, and L.A. Vøllestad, *Permanent impairment in the feeding behavior of grayling (Thymallus thymallus) exposed to methylmercury during embryogenesis*. Science of The Total Environment, 1998. 213(1–3): p. 247-254.
60. Uryu, Y., et al., *Mercury Contamination of Fish and Its Implications for Other Wildlife of the Tapajós Basin, Brazilian Amazon*. Conservation Biology, 2001. 15(2): p. 438-446.
61. Johnson, S.W., *Environmental effects of mining* in *In Mining Environmental Handbook* J.J. Marcus, Editor. 1997, Imperial College Press: London. p. 132-185.
62. GFC, *Guyana REDD+ Monitoring Reporting and Verification System (MRVS) Interim Measures Report*. 2010, Guyana Forestry Commission and Poyry Forest Industry: Georgetown, Guyana.
63. Peterson, G.D. and M. Heemskerk, *Deforestation and forest re-generation following small-scale gold mining in the Amazon: the case of Suriname*. Environmental Conservation, 2001. 28: p. 117-126.
64. Dalgety, W.T., *Placer mining and the Guyana Environment*. 2004, Guyana Geology and Mines Commission: Georgetown, Guyana.
65. Telmer, K., *Mercury and Small Scale Gold Mining – Magnitude and Challenges Worldwide*, (n.d.), Global Mercury Project.
66. Buxton, A., *Responding to the challenge of artisanal and small-scale mining. How can knowledge networks help?*, 2013, IIED: London, UK.
67. Stabroek News Staff, *Unregistered gold miners to come under radar*, in *Stabroek News*. 2012, Guyana Publications Inc.: Georgetown, Guyana.
68. Clarkson, T.W. and D.O. Marsh, *Mercury toxicity in man*, in *Clinical, biochemical, and nutritional aspects of trace elements*, A.S. Prasad, Editor. 1982, Alan R. Liss, Inc.: New York. p. 549-568
69. Beauchemin, S., et al., *Hg Concentrations in Hair from Pregnant and Nursing Women Living in Micobie, Isseneru and Masekenari: Summey for 2008 and 2009*. 2010.

70. IHRC, *All that Glitters: Gold Mining in Guyana : the Failure of Government Oversight and the Human Rights of Amerindian Communities*. 2007: International Human Rights Clinic, Human Rights Program, Harvard Law School.
71. Colchester, M. and J. La Rose, *Our Land, Our Future: Promoting indigenous participation and rights in mining, climate change and other natural resource decision-making in Guyana*. 2010.
72. Stabroek News Staff, *Linden wants to administer business development projects - says \$1B of LEAP funds spent on consultancies*, in *Stabroek News*. 2012, Guyana Publications Inc.: Georgetown, guyana.
73. TNC, *Smart Development: Development by Design*. 2013.
74. Humphreys, M. and M. Sandbu, *The Political Economy of Natural Resource Funds*, in *Escaping the Resource Curse*, M. Humphreys, J. Sachs, and J. Stiglitz, Editors. 2007, Columbia University Press: New York.
75. UNEP. *Strategic Approach to International Chemicals Management*.
76. UNEP, *Overarching framework UNEP Global Mercury Partnership*. 2009, United Nations Environmental Programme.
77. EC. *Environment - Mercury*. 2013.
78. Shreve, C., et al., *Exploration of Payment for Ecosystem Services for Incorporation into Guyana's National MRVS: Technical Report to the Guyana Forestry Commission 2012*, WinRock Int.

## 8. APPENDICES

### Appendix 1: Links to Source Additional Information

#### CSR and IFC benchmarking

[www.fvtool.com/files/Benchmark%20Matrix.pdf](http://www.fvtool.com/files/Benchmark%20Matrix.pdf)

#### CTC BGR for 3T in Central Africa

[www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Projekte/Laufend/Afrika/1046\\_2006-2202-7\\_Kongo\\_Transparenz\\_Rohstoffsektor\\_en.html?nn=1549142](http://www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Projekte/Laufend/Afrika/1046_2006-2202-7_Kongo_Transparenz_Rohstoffsektor_en.html?nn=1549142)

[www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Projekte/Laufend/Afrika/1069\\_2010-2235-9\\_Ruanda\\_ICGLR\\_en.html?nn=1549142](http://www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Projekte/Laufend/Afrika/1069_2010-2235-9_Ruanda_ICGLR_en.html?nn=1549142)

#### ARM/FairTrade standards for Gold

[www.fairgold.org/](http://www.fairgold.org/)

#### Responsible Jewellery Council (RJC)

[www.responsiblejewellery.com](http://www.responsiblejewellery.com)

#### Swiss project initiatives in Ecuador, Peru and Bolivia

PMSC, Ecuador [www.hruschka.com/pmsc/descripcion.html](http://www.hruschka.com/pmsc/descripcion.html)

GAMA, Peru [www.gama-peru.org/gama/tiki-index.php](http://www.gama-peru.org/gama/tiki-index.php); <http://geco.mineroartesanal.com/tiki-index.php>

Medmin, Bolivia [www.medmin.org/](http://www.medmin.org/)

#### ICMM

<http://www.icmm.com/our-work/sustainable-development-framework/10-principles>

## Appendix 2: Production and Income in other minerals in Guyana

### Precious Stones

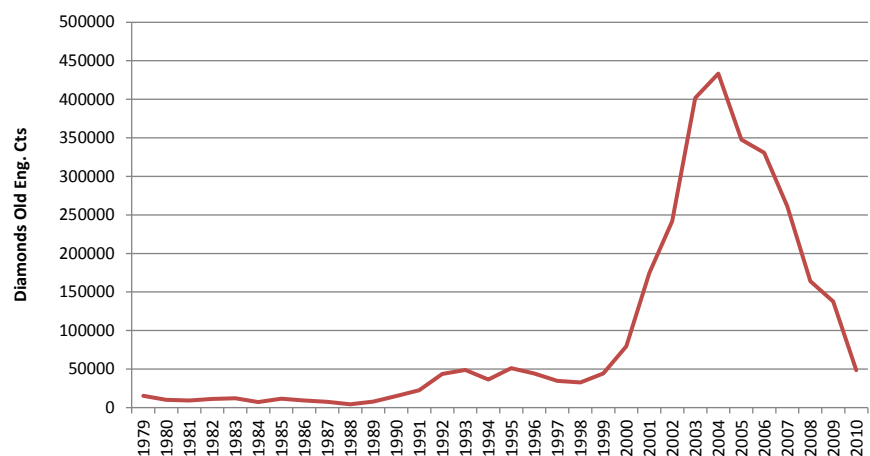


Figure i: Diamond production 1979-2011 (Source: GGMC)

Guyana’s precious stones industry focuses on the extraction of diamonds. Production rose dramatically in the early 2000s, peaking in 2004 with a production of almost 450,000 metric carats. Production declined to just over 50,000 metric carats in 2011, much of which may be attributed to the attractiveness of higher returns from gold extraction over diamonds. Price increases in 2011 influenced some recovery of the diamond industry in 2011, as the total exported value increased from US\$7 million to over US\$10 million.

### Bauxite

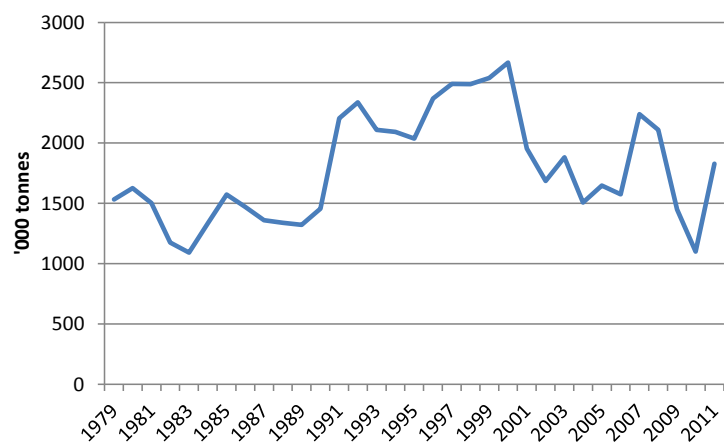


Figure ii: Bauxite production 1979-2011 (Source: GGMC)

Bauxite production has been a pillar of Guyana’s economy for a number of decades. Production has centred in Region 10 with important facilities at Linden, Kwakwani and Aroiamia. In recent years the industry has encountered a number of difficulties and production dropped to just over 1,000,000 tonnes in 2010, a decline of

over 50% from two years previous, before recovering to just over 1,700,000 tonnes in 2011. Economic value from the bauxite industry reflects these fluctuations in production, with exports and value increasing significantly in 2011 compared with 2010.

Bauxite generally faces a different set of challenges from the small- and medium-scale production in the other mineral sectors. However, as the oldest large scale mining operation in Guyana, it may provide lessons and recommendations for the planned development of large-scale facilities relating to manganese, copper and gold in terms of environmental, social and economic issues.

### Sand and Stone

Guyana is an important producer of quarry stone and sand for use in the local construction sector and for export. Quarry stone production has grown strongly in the last decade, increasing by an average of 32% annually. This increase in production is linked to increasing construction activity in the economy, at least in part a function of the growth of other mining sectors.

Sand production has also grown strongly in the last decade growing by a factor of three during that period. Most production is also for construction, however in 2010 roughly 20% of production was exported, representing approximately a value of US\$1.5 million.

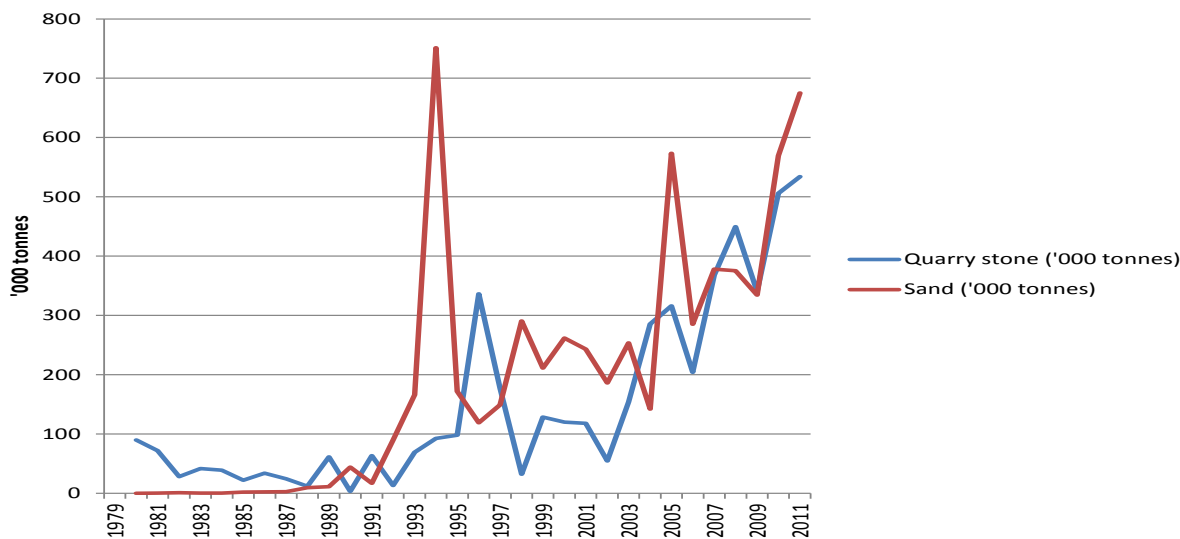


Figure iii: Quarry Stone and Sand Production 2001-2011 (Source: GGMC)

### Other minerals

Along with the traditional minerals that have been the mainstay of the Guyanese mining industry there are a number of activities relating to other minerals. Chief amongst these is the current activity by Reunion Manganese at Matthews Ridge to examine the feasibility of reopening the old manganese sites. Initial exploration activity is also beginning relating to Uranium and Rare Earth metals, and petroleum.

### Appendix 3: Project to regulate gold mining activities in Madre de Dios, Peru

The gold mining region of Madre de Dios in Peru is currently attempting to undertake a process similar to the one for alignment of the mining sector in Guyana with the LCDS. The general contexts are similar in Guyana and Madre de Dios. In Madre de Dios mining is taking place in and along rivers in Amazonian rain forest. Parts of the area are national reserves and are threatened by the mining operations. This exploitation is causing considerable environmental damage with respect to biodiversity, deforestation, and soil and water pollution. Mercury pollution is also a problem and conflicts have arisen between miners and native communities. The area is difficult to access and a large portion of the operations are illegal or informal.

This difficult regulative situation has existed for more than 20 years. Recently the Government has shifted emphasis to resolve the problem. The challenges are in formalising the mining activities, enforcing the legal framework around natural reserves and buffer zones, and contributing to reduced impact from mining practices—very emphases as those needed in Guyana.

A civil society group has developed an integrated strategy to address the situation in the southern Amazonian region. The strategy has four transversal and four strategic axes. The transversal axes are related to reducing corruption, conflict management, communication and information dissemination, and academic support. The strategic axes are territorial planning, formalisation of the ASM activities, monitoring and enforcement, and recuperation of the ambient quality and public health.

Responsibilities for the different issues are shared among the key stakeholders in the industry. The Ministry of Environment spearheads programmes for territorial planning issues, and recuperation of the ambient quality and public health; the Ministry of Energy and Mines leads the formalisation; and regional governments take care of the monitoring and enforcement actions.

This Peruvian example demonstrates the need to ensure an integrated approach with due consideration for the various economic, social and environmental sectors. It also demonstrates the need for inter-institutional cooperation and the value of including the private sector and civil society in the process, with clear division of responsibilities. Importantly, the utility of ensuring implementation of practical means and measures on the ground, and the positive effects of successful lighthouse projects are being demonstrated in this process.



## Appendix 4: Mining and freshwater, options and recommendations

Mining in general has a strong impact on its physical and social surroundings during all phases of its projects. This applies to the geological preliminary examinations, prospecting, exploration, exploitation and beneficiation/processing as well as to the time after the mines were closed. In the sector of small-scale mining – which is predominant in Guyanese mining - the extent of the impact is limited to those from the mining operation itself because small-scale mining often does without all geological preliminary examinations, prospecting and exploration.

Figure iv shows the major environmental impacts of gold mining with regards to the exploitation techniques. The impacts of processing are shown in figure v.

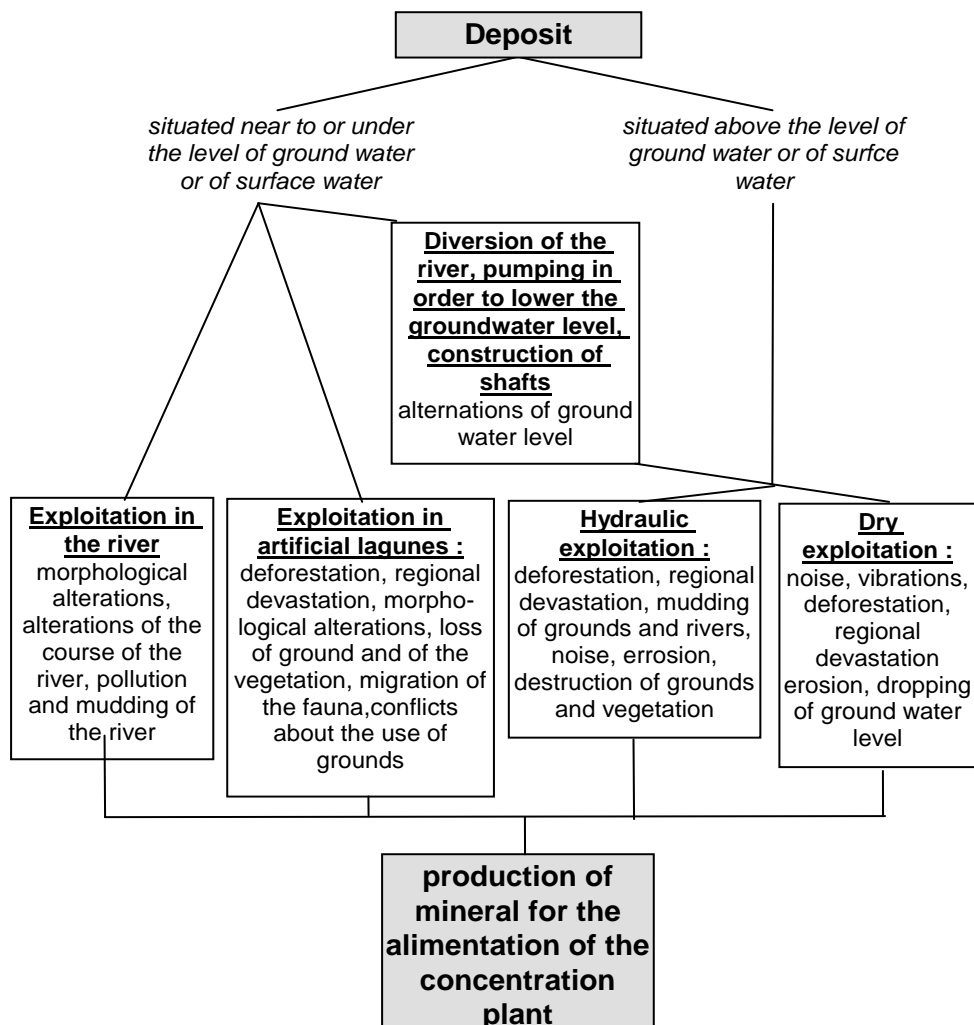


Figure iv: Possible major environmental impacts caused by the different extractive systems for alluvial gold minerals

In addition to these risks which are related directly with the exploitation, there are a number of other potentially serious indirect environmental impacts from mining, which include:

- Production of refuse and waste
- Inducement of colonisation due to the development of infrastructure
- Spreading of tropical diseases caused by water wells

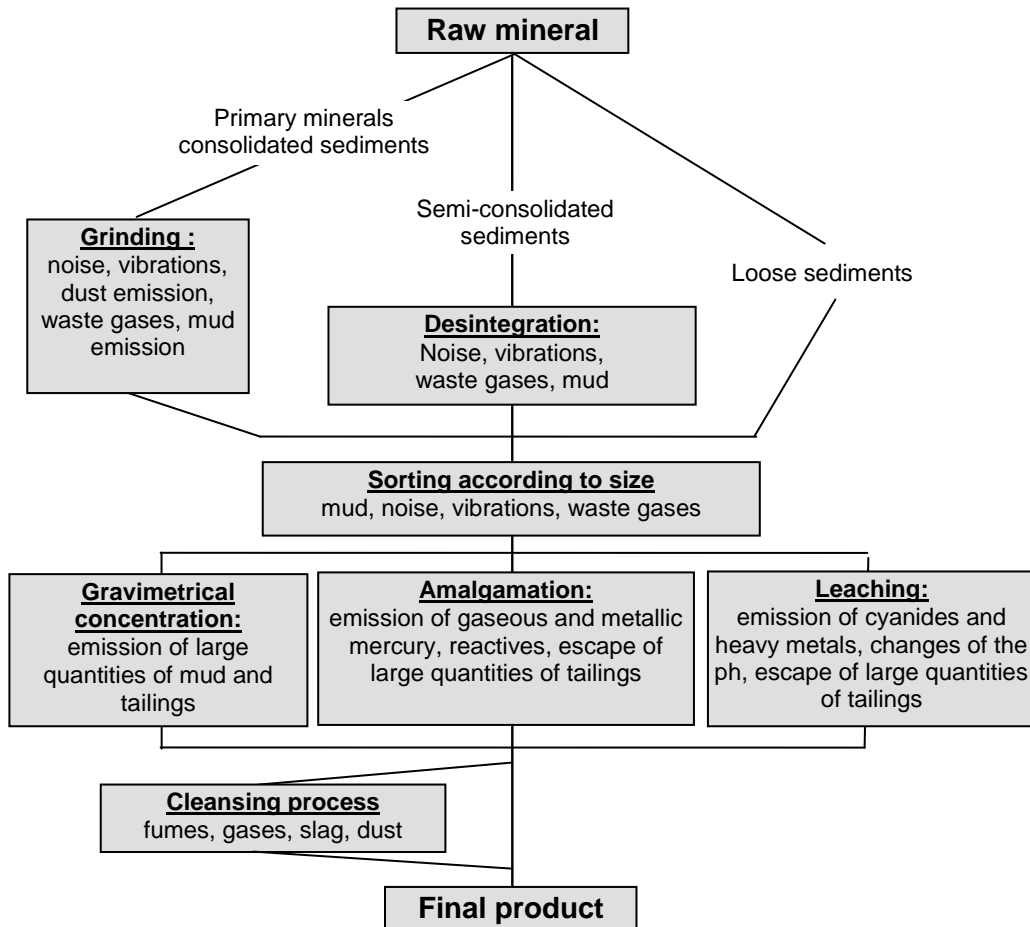


Figure v: Environmental impacts caused by the concentration of gold

## Appendix 5: Some Specific Options to Consider

### *Specific considerations on the push-side*

#### Policy or legal framework

There are two options for the generation of political support: the development of a supporting policy or the establishment of a legal regulatory framework. These are further described in the points below.

1. *Policy Approach* – Government seeks political support by moderating a multi-stakeholder platform to achieve agreement on the general operation of the system.
2. *Legal approach* – Government seeks legal support for the system by enforcing related laws and regulations.

The policy option is recommended for early action, recognizing that permanent solutions are best crafted through legislative structures.

#### Minimising natural capital losses

- Improving recovery rates within the industry allows for maximisation of production for a certain area of disturbance. This would help contribute to the minimisation of indirect losses of renewable natural capital from extraction of gold. This would assist Guyana in increasing production whilst meeting its international commitments. Improved recovery rates are also a crucial step towards encouraging rehabilitation, reforestation and after-use. With low recovery rates areas may be repeatedly mined as better techniques and technology become available making reforestation shortlived as the ecosystems are unable to recover functionality.
- Assess options, opportunities, and the associated economic and social costs of shifting Guyana's gold mining from alluvial to primary (hardrock) mining.

#### Maximising wealth

- Strengthening value chains, substituting imported production for domestic, can help mining to boost overall wealth. Investing in agriculture that can meet the regional and national demands from the mining industry can also help boost incomes and wealth.
- Intervention to improve hinterland security would benefit miners and other forest dwellers and users, and help to build stronger, more resilient hinterland mining communities. This can also help to attract labour in other areas and the develop these communities into strong societies. This would help to boost social capital in both these areas and across the countries.
- Creating incentives for miners to make suitable investments in wealth generating areas such as non-mining businesses and investments in human capital development can allow for wealth generation to occur from the private income stream of mining.
- Managing government inflows from mining and other extractive industries is an important part of the necessary steps to reducing negative economic consequences and helping to boost overall wealth creation. The establishment of local, regional or national funds, and the promotion of incentives for companies to do the same, can be an important part of this management. International experience shows that accountability, transparency, and good management are crucial to ensure success of these funds.

### ***Specific consideration on the pull-side***

#### Understanding barriers and driving factors

There are several factors that influence compliance with environmental norms.

*Economic factors:* Economic considerations can motivate or de-motivate make changes in attitude towards the environment. When the cost of action is high, it is less probable that compliance will be achieved. The probability of voluntary compliance, are those environmental measures with “win-win” options where everyone gains. On the other hand, the cost of fines and sanctions can provide a motive for compliance, when this cost is at least equal to that of compliance.

*Institutional factors:* Each country and each culture has its customs with regards to compliance with the law. Institutional credibility is the product of traditional commitment of the government and its officials. The strategies used to create credibility can vary: in some cultures, an aggressive demand can create credibility. In others, it requires an initial period for the creation of confidence in order to create a subsequent atmosphere of cooperation.

*Social-cultural and psychological factors:* Any “target group” is always composed of individuals that give one of three responses to required norms, such as changing conventional practices:

- Individuals that voluntarily comply with the requirements
- Individuals that resist compliance with requirements, and
- Individuals that only comply when they see that there are sanctions for those that do not comply.

In order to achieve compliance with environmental and other requirements, it is important that:

- A high probability exists that non-compliance will be detected,
- The reply to non-compliance is immediate and foreseeable,
- The reply to non-compliance includes a sanction, and
- The presence of the above three factors is felt.

The personal prestige of being linked to being a “responsible citizen” varies with different cultures, and also within the same culture, depending on the grade of maturity. Its value can be small in recent informal mining settlements, but can reach higher levels in regions with an old mining tradition. In communities, leaders’ attitude towards compliance with laws and norms is extremely important in fostering wider compliance.

*Technological factors:* Compliance should be technically feasible. It is necessary that those involved know exactly what they have to do and have access to the necessary technology and the knowledge required to correctly apply and operate the technology. Building upon these considerations, it is highly recommended that measures be taken to generate a better understanding of the barriers and success factors for “greening” the mining sector in Guyana in line with the objectives of the LCDS.

#### Enabling environment considerations

Promotion is an important element in many environmental programs. Possible forms of compliance promotion are:

*Education and technical assistance for the target group:* Education, awareness and sensibility form the basis for voluntary compliance and are necessary to break the ignorance barrier that is an obstacle for compliance. This is important especially in the initial phase of applying changes. In very few cases are changes voluntarily employed

by the target group solely on the basis of consciousness and education. It is necessary to provide technical assistance and follow-up over a long period in order to apply these changes and assure their sustainability.

In this respect it is recommended to consider the planned development of a mining school geared towards greening the mining industry. The development of the mining school, and the growth of industry specific training opportunities, can promote low-carbon mining in Guyana.

*Community participation:* The population most impacted by change is a powerful ally for the promotion of compliance. They can be an important steward if informed of the causes and effects of environmental and other damage over a short and long period. Women especially play an important role in this regard, particularly in those cultures where women are traditionally viewed as caregivers. Because of the important role of the community, many companies, cooperatives and mining partnerships, voluntarily try to create harmonic cohabitation with the surrounding populations. There are many examples of communities that, after being affected by the environmental and other impacts of mining, have taken active roles in not only addressing and stopping the impact, but also preventing future mining developments.

A recommendation for community participation in Guyana's context is the creation of local-level multi-stakeholder groups or committees comprising representatives of local administration, police, GGMC, environmental, forestry and water authorities, communities in the mining areas (including Amerindian communities), and mining companies and individual miners operating in the region. These local committees can be initiated by GGMC but must increasingly become independent bodies with the following objectives:

- Create awareness and sensibility on the issue of responsible mining practice amongst key stakeholders and keep them informed
- Coordinate interventions and monitoring of compliance, impacts of mining and the greening process
- Share knowledge on responsible mining in Guyana and build capacity
- Keep LCDS issues on the agenda
- Inform national level institutions on development with respect to mining and forest in Guyana

*Publication of positive examples:* For many companies and individuals, positive publication resulting from compliance with environmental and other standards is considered of great importance.

*Innovative forms of financing:* A barrier to the implementation of environmental measures is usually the cost. Various models to finance environmental investment can be created through the use of financial and tax systems.

*Economic incentives:* A range of measures, from subsidizing environmental costs and tax exemptions to taxation on contaminants (as is common in several industrialized nations) can also be employed to encourage compliance.

#### Voluntary versus compulsory measures

Management and support of the transition towards an EIS that is aligned with the principles and goals of the LCDS is crucial. Experiences from other countries<sup>42</sup> demonstrate that the process of change is usually slow and needs informed and sustained attention. Especially in countries where there is a fair level of difficulty in

---

<sup>42</sup>For instance, the transition from polluting to responsible mining practice in Colombia, Peru and Bolivia, the transition to enhanced occupational health and safety as in Mongolia, the transition to more effective mechanized alluvial diamond mining as studied in Guyana, Brazil, Ghana, Guinea, Sierra Leone and DRC, the formalisation of informal ASM in Peru following the new ASM law, the legalisation process in Mongolia, the adaption of clean and safe mining technology in Senegal are just a few examples.

fully controlling mining activities and applying pertinent legal standards, it is important to design an approach that combines both voluntary and compulsory measures. In a country like Guyana, where most mining is performed by a large number of small operators which are highly dispersed geographically, governance of the sector becomes a special challenge.

Though a large number of studies exist,<sup>43</sup> practical evidence-supported options for acceptable “green” mining technologies and practices that are economically feasible under Guyana’s conditions is still lacking. Therefore, the approach to effecting change within Guyana’s EIS has to essentially provide some proof of concept through pilot projects. Essential to this is the training of relevant stakeholders, from both private and public sectors, and the dissemination of information country-wide.

Without doubt, the greening of the mining sector has to go hand in hand with a transparent formalisation of informal producers, thereby, in the long run, including a larger portion of the national production in the official trade chain and generating government revenues to fund the greening of the industry.

With respect to mercury use in amalgamation, projects have found that the transition from traditional ineffective and polluting amalgamation practice goes from traditional amalgamation in the open cycle to controlled amalgamation in the closed cycle and eventually to completely mercury-free processing. The first step is relatively easily achievable with minimum changes in the process, while simultaneously enhancing the recovery of gold from the ore and reducing mercury losses in metallic and vaporous states by more than 95 percent. While the last step is technically feasible and reduces mercury losses to zero, there are considerable challenges to overcome such as lower gold recovery, difficulties in treatment of fine grained gold, and higher capital investment. Therefore, practical experiences underline that aiming for zero emissions creates a bias and at the same time is presents barriers for both the miners (for the transition to alternative practices) as well as for the government (for the monitoring). A more pragmatic approach with a much higher potential for compliance is to strictly replace open cycle amalgamation with controlled amalgamation in the closed cycle (see figure vi below). Similar considerations are likely to apply to other areas related to practical alignment of the EIS with the LCDS.

---

<sup>43</sup> I.e. *Placer Mining and the Guyana Environment* by W.T. Dalgety; *Manual for Training Artisanal and Small-Scale Gold Miners*/Veiga,M.M. et al./Vienna, Austria: GEF/UNDP/UNIDO, 2006, 126p.; *Environmental Management in Small-Scale Mining*, Wotruba. H, Hentschel, Th.,Livan, K., Hruschka, F., Priester, M.; *The golden vein*, ARM.

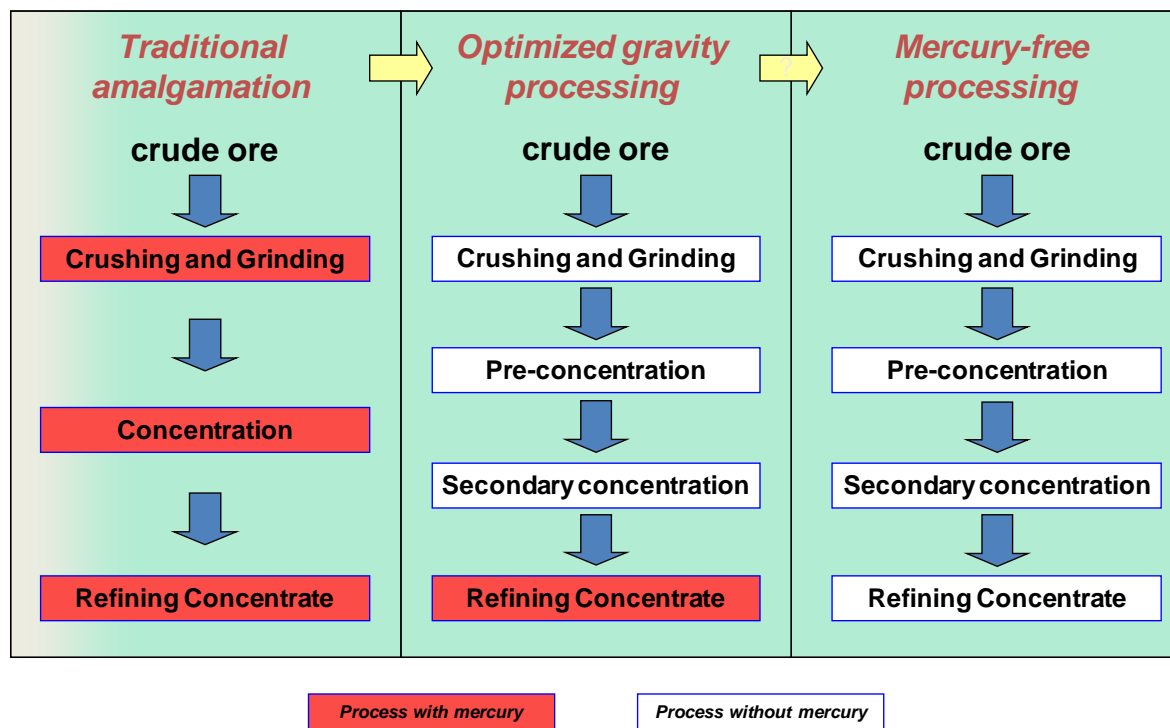


Figure vi: Process for reducing mercury emission from mining

## Appendix 6: Global examples of Sovereign Wealth and Environmental Guarantee Funds

<b>Country</b>	<b>Name</b>	<b>Type</b>	<b>Size</b>	<b>Source of Income</b>	<b>Objective</b>
Botswana	Pula Fund	Sovereign Wealth Fund	US\$6.9 billion	Diamonds	The Botswana Pula Fund was established in 1996 to manage the surplus from the country's diamond industry. Investment objectives are based on sustaining the purchasing power of the reserves and maximising returns within an acceptable level of risk.
Trinidad and Tobago	Heritage and Stabilisation Fund	Sovereign Wealth Fund	US\$2.9 billion	Oil and Gas	The Trinidad Heritage and Stabilisation Fund was established in 2007 with revenues from the petroleum industry. The fund has three key objectives: - To cushion the impact on or sustain public expenditure capacity during periods of revenue downturn whether caused by a fall in prices of crude oil or natural gas. - To generate an alternative stream of income so as to support public expenditure capacity as a result of revenue downturn caused by the depletion of non-renewable petroleum resources; - To provide a heritage for future generations, of Trinidad and Tobago, from savings and investment income derived from excess revenues.
Norway	Government Pension Fund – Global	Sovereign Wealth Fund	US\$611 billion	Oil and Gas	The purpose of the Government Pension Fund-Global is to facilitate government savings necessary to meet the rapid rise in public pension expenditures in the coming years, and to support a long-term management of petroleum revenues. The fund invests a large portion of assets in fixed income and equities. Up to 5% has been allocated to international real estate. They currently do not invest in private equity.
Indonesia	Indonesia Government Investment Unit & Green Investment Fund	Sovereign Wealth Fund	US\$0.34 billion	Non-commodity	Indonesia established a sovereign wealth fund called the Government Investment Unit in 2006. Unlike other funds it is not based on revenues from specific commodities. In 2010 Indonesia announced it would invest US\$100 million from the Government Investment Unit into a Green Investment Fund to complement planned finance of US\$900 million from foreign investors.
Papua New Guinea	Sovereign Wealth Fund	Sovereign Wealth Fund	NA	Mining and Oil and Gas	Papua New Guinea is planning the establishment of a Sovereign Wealth Fund chiefly to manage the expected windfall from Natural Gas development which is expected to double its GDP. The fund is planned to have both a Stabilisation Fund and a Development Fund.



<b>Country</b>	<b>Name</b>	<b>Type</b>	<b>Size</b>	<b>Source of Income</b>	<b>Objective</b>
Suriname	Sovereign Wealth Fund	Sovereign Wealth Fund	NA	Mining	Suriname is planning the establishment of a Sovereign Wealth Fund to manage its monetary reserves, estimated at over US\$700 million.
Peru	Environmental Guarantee Fund	Environmental Guarantee Fund	NA	Mining industry	In January 2012 the Peruvian government announced plans to establish a fund that will help to reduce the challenges associated with the growing mining industry. The government's cabinet chief Oscar Valdes stated "The environmental guarantee fund will be used in case of any damage done to the natural surroundings," and "The government's plan for responsible mining with the joint participation of the state, the community and investors will be fundamental to make mining investment viable."
Philippines	Environmental Guarantee Fund	Environmental Guarantee Fund	NA	Various industries	The Philippine Environmental Guarantee Fund mandates projects to place a negotiated amount into a fund shall be readily accessible and disbursable for the immediate clean-up or rehabilitation of areas affected by damages to the environment and the resulting deterioration of environmental quality as a direct consequence of a project's construction, operation or abandonment. It shall likewise be used to compensate parties and communities affected by the negative impacts of the project, and to fund community-based environment related projects including, but not limited to, information and education and emergency preparedness programmes.

## Appendix 7: Benchmarks for climate change related issues of small- and medium-scale mining in Guyana

### CO<sub>2</sub> Emissions

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
Burn vegetation to clear the area prior to mining activity. Use monitors and slurry pumps to remove the ore for transportation and sorting (inefficient technology due to high fuel consumption).			Having an energy efficiency policy; conduct regular energy performance monitoring and have a code of practice in place to avoid indiscriminate use of fuel.

### Environmental Impacts on Carbon Sink

#### Destruction of Forest

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
Burn the vegetation to remove trees and bushes prior to mining activity. Conduct mining activity without land and mineral exploration. Clearing large areas to deposit tailings. Open access roads to the public.		Cooperate with holders of other land use activity for systematic logging prior to mining activities (combined with commitments and cooperation for rehabilitation after the mining activity).	Commit to reducing the impact on forest. Cooperate with holders of other land use activity for systematic logging prior to mining activities (combined with commitments and cooperation for rehabilitation after the mining activity).

#### Impact on Soil

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
Monitor without removal of overburden, topsoil and vegetation.	River dredging	Separate and store top soil at the stage of overburden removal to be used at the rehabilitation and revegetation stage.	Monitor without removal of overburden, topsoil and vegetation.

## Impact on Water

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
<p>Dredge directly in the river from floating suction (with cutterhead dredges, suction dredges with divers, missile dredges) or bucket dredges with mineral concentration on the dredge while the rejects are directly discharged into the river.</p> <p>Deviation of the river (to create artificial ponds or to get access to the ancient river bed)</p>	<p>Monitor (hydraulicking or jetting) and dredge in artificial lakes.</p>	<p>Dry mine with caterpillars, loaders and trucks and concentration in a separate concentration plant with recycling of process water.</p> <p>Settle pond for the separation of fines from the water before any discharge into the river.</p>	<p>Dry mine with caterpillars, loaders and trucks and concentration in a separate concentration plant with recycling of process water.</p> <p>Drain around the mine site.</p> <p>Have a clear policy, assigned responsibilities and a code of practise in place to reduce water emissions.</p> <p>Contingency planning for floods, excessive rain etc.</p>

## Mercury

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
<p>Amalgamation in the open cycle (with mercury in the sluice boxes, mills etc.).</p> <p>Discharge of mercury polluted tailings directly in the environment (river or open tailing dumps).</p> <p>Burn the amalgam in the kitchen fire of the house.</p>		<p>Treatment of the rough material with sizing and gravimetric sorting methods to receive a high grade pre-concentrate.</p> <p>Amalgamation only of pre-concentrates in a closed cycle (barrel amalgamator, elutriation device, amalgam press, retort).</p> <p>Safe storage of rejects from the amalgamated pre-concentrate.</p> <p>Amalgamation and retorting only in specific aerated sites with limited access.</p> <p>Use of safety equipment (gloves etc.) when manipulating the mercury and amalgam.</p> <p>Recycle cleaned and reactivated mercury.</p> <p>Have staff trained on the effects and dangers of mercury and the amalgamation process.</p> <p>Have a code of practice for the storage and manipulation of mercury and for the operation of the amalgamation process.</p>	<p>Mercury-free processing with hydro gravimetric separation and direct fusion (only economically feasible for rather large grained gold deposits)</p>

### Toxic Substances and other waste

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
There is no management plan under way for dangerous substances, rubbish and waste rock. Indiscriminate use of cyanidation without treatment of effluents before discharge into the river.	Dangerous substances and waste are correctly stocked. However, there is no formal management plan. Waste rock is occasionally collected and stocked.	A plan for the management of dangerous substances has been prepared. Dangerous substances and mining waste are recycled or used in an optimal way. There are retention dykes at the site. Cyanide leaching of ore with sand, vat or agitation leaching applying the Merrill Crowe process or precipitation on zinc shavings under controlled conditions and by trained and qualified staff (only for primary ores; hard rock). Pit latrines.	Collection and retreatment of all effluents and sludges. Safety sumps for fuels, oils and other chemical substances required in the process. Active means for the treatment of effluents and the safe disposal of toxic substances. Existence of a contingency plan to fight consequences of a spill of toxic substances. Waste management system in place. Composting toilets.

### Recultivation/Rehabilitation

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
Leave mined out area without backfill, leaving water holes, heaps of coarse rejects, unfilled openings and scrap from mining machinery. Non existence of a closure and rehabilitation plan.	The enterprise has made provisions to cover part of the cost of rehabilitation after closure (Closure Plan as provided for in the Mining Law).	Backfill mined out areas with rejects and overburden from active mining fronts parallel to the advance of the exploitation process. The enterprise has made provisions to cover the cost of rehabilitation after closure (Closure Plan in accordance with the Mining Law).	Systematically backfill mined out areas with rejects and overburden from active mining fronts based on a concise planning of operations. Thereby depositing the large grain sizes from primary sizing at the bottom of the pits to refill. Systematic levelling of the ground, establishment of a cover of fine grained sediments, topped by stored topsoil and seeded with seedlings of natural species or of crops. Cooperation with Amerindian communities and other forest dependent communities for recultivation. Have a clear policy, assigned financial budgets and a code of practise in place to rehabilitate and recultivate or revegetate the destructed land.

### Impact on Biodiversity

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
Use of wild animal meat and fish from the rivers to feed the miners.		No hunting and fishing for food in the surroundings of the mine.	There is a policy in place on minimal impact of the mining operation with respect to biodiversity. The staff is sensitized, following a code of practice and signposts are reminding of careful performance.

### Other Environmental Impacts

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
The enterprise is not concerned about a study into the impact on the environment.	The enterprise declares that it looks after the protection of the environment. However, it is not planning to undertake a study into the impact on the environment in the near future and has no documents with regard to environmental management.	The enterprise has undertaken a study into the impact on the environment. However, a system for the management and protection of the environment has neither been developed nor implemented. Exemplary environmental efforts are recognized and/or rewarded. Corrective actions are tracked and verified to ensure successful completion. Performance evaluation includes some environmental measures.	Have an environmental impact and risk assessment that is used as a management tool for operational planning. An evaluation of the environmental risks connected to the different work places is done regularly by the department in charge of environment, to amend an environmental policy and a training plan. There is full and open cooperation with external oversight organizations. Local stakeholders' suggestions are actively solicited, and any concerns raised are addressed and responses documented.

## Social Impacts

Ineffective Practice	Neutral Practice	Good Practice	Best Practice
<p>The ground in the mining zone has been occupied without taking into account basic preoccupations and the consequences that might result. The enterprise disregards the pleas and reclamations from the local communities.</p> <p>Interaction with communities is reduced to cases of conflict.</p> <p>The mining operation defends its installations with armed forces.</p>	<p>The use of the ground, trees, rivers and dwellings in the area began without consultations between those responsible for the site and the local and national authorities, and there are still dispute and conflict with regard to mining rights, land rights and rights of use.</p>	<p>Consultations with the representatives and local authorities are organised irregularly to resolve conflicts, differences and other preoccupations of local communities.</p>	<p>There is a process of permanent consultations with the representatives and the local authorities of riverine population and Amerindian communities to resolve conflicts, differences and other preoccupations of local communities (The representatives are chosen by the communities to defend their interests).</p> <p>Support of local enterprises for the provision of goods and services</p> <p>Integral plan for the engagement with local communities.</p> <p>Social consultations with the interested parties before using the ground.</p>

The table distinguishes between two forms of use of mercury (Hg) in the amalgamation process:

### 1) “Open circuit” amalgamation

All the feed material (gold bearing) is put into contact with mercury by a continuous pulp flow. It is not possible to recover all the mercury in the form of amalgam, a part in the form of free metallic mercury (droplets or very fine particles) or in the form of amalgam (fine particles or floccules) escapes with the tailings, contaminating a great quantity of material.

### 2) Amalgamation of concentrates (or “closed circuit” amalgamation)

This means that only a small part of the material treated (a “concentrate”) generally produced by gravity methods, is exposed to mercury in a partially or totally enclosed environment and where amalgamation is effected without any pulp emissions (e.g. amalgamating drums)