

1. Introduction

Mining in Guyana has grown exponentially in the last 25 years, becoming *the* dominant export industry and engine for growth, following similar resource-extractive development pathways in a number of developing countries. Guyana's pathway to economic domination by mineral extraction has taken a distinctly different path from other mineral-intensive countries, however, in that the majority of extraction has been from indigenous small and medium-scale operators. A single Canadian-owned gold mine was the only representative of the large-scale mining sector for much of the time period. Understanding the causes, and the impacts of this unique resource-extraction development pathway is of vital importance, both to Guyana, and also to other developing countries looking to promote, formalise and regulate their own growing small-scale mining sectors.

Small scale mining, also described as Artisanal and Small-Scale Mining (ASM) in the literature, has grown into a crucial provider of livelihoods and metals across the developing world, from South America, to Africa and Asia. Understanding the growth of this industry and its impacts, and how formalising this often informal sector may impact the industry, economy and society is vital for understanding how to formulate policy and regulate the sector. A small but evolving literature has emerged looking at this context (Hilson & Maconachie, 2017, Hilson et al, 2017), including some focusing on Guyana (Hilson & Laing, 2017a; Bulkan & Palmer, 2016; Hook 2019a; Hook 2019b).

Guyana's unique mining industry has evolved as a result of a wide variety of factors including the shifting international gold price, and crucially government policy that legalised, regulated and encouraged small and medium scale activity. Chief to this policy position was the establishment of a legislative framework, the Mining Act of 1989, which creates a structure for Guyanese small and medium scale miners to obtain property rights and mine legally. The impacts of this legislative instrument, and the context in which it originated were examined by Bridge (2002). This paper draws and extends the arguments made in that earlier paper to examine what has happened in the intervening almost two decades.

The dominance of small and medium-scale mining has had particular impacts within Guyana, on its economy, society and environment. Economically the policy helped to maintain value within Guyana, but may not have fully insulated the country from the resource curse (Hilson & Laing, 2017a). Although a large value has been created for consumption by Guyanese miners and their families, little of this has been captured by government for investment in long-term infrastructure, and a large share has ended up in the hands of a small rent-seeking elite – with much being offshored. The industry has provided a valuable source of employment for low-skilled local labour, helping to absorb individuals from diminishing industries such as sugar. Socially the industry has created problems such as prostitution, human trafficking and crime, especially in remote areas (Colchester, 1997). However, it may have proved as an important safety valve, providing income and activity for otherwise disaffected low-skilled individuals. Environmentally the industry has created problems due to mercury pollution and deforestation but there is space within the legislative structure for the industry to become an agent of change for restoration and land reclamation.

This paper examines the causes and impacts of Guyana's unique mining industry. Section 2 examines in brief the literature from Guyana and the wider context surrounding this issue. The evolution and growth of the mining sector in the country is examined in depth in Section 3 with Section 4 drawing on evidence to examine the nature of these key causes, and the legislative framework in particular. Economic, social and environmental impacts are examined in depth in Section 5. Section 6 concludes and draws lessons for policy.

2. Literature

There is a limited, but emerging literature examining the nature and impacts of the mining industry in Guyana. A key overarching study was drafted in 2009 by the distinguished Guyanese academic, Dr Clive Thomas (Thomas, 2009). This was written at the request of a local industry association, the Guyana Gold and Diamond Miners Association, to understand the scale of the industry, its costs, output, and crucially its importance to the Guyanese economy. The report focuses on small and medium scale gold mining, highlighting the rapidly increasing dependence of Guyana's economy and society on the industry. Clifford (2011) also provides an overview of the sector in the country, highlighting both the commonalities but also the differences between the ASM sector in Guyana, and that found across the world. A further overview report was drafted by Conservation International (CI) and the World Wildlife Fund (WWF) in 2013 (Singh et al, 2013). The report examined economic and environmental issues arising from the industry, with the intention of informing how the industry could become a sustainable element of the Low-Carbon Development Strategy in the country. Bridge (2002) in discussing how economic geography has traditionally prioritised the understanding of processes over the evaluation of outcomes, uses the mining industry in Guyana as a case study—highlighting the role that the Mining Act played in shaping the industry in Guyana, and thus the role that formalisation played in moulding the industry as was seen at that time. Hook (2019b) adds to this literature by focusing on the informality underpinning the formal framework—from accessing land, extracting gold to the selling of the product, highlighting that some of the worst of the negative impacts from the sector arise from this informality.

Beyond these overview studies various literature has emerged that focus on key aspects of the mining sector in the country. The sector's relationship with the Low-Carbon Development Strategy has been studied from both a qualitative (Lowe, 2014) and a quantitative (Laing, 2015) perspective. Its importance and impacts on the wider economy have been examined in relation to the resource curse (Hilson & Laing, 2017a) and the rentier profits that have emerged from the sector (Bulkan & Palmer, 2016).

The sector has had key impacts on the environment, public health and indigenous communities within the country and separate literatures have emerged around each of these issues. Palmer et al (2002) examined the issue of transmission of HIV within mining camps in the country. The relationship between miners and the indigenous communities who often own, or are adjacent to mining operations has also been examined from a variety of different perspectives (Colchester, 1997; Forte, 1998; Forte 1999; Mars, 1998; Colchester et al, 2002; Hennessey 2015; Hilson & Laing, 2017b). The sector also has a myriad of negative environmental impacts associated with it, from deforestation, soil erosion, sedimentation of watercourses and mercury pollution. These issues have been looked at in their totality (Roopnarine, 2002; Roopnarine, 2006; Singh et al, 2013), or in a singular dimension, predominantly relating to mercury pollution (Vieira, 2006; Hilson & Vieira, 2007; Howard et al, 2011). Hook (2019a) extends this thinking by highlighting that the informality within the sector is a key barrier to reducing these environmental issues—and to enact 'green mining'

Within the wider literature on small and large scale mining three areas are of key relevance to the topic of the paper: the formalisation and legalisation of small-scale mining; small-mining in relation to large-scale mining and the challenges involved in the small-scale mining sector across the world.

A crucial aspect of the investigation here is the role that the formality in the sector in Guyana, embodied in the Mining Act of 1989, has had on defining the nature of the mining industry in the country. Formalisation of the ASM industry has been discussed widely in the literature (Echavaria,

2014; Salo et al, 2016; Verbrugge & Besmanos, 2016) and has becoming an emerging theme in policy-making among many developing countries.

The conceptual gap between the perceived informality of small-scale mining in the academic literature and the reality of increasing formality occurring across the developing world (including Guyana) has been critically discussed in the literature (Hilson & Maconachie, 2017, Hilson et al, 2017). The formalisation process has also been discussed in various countries around the world including Colombia (Echavarria, 2014), the Democratic Republic of Congo (Geenen, 2012) and Uganda (Siegel & Viega, 2009).

The interactions between small and large scale mining has also been discussed in a small, but growing group of literature. Aubynn (2009) examined the issues that have arisen between small and large scale mining in Ghana, focusing on the Abosso Goldfields concession and highlights the efforts made by large-scale mining operators to accommodate the ASM sector. The conflicts that arise between small and large scale mining in Ghana have also been examined (Hilson, 2002a). Resolving these conflicts, at least from the perspective of large-scale operators has been discussed in the grey literature (World Bank, 2009). Given, however, that Guyana has very little experience of small and large-scale mining operating in the same geographical space, the issue of conflict is less relevant to the country than elsewhere. The experience, and causes of small-mining occurring, not occurring with large-scale mining, but in the absence of, such as in Guyana, has not yet been explored in the literature however.

The issues resulting from ASM mining have however been widely explored in a number of studies from a number of different perspectives including its role in flooding (Shoko, 2002), gender issues (Ya koleva, 2007), poverty (Hilson, 2006, Hilson, 2012), environmental impacts and management (Tarras-Wahlberg, 2002, Ayree et al, 2003), in relation to forests (Hirons, 2011) and impacts from its mercury use (van Straaten, 2000, Serfor-Armah et al, 2005, Telmer & Veiga, 2009). It is this literature on the challenges that is extended in this work, specifically in relation to the differential impacts from Guyana's choice of pathway towards small-scale mining rather than large-scale operations.

3, Background to Guyana Mining

Mineral extraction has been an important feature of the Guyanese economy over the last two centuries. Through the colonial period exploitation of minerals occurred on various scales, with gold, manganese and bauxite all mined in different locations and time-periods, on both large and small-scales. Large-scale extraction of manganese occurred at Matthews Ridge, with Bauxite extraction beginning in Linden in the early years of the twentieth century. The mining industry has, however, been historically dominated by small-scale operators focusing on the extraction of gold from alluvial soil through placer mining, and to a lesser extent the small-scale mining of diamonds. These activities grew in importance in wake of the abolition of slavery with the emergence of the so-called '*pork-knockers*'. These itinerant workers moved around the remote forested areas of the country in search of gold and its related wealth.

This model of mining has broadly continued post-independence with only minor deviations. Today the mining sector is a key component of the Guyanese economy, accounting for 15% of GDP value-added and 65% of exports (Guyana Bureau of Statistics, 2018). The sector is still dominated by small and medium scale, domestically owned, gold mining operations, focusing on alluvial gold extraction. There are two medium-to-large-scale gold mines operating under foreign ownership, and a large gold mining operation at Omai did operate between 1993 and 2006, but two-thirds of current production is still from small and medium operators (Guyana Geology and Mines Commission, 2015). The mining of

diamonds has diminished in importance with the growth of other sectors. Two large-scale Russian owned Bauxite operations exist at Linden, and Kwakwani with a new Canadian operation at Bonasika in the pipeline.¹ Extraction of sand and quarrying is also of local importance. This is mostly small-scale activity occurring on a thin stretch between the capital, Georgetown and the interior mining town of Linden. The scale of the importance of the gold-mining sector compared to other minerals can be seen by comparing export revenues. Between January and September 2018 raw gold contributed US\$552 million in export revenue, compared to US\$94 million from Bauxite and just US\$10.5 million from diamonds (Guyana Bureau of Statistics, 2018).

The history of mining in Guyana and the current make-up of the mining industry places it in the relatively unique position of being a country dependent on mining for its recent economic growth, and foreign exchange, and also having a mining sector dominated by small and medium scale mining. The country has the fifth highest percentage in the world of its rural population involved in ASM activity (Table 1).

Table 1: Source: www.artisanalmining.org/Inventory/

Country	Number of ASM miners as % of rural population
Suriname	10.8%
Eritrea	10%
Mongolia	8.5%
Sudan	7.5%
Guyana	6.4%
Ghana	6.4%
Sierra Leone	5.2%

Two questions arise, which form the key questions for this paper:

- What were the factors that resulted in the current structure of the mining sector in the country?
- What have been the wider economic, social and environmental effects of this particular structure?

The first of these questions, that reflects on both why the small-scale grew, but also why the large-scale sector was curtailed is examined in Section 4 before the paper turns to the second of the questions in Section 5.

The questions are answered drawing on evidence from secondary data obtained from the Guyana Geology and Mines Commission (GGMC) and other sources within the country, findings from the literature, articles from newspaper articles and data from a variety of interviews conducted between 2012 and 2018 for two projects related to natural resource management, deforestation and climate change policy in the country.² These interviews took place with government agents, miners, miner associations, other non-governmental organisations. The interviews took place predominantly in Guyana, with some conducted remotely via Skype.

¹ For further information see: <https://aluminiuminsider.com/first-bauxite-lands-us10-mm-financing-for-bauxite-project-in-guyana/>

² The 2012 interviews were conducted under a project funded by the ESRC entitled Assessing the impact of institutional conditions upon REDD+; the 2018 interviews were conducted for a project funded by the Center of Global Development entitled Guyana's REDD+ Agreement with Norway: Perceptions of, and Impacts on, Indigenous Communities.

4. Why does small-scale dominate the mining industry in Guyana?

The overall dominance of the small-scale mining sector over the large-scale sector in Guyana can be attributed to a wide number of factors. This paper hypothesises that four main factors have been crucial in creating and sustaining this balance in the industry: the nature of the resource; the nature of the country; its political history and the legal framework created by the 1989 Mining Act and later amendments. The latter of these is proposed to be the main driver in creating the current structure of the industry.

- ***Nature of the resource***

The nature of the gold resource in Guyana has lent itself to an industry dominated by small and medium scale producers. The highest potential for extraction was identified over 50 years ago as in alluvial gold rather than ore (International Business Publications, 2013). Alluvial gold refers to gold dust found within alluvium, soil layers. Its extraction is one of the oldest forms of precious metal extraction, and is often referred to as placer mining. By definition this activity generally occurs at a small and medium scale level due to the nature of the resource, being in low concentration across a geographically dispersed area. This lends itself to extraction set-ups with low amounts of fixed permanent capital, and an ability to shift production sites depending on discovered deposits. Prospecting alluvial gold is also trickier than gold present in ore. Thus alluvial gold tends to be extracted by small and medium scale operators who are less dependent on the large up-front fixed capital investments required by large-scale operators. This feature of the resource, and its implications for the industry was first identified by the UN Economic Geologist A.K. Banerjee in 1972, following ground investigations post the UN Mineral Survey Phase II (1967-1969). He concluded that the most immediate prospect for development of the industry in the country was through the exploitation of gold deposits in primary or rich alluvial zones on a small to medium scale (International Business Publications, 2013). This prediction has come to pass, witnessed by the large share of the industry represented by small and medium scale operators.

- ***Nature of the country***

Along with the nature of the resource, the nature of the country may also have contributed to the current balance within the industry. The majority of the country's current production occurs within heavily rain-forested areas, with little road or even navigable river access. Guyana has under 8000 km of total roads, of which just 7% are paved (CIA, 2018). The country has 37 metres of roads per km² of land area. For comparison, Ghana, which is of comparable size, has over 100,000 km of total roads, 13% of which are paved, and has 450 metres of road per km². Although the lack of infrastructure is unlikely to be a sufficient factor on its own behind the lack of large-scale mining activity in the country, it may have served as a barrier along with the other factors discussed here. The lack of infrastructure increases the costs of prospecting, mine construction and mine operation.

- ***Political history***

Guyana's political history may also serve to explain the current make-up of the mining industry. Since independence in 1966 the country has been ruled by a variety of parties and governments that have all been socialist to a greater or lesser degree. At independence the country was run by the People's National Congress (PNC), an offshoot of the Progressive People's Party (PPP). It was formed in 1957 following a split in the latter party, and was led by Forbes Burnham who became the country's first independent Prime Minister. The opposition PPP, led by Dr. Cheddi Jagan were openly socialist and throughout the 1960s prior to independence the USA and the UK engaged in a variety of activities to ensure that they did not hold power upon independence (Manroop & Singh, 2012).

Upon independence the Burnham dominated government became increasingly socialist, pursuing a strong strategy of import-substitution. The country was declared a co-operative republic in 1970 and a key first priority was nationalisation of the industries involved in resource extraction. At the time there were two foreign-owned large bauxite operations in the country. Both were nationalised by 1972, with Guyana Timbers Ltd, following shortly after. Burnham died in 1985 and although his successor Desmond Hoyte initiated an opening up the economy and privatisation, he still led a socialist party. As did Dr Cheddi Jagan when he won the first open elections since independence in 1992. Both bauxite operations and Guyana Timbers Ltd. have subsequently been privatised, but the stigma, and fear of such nationalisations may still prevail. A senior government official responsible for economic development commented in an interview, when asked about the nature of foreign direct investment in the country, "*Why would foreign investors want to place large amounts of expensive equipment in remote areas when government might just take it away?*". This highlights the political climate as a potentially key barrier to large-scale foreign owned mine investment in the country.

- **Mining Act 1989**

A critical factor in the emergence of the small and medium-scale gold mining sector as, *the*, driver of economic growth in Guyana has been the legal framework created in the country to regulate and manage the industry. Ownership of all sub-surface resources in the country is vested in the state, as per Section 6 of the Mining Act 1989, "*subject to the other provisions of this Part, all minerals within the lands of Guyana shall vest in the state*". The government is thus the body with responsibility for managing sub-surface resources and issuing licences, permits and other rights to extract the resources.

Small-scale mining has been legal in Guyana since colonial times, and was embodied in the previous incarnation of the Mining Act of 1972. The revision of the Act in 1989 came at a point in Guyana's economic history where it was opening itself up to international trade and investment after the socialist experiments of Forbes Burnham, and when it, along with many other developing countries, faced a debt crisis and needs for immediate access to foreign exchange. The Act was accompanied by liberalisation of the states' monopsonistic gold-purchaser, the Guyana Gold Board, that previously had been a central tenet in the state's exchange control regime, consistent with the previously socialist philosophy of the ruling government (Bridge, 2002).

The Act arose in a context of rising gold prices in the mid-1980s and a need in the country for foreign exchange, and pressure from international funding agencies such as the International Monetary Fund (Bridge, 2002; Bulkan & Palmer, 2016). The rising gold prices created the rationale for attracting increasing amounts of foreign investment, and to re-orientate the economy towards the extractive industries. The needs of the Guyanese government for access to foreign exchange helped facilitate this push, along with the external drivers of the structural adjustment programmes being put in place by the IMF and the World Bank. The liberalisation of the sector mirrors the experience of many other developing countries, but the details of the process have helped shape the unique situation seen in Guyana. The Act itself treads a thin line between meeting the demands of the international financial system, in providing access for foreign investment, but also protecting domestic interests, and keeping a large amount of mining rights under Guyanese hands.

A clear example of this can be seen in the changes to the new regulatory regime made in 1993, with the introduction of a new category of mining, between small-scale low-capital operators, and large-

scale foreign owned companies - Medium-scale mining. While small-scale claims³ are issued for either land areas of 1,500 by 800 feet (approximately 27.5 acres) or one mile of navigable river⁴, medium scale claims are for a much bigger area of between 150 and 1200 acres. They do, theoretically at least, come with a higher level of regulatory burden, such as the requirement to submit an Environmental Management Plan⁵, however there is little evidence that this has been enforced. Crucially these permits could only be held by Guyanese, but are for a longer duration (5 years) than their small-scale equivalents (1-year). They were thus designed to facilitate joint ventures between foreign capital, and Guyanese rights-owners.

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The result of the Act was to create the conditions in which a new 'small' but in reality often medium scale, domestically-owned industry emerged that involved greater amount of capital equipment, greater production and also greater associated damage to the environment. The dramatic growth of this industry created an important source of foreign exchange, growth and employment to the country, and has reduced the pressure to attract foreign-owned large-scale mining operations, although not entirely, as the generous tax-breaks offered to prospective foreign investors bear witness (Kaieteur News, 2018a). Importantly they ensure that a select-group of Guyanese operators maintain the status as gate-keepers to large swathes of the industry. The effects of this unique regulatory regime are discussed below.

Impacts from the Mining Act

Guyana's mining industry has changed dramatically over the last three decades. Declarations of gold in ounces have grown exponentially since the passing of the Act in 1989, after a decade of stagnating production (Figure 1).⁶ This was despite initial falls in the gold price, highlighting the key role that institutions played rather than mere prices, in shaping the industry.

The scale of the increase in production in the small and medium-scale gold mining industry has been such that the industry has, in recent years, produced more than was produced by the large-scale mine at Omai and the small-scale industry at the time put together. Essentially the industry has grown at such a rapid pace that it has reduced the need (though not entirely) for the country to attract foreign large-scale investment.

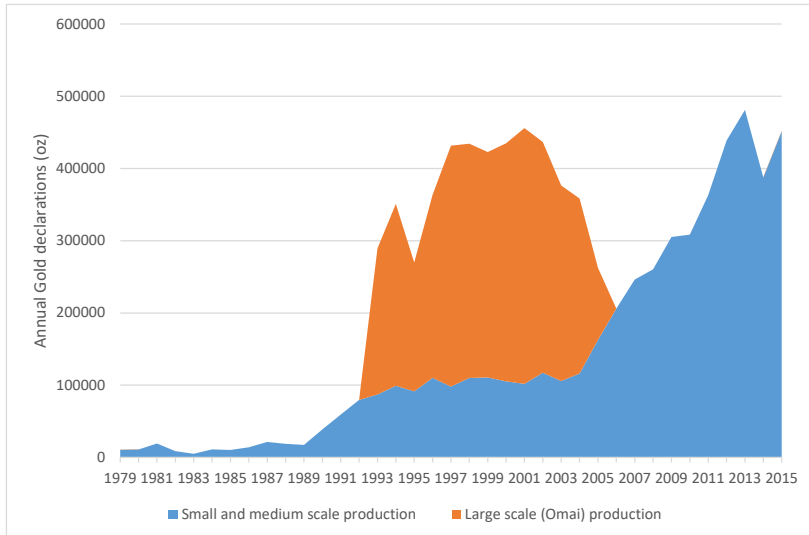
Figure 1: Annual gold declarations 1979-2016 (Source: Guyana Geology and Mines Commission)

³ Mining Claims are defined by the Regulations under the Mining Act s2 as: 'the area of State land in respect of which a concession is granted or a lease or license is issued, and includes any claim located whether a concession, lease or licence has been issued in respect thereof, or not, and includes the area of any land or water in respect of which a dredging concession or river location licence is granted.'

⁴ Regulations under the Mining Act s12.

⁵ Mining (Amendment) Regulations No 3 of 2005 s226.

⁶ Official declaration figures are complicated slightly due to the high rates of leakage of gold from the country. Only registered gold dealers and the Guyana Gold Board are allowed to purchase or hold gold in the country, but with porous borders between Guyana and Suriname, and differential tax rates, there has been much incentive to smuggle gold out of the country before declaration (Stabroek News, 2019).



The rapid increase in gold production was driven, to a great extent, by the increase in gold prices (for the relationship between holding mining property rights and gold prices in Guyana see Laing 2015, and earlier work in Suriname, Heemskerk, 2001). This twin increase in gold production and price has meant a revenue boom for the industry and the country as a whole. This rapid increase in revenue helped to fuel economic growth in the country, and wealth across the industry. It further helped suck in investment and activity into the industry. The skill level of much of these new entrants was questionable at best,⁷ and this may have contributed to a decline in efficiency from the industry, and an increase in environmental damage per unit of production (see section 5).

A defining feature of the small and medium scale mining industry that has emerged since the passing of the Mining Act in 1989, and in the rapid growth of the industry over the last three decades, is the dominance of the industry, not just by the small and medium scale sector, but also by a small group of Guyanese businessman who own a large amount of claims, account for a large share of declarations and operate a number of mining operations across the country, generally as landlords, extracting rents from those operating the mining on those claims (both domestic and foreign operators).

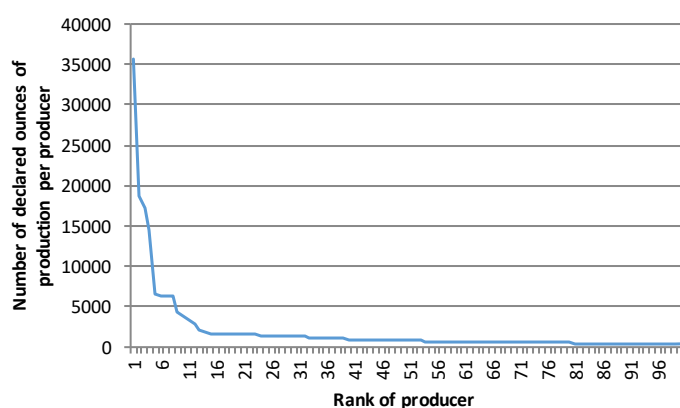
The issue of landlordism in the country has been discussed in depth in Bulkan and Palmer (2016), and the scale of the effect is highlighted in Figure 2. This shows the amount of declared production of the top 100 largest producers in the country, and shows the scale of concentration in the industry. The largest two producers are accounted for by registered dealers who purchase their product from a range of smaller producers, but after that the largest declarers are large landlords. There is little data available on how many claims are owned by these individuals, or how much of the declared production comes from their own operations, and how much from renters.

The figure highlights that although the industry is based on small and medium-scale technology, and although it is predominantly domestically-owned, it has still been captured by an elite group of producers. This elite group of producers (and most importantly rights-owners), have thus captured a

⁷ As per personal communication from an individual working with an NGO in the country.

large share of the industry and crucially a set of rents from the industry. Either through the guise of claim-holders, renting out claims to operators, and collecting a share of the returns, or through joint ventures with foreign operators, a large amount of rents has been captured by this group, extracting income from the industry. The scale of these rents can be seen with some approximate calculations. Based on the data given in Figure 2, and assuming a gold price of US\$1300 per ounce (approximately the global price in 2019) the top 10 largest declarers garnered revenue of approximately US\$155 million per annum – and potentially much larger if they are also benefitting from any of the estimated 60% of gold that may be being smuggled out of the country. This revenue is not necessarily analogous to profit – but demonstrates that over the last two decades a huge amount of rents is likely to have accrued to a very small number of individuals from the industry – which much of this rent likely to have left the country to be consumed in Toronto, New York and Miami (Hilson & Laing, 2017a).

Figure 2: Number of declared grams of production by producer (Source: Guyana Geology and Mines Commission)



5. Impacts from Small scale mining focus

Guyana’s geography, geology, ecology, political history and legal framework has created a unique position, whereby the country’s mining sector is dominated by locally-owned, semi-industrialised small and medium-scale production. The impact of this situation needs to be examined to understand the implications for other countries looking to promote their own small-scale sectors, through legalisation and formalisation. In this section the economic, social and environmental consequences of the unique make-up of Guyana’s mining industry will be examined.

Guyana’s mining sector has become *the* engine for economic growth and foreign exchange over the last decade in the country. While the economy as a whole grew on average by 4.2% between 2006 and 2016, the mining sector grew by 15%, driven by the increases in the small and medium scale gold industry. The mining sector contributed almost 25% of the total increase in value added between 2006 and 2016 (Guyana Bureau of Statistics, 2018).

A crucial aspect, however, of the type of mining sector that has emerged in Guyana has been its impact on domestic employment, especially on low-skilled, male, rural employment. The impact of this can be seen if the labour footprint of large and small-scale gold mining in the country is compared. In 2002

the large Omai gold mining operation, owned by Cambior, had 943 employees (Ramessar, 2003) and mined approximately 300,000 ounces of gold annually. This equated to just over 300 ounces per worker.

Data on employment in the small and medium scale sector is much harder to obtain, but recent estimates place the number of small and medium scale miners at approximately 30,000 (Seccatore et al, 2014). For this level of employment approximately 400,000 ounces were extracted annually – equating to approximately 17 ounces per worker.

These two contrasting levels of labour productivity highlight the labour intensive nature of the small-scale industry, and the relatively labour efficient large-scale production. It also highlights, however the power of the small-scale sector to create employment opportunities, for predominantly low-skilled individuals for which other avenues of employment may be tricky, especially in the light of declining employment in the traditional agriculture (rice and sugar), and other resource-extractive (e.g. timber) sectors.

The creation of this domestically-owned small and medium scale industry has created a valuable source of employment for the Guyanese economy. Although theoretically the same level of employment could have been created through large-scale mining if a sufficient tax burden had been collected from large-scale profits and reinvested by the government in job creation programmes in merit sectors such as education and health, there is little evidence of this happening in Guyana, or indeed, globally.

Turning to tax revenue there is also a differential impact between small and large-scale mining. Currently the main taxes levied on small-scale miners are a 2% income tax and a 5% royalty, collected by the Guyana Gold Board once the gold is sold to them. There are a number of issues surrounding compliance with these taxes, in a sector dominated by informality and irregularity (International Human Rights Clinic, 2007) and there are also issues with gold not being declared and leaving the country illegally (iNews, 2016; Kaieteur News, 2017; Stabroek News, 2019). However, the sector is estimated to contribute approximately US\$45 million in tax revenue annually – about 3% of the total national budget (Cooperative Republic of Guyana, 2018).

In contrast the large-scale operation at Omai negotiated a tax agreement whereby they paid a 5% royalty on production and a corporate tax rate of 37.75% (Ramessar, 2003). Potentially representing a much greater take of tax from large-scale operations than that levied on small-scale miners. In reality Omai in all its years of operation in the country never declared a profit and estimates of the total direct revenue to the government across the lifespan of the mine have been placed at US\$45.5 million (ibid!)

These numbers highlight that although large-scale mining may on paper seem like a more stable source of tax revenue than small-scale operations – in fact experience in Guyana highlights otherwise.

Evidence from Guyana is also emerging relating to the role of the small-mining sector and the resource curse (this effect is explored more in Hills & Laing, 2017). The resource curse is the phenomena whereby dependence on foreign-owned large scale mineral production leads to labour diversion, Dutch disease and capital flight – limiting the economic growth benefits of this production. In Guyana, even though the production is locally-owned, capital flight has still been an issue, with capital off-shored by the Guyanese owners of production to expatriate communities in Florida, Toronto and New York, limiting the domestic re-investment of profits, and the potential economic growth dividend of gold production. This effect has been amplified by the concentration of production in the industry by a small group of individuals. The amount of wealth that has left the country from this group of

producers is difficult to quantify, but given the approximate calculations discussed above it is likely to be in the tens of millions of US dollars every year.

The issue of labour and capital diversion has remained with the rapidly expanding gold sector sucking labour and capital away from other industries, notably agricultural production (Hilson & Laing, 2017). With the larger labour dependence of small-scale mining, the labour diversion issue is arguably greater with the make-up of Guyana's industry compared to a more traditional large-scale mining industry.

There has also been a run to consumptive investment with the locally-owned gold mining boom. Loans and advances for housing and motor cars have tracked mining returns – leading to substantial improvements in living conditions within the country (if greater traffic problems) – but limiting the wider economic benefits from the industry to the country (ibid).

Beyond economic impacts there have been social and environmental implications from Guyana's pathway to a mining sector dominated by small and medium scale operators. Given that there is no counter-factual in the country itself for whether the social situation would have been different if the industry had been dominated by large-scale production a certain amount of extrapolation is required here. However, there are clear impacts of the mining industry generally upon the society of Guyana and at least some of these are likely to have arisen from the dependence on small-scale production. Two of the most notable effects that have arisen are the incidence of crime and health impacts (predominantly HIV and malaria) in rural communities that are proximal to mining areas. Statistics on these two impacts are scarce in the country but there is much anecdotal evidence that alludes to higher rates of crime and HIV in a set of 'wild-west' mining towns in Guyana's interior (Palmer, 2002; Seguy et al, 2008; Reuters, 2011; OSAC, 2018). These problems are not new and have been extensively documented in a number of papers (Colchester, 1997; Forte 1998). The effects have been especially felt (though not exclusively) by indigenous communities that live congruent or often over-lapping mining areas (Colchester, 1997, Forte, 1998, Forte 1999, Mars, 1998, Colchester, 2002, Hennessey, 2015, Hilson & Laing, 2019b). These issues are often complicated by the fact that the mining community and indigenous communities are often inter-linked with many indigenous individuals engaged in the mining industry at various levels, both on titled community land and on state land.

These problems have been exacerbated by the influx of semi-legal Brazilian *garimpos* into the country in the period 2007 to 2015 (Bishop et al, 2017). Again statistics on the actual volume of Brazilian miners entering and working within the country are not available but there is some evidence from both interviews and newspaper sources that a large number of these miners have entered or are operating illegally and there have been many incidents of murders and robberies relating to their entry (Correa & Superti, 2016; Kaieteur News, 2018b).

The rapid growth of the mining industry across the country has led to a range of conflicts between miners, between miners and foresters and especially between miners and indigenous communities, often leading to legal battles (Hilson, 2002b; Kaieteur News, 2013; Hilson & Laing, 2017b). Conflict and violence has also occurred on an individual basis, often against women involved in or alongside the industry (International Human Rights Clinic, 2007).

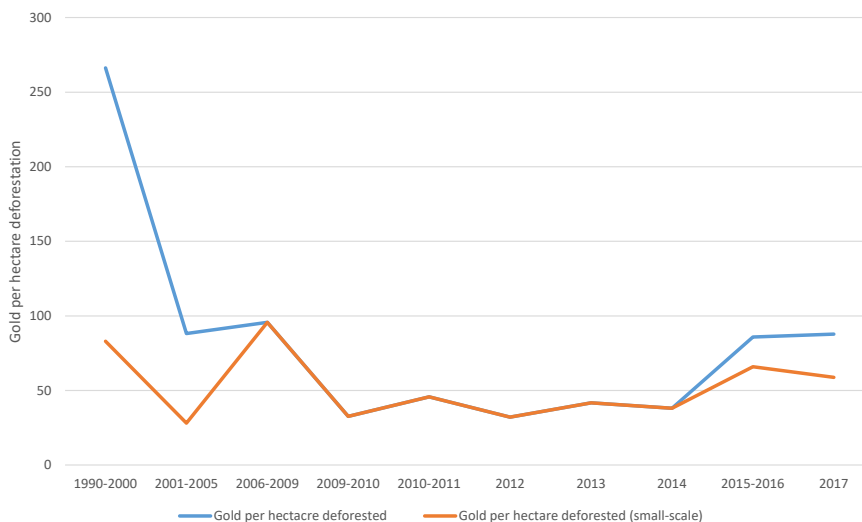
Where there is clearer data is on the differential environmental impacts from small and large scale mining in the country. Mining in Guyana has contributed to a number of environmental impacts from water pollution to deforestation. Given the nature of the terrain in the country and the remote nature of mining activity for many years data on the actual impact of mining on these environmental media was not available. However, in recent years Guyana has instituted a state-of-the-art satellite monitoring scheme for deforestation, as part of their commitments under the Reducing Emissions

from Deforestation and Forest Degradation (REDD+) partnership with Norway (Bholanth & Cort, 2015). This has created a much broader set of data about deforestation in the country, including the source by industry.

This data set allows a comparison of the deforestation created over time by the industry. Mining has been identified by this data set as *the* driver of deforestation in the country accounting for as much as 84% of total deforestation in 2017 (Guyana Forestry Commission, 2018). More interesting however is how deforestation caused by mining has evolved over time as the industry has developed. Deforestation from the industry hit a peak in 2012 with over 13,000 hectares cleared (Guyana Forestry Commission, 2018). This period was the peak of the small-scale gold mining boom in the country, and deforestation from mining activity had increased from a low of just 1,000 hectares per annum between 1990 and 2000. The reasons for this peak were two-fold—first an overall increase in mining activity with annual declarations at a historic high, and also an increasing influx into the small and medium scale industry of inexperienced operators who expanded production and prospecting areas *en masse* clearing the forest in their wake. Overall declarations have risen subsequently, but only with the introduction of the new large-scale mine sites, while deforestation has fallen. This highlights a key impact of a reliance on the small and medium scale operators in Guyana, namely much greater impacts on the forest. This effect can be seen in Figure 3 that shows the amount of gold declared per hectare of deforestation attributed to mining activity. This is split between total declarations, and declarations from the small and medium scale sector. What the chart shows is that in the periods when large-scale operators have been operating, before 2006 and post 2014, the amount of gold produced per area of forest destroyed was at its highest—and this was greater than for the amount cleared by small-scale producers. This highlights that the small-scale industry has a much larger footprint on the forest, both in aggregate, and also per unit of production. This is a function of the type of processes involved in small-scale mining (clearing forest and removing topsoil) but should be highlighted as a key downside of the nature of Guyana’s mining industry. Options are available within and outside the sector, however, to mitigate these effects through reforestation and rehabilitation (Román-Dañobeytia et al, 2015; Pasha et al, 2017).

Figure 3: Gold declarations per hectare of deforestation 1990-2017 (Source: Guyana Geology and Mines Commission, and Guyana Forestry Commission)⁸

⁸ It should be noted that the quality of data on deforestation varies dramatically over the time period covered in the chart. 1990 data was determined using manual interpretation of historical aerial photography and satellite images. Data up until 2011 was based on 30m satellite image resolution, reducing to 5m resolution up to 2014 and switching back to 10m data from 2015 onwards. Generally data prior to the introduction of the national Monitoring, Reporting and Verification System in 2009 has a much higher error range and estimates should be treated with caution. For more details see Guyana Forestry Commission (2018).



Beyond its impact on forests small-scale mining also has impacts on water-courses that are potentially much greater than large-scale activity. This can be seen in Guyana with the increasing literature and data regarding mercury pollution that arises from the use of the metal as an amalgam in the small-scale production process. This mercury has caused health issues to those working in the industry, including those in government offices responsible for purchasing gold (DPI, 2018). It has caused pollution in watercourses across the country affecting indigenous communities and wildlife (Roopnarine, 2002; Legg et al, 2015). This highlights a further potential downside from the nature of Guyana’s industry. It should be noted here however that the largest environmental problem in the country’s history occurred as a result of a tailings dam failure at the large gold scale Omai site in 1995, causing a release of a large volume of cyanide-laced water in the Essequibo River, impacting fish populations, local residents, and sparking demand from international donors for greater environmental protection in the country, leading to new legislation and regulatory agencies, with the Environmental Protection Agency established in 1996 (Lakhan, et al 2000).

6. Discussion and Conclusion

Guyana’s unique mining industry has emerged as a result of geographic, historic and political circumstance, and as a result of key policy decisions and the creation of an overarching legal framework that recognises, legalises and encourages small and medium scale, domestically owned operations. As a result the country has ended up with a much larger, locally-owned ASM sector than many other developing countries.

The structure of the industry has resulted in a number of key effects on the country’s economy, society and environment, compared to a large-scale, foreign-owned, resource-extractive growth path. Economically the pathway has brought benefits in terms of employment, especially of low-skilled individuals, and also in terms of tax revenue. Despite the domestically-owned nature of the industry there is evidence of a resource curse, with the industry captured by a small group of local producers and capital flight and resource diversion still occurring, raising questions about the long-term benefits of the sector to the country as a whole.

The make-up of the sector has raised questions about its impact on the social and environmental fabric of the country. There is some evidence that deforestation has been higher as a result of the pathway towards small and medium-scale mining, and potentially impacts on water may have been greater.

Learning lessons from the role that policy has played in defining Guyana's mining sector, and the positive and negative impacts from the sector's evolution is crucial for countries around the world looking to formalise and legislate the growing ASM sector. Guyana's experience shows that formalisation, and particular types of legislation can encourage and stimulate domestic investment and growth in the sector. However, it also shows that although legislation and formalisation can assist, it is unlikely to be sufficient to create a growing small-scale sector. In Guyana the growth of the sector has also been driven by geographic and geological conditions, relating to the difficulties in large-operators operating and the nature of the resource suiting small-scale production. Guyana's political and economic history has also informed this growth. Whether legislation and regulation would achieve the same result without these pre-conditions is an interesting topic for future research in other countries. Guyana's experience also highlights that price is a crucial, but not the sole, reason for shifts in the sector. Institutional and regulatory factors, and migration of labour and technology can also create the conditions for a surge in mining activity. The largest growth in the sector occurred in Guyana when price rises, institutional factors and influxes of external resources all acted together.

Guyana's experience also highlights that a growing and developing small-scale sector can bring positive economic benefits, helping to create a source of demand for often, low-skilled labour, boosting domestic employment. It can also potentially serve as a stable source of tax revenue, even with problems relating to smuggling and evasion. Crafting a mining policy framework that helps to maximise these employment and taxation benefits should thus form a key part of any regulatory environment dealing with small and medium scale mining. Negative consequences however can result from such an industry, relating to capital flight and diversion, social and environmental consequences. Any regulatory framework should aim to encourage profits from domestic owned small and medium scale operators to remain in country and be invested in productive activities. Managing social and environmental consequences should also be built into regulatory structures to ensure that a vibrant small-scale mining sector can make a positive contribution to the social fabric of the relevant country.

The lessons from Guyana's experience helps highlight that a development pathway based on domestically-owned small-scale mining brings with it challenges and opportunities just as a pathway based on foreign-owned large-scale mining. What is needed is a suitable regulatory framework to encourage the growth of the sector and its positive benefits whilst constraining and mitigating the negative economic, environmental and social impacts. It is in this area that policy needs to be designed and developed

A critical aspect of such policy should surround the role of regulation and price incentives in the sector. Three aspects of the effects of the sector in Guyana highlight that, from an economic perspective, the externalities caused by the sector are not captured sufficiently by the royalty structure within the country. The costs of deforestation and water pollution are not adequately captured in the payments made to government, neither are the social and health effects of the sector. Further the leakage wealth out of the country as a result of the activities of the sector are not captured by the current fiscal regime. Reform of this component requires both changing fiscal incentives, but also buttressing them with more secure regulation. Reducing corruption and increasing capacity are crucial to improving the regulatory environment – both of which should be more achievable in the coming years if the dividends from Guyana's projected oil boom can be utilised correctly to increase civil service salaries and provide more technical resources to the sector. Increasing royalty rates and rental fees however are unlikely to be successful without firmer control over smuggling out of the country.

Instead the use of a 'carrot' based approach along with strengthening legislation may be more effective, and politically acceptable to a sector, that has demonstrated elite and regulatory capture in recent years.⁹ Use of sliding-scale royalty rates and fee structures for demonstrating good performance in either social or environmental regimes may help align incentives. Providing fiscal imperatives and incentives, such as tax breaks, or a regulatory requirement that a certain percentage of profits must be re-invested into certain clean mining technologies could help facilitate change within the sector. Crucially these fiscal incentives and imperatives should also apply to the linkages between the mining sector and the rest of the economy. The small-scale, domestically-owned nature of the mining sector in Guyana offers great opportunity to avoid capital leakage from the country normally associated with large-scale, foreign dominated extractive-based economies. However, this has not been the case so far. Changing fiscal rules to require medium-scale operators to re-invest a certain share of profits into non-extractive industries within the country can help diversify the economy, spread the benefits of the sector, and also reduce risk for the operators themselves.

Although regulation and prices may be able to mitigate some of the negative impacts from the sector – it is unlikely to be able to change the nature of the sector itself in order to mitigate crucial problems, such as capture of the industry by a small elite, capital flight and landlordism. Instead the solution may lie in the very thing that helped create the industry and the structures in the first place – the property rights that relate to the mineral resource. The Mining Act and its precursors created a system of short-term rights to extraction, for a limited resource. Along with a concentration in production there has been a concentration in these rights amongst a small elite who thus control the industry. The short-term, and limited nature of these rights reduces the incentives of holders to manage the resource and related resources (such as the forest or water resources) sustainably. It also reduces the incentive to invest in the long-term management of the property. Creating longer-term more holistic rights whereby the owner owns not just the right to extract minerals, but also the timber resource and the long-term liabilities for any damage – could help better align incentives between rights holders and the country as a whole – potentially reducing environmental damage. By making these rights more linked to performance – such as efficiency, production by the owner or environmental performance – such a system could also help to break open the elite who own large amounts of claims and sit on them for many years, and have limited management roles in the production (and associated damage) that occurs on such claims. Such a system could help to create more permanence in the industry – potentially helping to reduce social ills such as prostitution and crime that arise, at least in part, from the transient nature of the industry and its labour force. This system could incorporate the features that have helped Guyana develop the domestically-owned small and medium-scale industry that has proved important for employment – whilst mitigating some of the most important social, economic and environmental impacts.

Guyana's experience provides lessons for wider implementation of policy relating to the ASM sector specifically and extractive industries more generally and extend the literature on the sector. Guyana's move towards formality has gone further than many countries, although many other countries are now embarking on similar pathways. Guyana's experience over the last two decades highlights that the legal framework and rights structures in place are a crucial, but not the sole driver of defining the nature of the sector. Formalising the industry is thus an important part of creating a vibrant small-scale mining sector that can, but not necessarily will, bring positive benefits to the country. Acknowledging and understanding the limitations, along with the potential benefits, of the

⁹ In 2010 a protest by miners against the proposed policy measures under the country's new Low Carbon Development Strategy brought the interior town of Bartica to a halt, and forced the government to delay, and eventually stop, the introduction of the measures (Stabroek News, 2010).

formalisation process is crucial. The experience from Guyana also highlights both the clear positives, and negatives, that have arisen from an extractive-based economy dominated by small and medium-scale domestically owned operators. Capturing the benefits, such as the provision of livelihoods and employment to individuals with a range of different skills, whilst minimising the negative impacts that Guyana has experienced, such as capture by a small rent-seeking elite, negative social and environmental consequences, and capital flight – should be the aim of formalisation and legalisation processes in other countries.

Growing research into the exact structures that formalisation and legalisation for the ASM should follow is key to this approach. Important questions from Guyana include the question of what rights to grant, effectively what to formalise and legalise. Granting sufficiently long-term and holistic rights that align incentives of right-holders with that of the country is important – along with providing the key fiscal and regulatory imperatives and incentives to reduce the negative impacts and off-shoring of capital that Guyana has experienced. Designing a legal regime that both encourages an industry that can provide local employment, livelihoods and foreign exchange, but also retains incentives for long-term investment, maintenance of environmental services and reduces excessive dominance of the industry by a small elite – is likely to be crucial to the growth of successful ASM sectors across the world.

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