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Reconciling Green and Oil State Goals: Guyana as a Case Study

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ABSTRACT

The *Brundtland Report* of 1987, titled “Our Common Future”, offered a universal model of development, at the centre of which is the balance of economic, social, and environmental components. The oil and gas sector has begun to accept the notion of sustainable development as an essential component of the economy that has a substantial influence on the economic growth of society and the quality of the environment. This article was inspired by a desire to comprehend the contradiction between hydrocarbon production and the pursuit of a green state development plan. The paper raises some questions about whether Guyana can truly accomplish the goal of green state development. Guyana continues to grapple with the environmental degradation that the mining sector leaves in its wake, even in the face of regulations. This paper draws on several secondary data sources to answer these critical questions. It begins with examining the key concepts relevant to the discussion before examining Guyana’s past experiences with natural resource extraction. The paper presents the author’s perspective on whether Guyana can effectively achieve a green state status while being an oil-producing state in its experience, along with current and planned initiatives for the oil and gas sector. The paper concludes with recommendations for reducing the environmental impact of oil exploration and production in Guyana.

Keywords: Green Growth; Guyana; Oil exploration; Oil Production.

INTRODUCTION

This article was inspired by a desire to comprehend the contradiction between hydrocarbon production and the pursuit of a green state development plan. Over the last two centuries, rapid industrialization and economic expansion have unquestionably produced significant material improvements. Consequently, houses, employment, automobiles, education, and health care are better than ever before on a worldwide scale. Simultaneously, the adverse effects of our economic prosperity on the environment are

becoming more apparent. Changes in the global climate indicate that our dependence on fossil fuels must be rapidly decreased. However, climate change is merely one indication of the harm caused by contemporary life. Desertification, soil erosion, the decline of forests, and the constant loss of unique species are other environmental effects (Dorothy & Otu, 2012; Otu, 2018).

This produces an intriguing contradiction in that, above a certain threshold, gaining material wealth might become a burden rather than a blessing. This contradiction raises an important question: can we continue to be both an economically prosperous and ecologically healthy nation? This question is the central topic of this study. Moreover, these problems are central to the argument between anthropocentrism and ecocentrism. People who hold anthropocentric beliefs admit that they are the only relevant creatures in the universe and deem people and plants insignificant unless they offer life necessities such as food, clothes, and medical care. On the other hand, ecocentrism acknowledges the inherent worth of all living creatures on Earth, regardless of their use to people. Additionally, it encourages individuals to care for plants and animals for their benefit.

According to the most recent IMF figures, Guyana is at the epicentre of this dichotomy. It was showered with unprecedented riches, with a projected 86 per cent increase in GDP in 2020. This money will be generated through the offshore production of freshly found hydrocarbons in Guyana's exclusive economic zone. The scale of these discoveries and the anticipated economic advantages they would bring to Guyana is both thrilling and frightening. What implications will our pursuit of an anthropocentric development path have on our vital ecosystems? Will the need for profit supplant the necessity for ecologically friendly practises?

This research uses a variety of secondary data sources to address these critical concerns. It starts with a review of the essential ideas pertinent to the debate, followed by an assessment of Guyana's prior natural resource extraction experiences. In the backdrop of Guyana's historical experience and its current and future efforts in the oil and gas industry, the closing chapter gives the author's view on whether Guyana can successfully attain green state status while still producing oil. The report finishes with suggestions for mitigating the environmental effects of oil exploration and production.

LITERATURE REVIEW

John Maynard Keynes (1987) cited in Barbier, (2005) estimated that between 2000 BC and the early eighteenth century, 'civilised countries' experienced a doubling of their standard of living. However, there was no commensurate increase in the material basis of society within that period. By 2000 BC, humans had already discovered fire, language, the wheel, the plough, sail, banks, governments, maths, and religion; in the 18th century, these things still formed the basis of our civilisation. However, all of this was changed with the industrial revolution and the limited liability company. These developments meant, for humanity, a powerful source of energy, the means to harness it, and the financial mechanisms to exploit it. Simultaneously, modern advances in medicine, beginning with the smallpox vaccine, led to ever-increasing life expectancy and ever falling infant mortality. The population would begin to increase exponentially (Barbier, 2005).

The Industrial Revolution and the remarkable economic progress were based on one fundamental discovery: the wide availability of coal, oil, and gas – collectively referred to as fossil fuels. Essentially, what the industrialised world was doing was mining millions of years of concentrated sunlight and using it to fuel their economies. What was

unknown at the time was that the mass burning of these fossil fuels would eventually change the planet's climate. The very same energy that had made it possible for us to develop rapidly could also destroy us (Barbier, 2005).

In those early days of industrialisation, such environmental considerations were far from policy maker's minds. Guyana's natural environment provided the services in raw materials, assimilation of waste, maintenance of biodiversity, clean air and water and a stable climate, which appeared to be free and inexhaustible. The paramount concern was maximising material welfare, expressed through the ever-increasing production and consumption of goods (Barbier, 2005). However, the harsh realities of the present have caused us to recognise the fragility of our natural environment, our dependence on it, and the immense and irreversible damage being done to it in our continued pursuit of economic success. Climate change is not a distant threat looming on the horizon. It is already here, arguably the greatest challenge of Guyana's history. This brings us to the primary question this paper seeks to answer: can we continue to enjoy economic success as a nation and, simultaneously, achieve an environmentally healthy nation? While no one could sensibly deny that economic growth has brought enormous benefits, it is similarly hard to deny that those benefits have come at a high cost to the environment. Moreover, these costs will continue to rise as fossil-fueled growth continues worldwide.

How, then, can an oil-producing state achieve sustainable development? The green economy, or green growth, has been proposed as a possible solution for achieving the seemingly conflicting goals. According to the OECD, green growth is a matter of both economical and sustainable development policy. It confronts two crucial priorities simultaneously, i.e., the continued inclusive economic growth needed by developing countries to reduce poverty and improve well-being; and improved environmental management needed to tackle resource scarcities and climate change (OECD, 2012). The article says that "Green growth means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities."

This green development agenda has become necessary because risks to development are rising as growth continues to erode natural capital. Failure to address this would increase water scarcity, worsening resource bottlenecks, significant pollution, climate change, and unrecoverable biodiversity loss (OECD, 2012). Moreover, to ensure that the progress made in living standards in these past fifty years is not eroded, we must find innovative ways of producing and consuming goods and services and even redefine what we mean by progress and how we measure it (OECD, 2011). Is green growth a feasible goal strategy for developing countries? It has been postulated that developing countries are the key to achieving global green growth. Even though, in recent times, most developing countries contribute only minimal shares to global greenhouse gas (GHG) emissions, these emissions will soar if they pursue the same path to economic growth as developed countries have followed. Developing countries are becoming increasing sources of global economic growth, but this growth is being accompanied by growing emissions and more intensive use of natural resources. It is also vital to note that because developing countries are more dependent on natural resources for economic growth, they are also more vulnerable to environmental degradation's potential economic and social impacts. These factors present a unique challenge to their ability to develop (OECD, 2012b). The issues mentioned above led to a growing consciousness across the globe and

contributed to the heavy push for sustainable development. A pertinent question to consider at this time would be, where does sustainable development fit in the discussion on green economy and green growth. The (OECD, 2012b) has suggested that:

Sustainable development provides an important context for green growth. Green growth has not been conceived as a replacement for sustainable development but rather should be considered as a means to achieve it. It is narrower in scope, entailing an operational policy agenda that can help achieve concrete, measurable progress at the interface of the economy and the environment. It focuses on fostering the necessary conditions for innovation, investment and competition that can give rise to new sources of economic growth, consistent with resilient ecosystems. In other words, green growth has the potential to help developing countries achieve sustainable development.

Guyana is in an exciting position, being a developing country that has discovered oil when the world is focusing on strategies for reducing dependence on fossil fuels and pursuing greener paths to development. In stride with these global priorities, Guyana also seeks to pursue green growth, as evidenced by the development of the Low Carbon Development Strategy and the more recent Green State Development Strategy. This paper explores the challenges and opportunities that becoming an oil-producing state will create for the country's ambitions of also becoming a green state.

Green growth priorities: The Green State Development Strategy

It would be fitting to examine some of the green development goals that the country has set for itself before examining the new dimension of oil production. The Green State Development Strategy was in fact developed in light of the prospects of an oil and gas sector. The policy acknowledges that oil and gas can present a blessing and a curse. In this light:

the *Strategy* is developed on the premise that with revenues generated from the country's natural wealth, it is now possible to modernise traditional sectors (e.g. forestry, fisheries), maximise efficiency and investment opportunities in high growth sectors (e.g. mining, rice), and invest in future value-adding sectors (e.g. business process outsourcing, tourism and agro-processing), ensuring better opportunities for Guyanese (Green State Development Strategy, 2019).

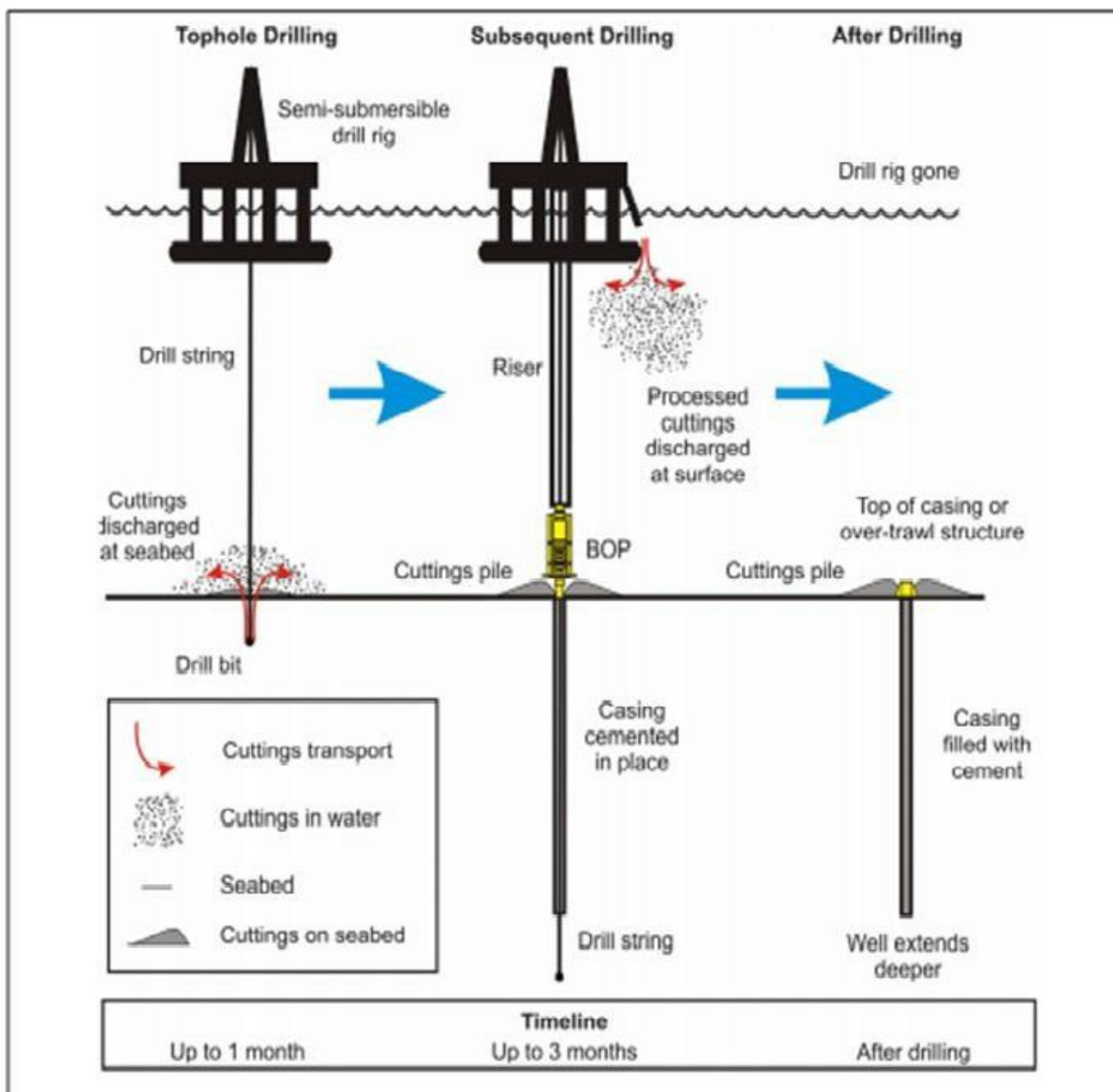
Guyana is relatively unique, with much of its natural resources still largely intact. More importantly, given the late stage at which oil and gas resources have been discovered, Guyana now has the opportunity to avoid rapid resource depletion and degradation through proactive management to ensure that the benefits provided today are sustained for future generations. Avoiding these pitfalls will require integrated action across sectors and agencies. However, it will also require "monitoring and enforcement of market-based rules among private operators, and incentives that support innovation and ethical practices" (Green State Development Strategy, 2019). The absence of these will lead to the continued exploitation of natural resources in a business-as-usual manner. The actual cost of resource exploitation will not be reflected in market prices.

In the pursuit of green growth for Guyana, the most significant challenge in the short term seems to be the management of Guyana's oil and gas wealth. This is so given that the revenues earned through negotiated production sharing agreements are essential for economic development and must therefore be accurately projected. The critical environmental challenges include close monitoring of carbon emissions, avoiding oil

spills and other operational risks (Green State Development Strategy, 2019). Appendix one outlines the strategies contained in the GSDS for achieving a green economy.

Environmental Impacts of Offshore Exploration and Production

The Green State Development Strategy outlines the potential economic gains to be derived from the oil and gas sector for Guyana and how these gains will be used to transform the economy. The strategy doesn't say much about (1) recognising the possible effects of offshore drilling on the environment and (2) outlining any steps that could be taken to reduce these effects. Off-shore exploration and production of oil and gas deposits is now a common activity in the deep ocean.



These activities have expanded into much deeper waters as easily accessible oil and gas resources became depleted, and technology improved (Erik. E. Cordes, 2016). Tomlinson and Boland (1981) explain that deepwater usually refers to the depths of 1,000 feet (305m) or more, and the first site was discovered by Shell Company in 1975 (Tomlinson & Boland, 1981). The expansion of offshore as opposed to onshore oil exploration and production (E&P) may be explained by the development of new technologies suitable to deep-water conditions, which produced more than 10,000 barrels per day, while good wells onshore produced only few thousand barrel a day. As a natural consequence of this, oil companies competed to go deeper and deeper to reach finally what is called ‘ultra-deep-water’ that refers to more than 5,000 (1524m) feet depth. Statistics reveal that offshore oil drilling produced in 1954 only 133.000 barrels of oil per day, this production raised to reach 1.7 million barrels per day in 1971 which show the increasing development and revenues of this activity, after all legal disputes were settled (Tomlinson & Boland, 1981; Nabiebu, 2022; Otu and Nabiebu 2022b).

The problem is that this deep-water expansion has not equivalently been matched by legislation or policies that reflect modern practices of environmental conservation. This underscores a pressing need for Guyana as a new entrant to be fully apprised with the most updated knowledge of deep-sea ecology, known human impacts on deep-water ecosystems, and the exiting environmental protection measures (Erik. E. Cordes, 2016). Experience and research have shown that there are environmental challenges associated with each stage offshore oil exploration and production. Some of the most common impacts as reported by (Tomlinson & Boland, 1981) are summarized by below:

OIL EXPLORATION- SEISMIC SURVEYS

These surveys are conducted to locate and estimate the size of an offshore oil reserve by using high explosive impulses. The noise emitted from these surveys can kill fish or damage their eggs and hearing. Consequently, fish will have difficulties locating prey or mates, while at the same time becoming more susceptible to predators. The noise can also disrupt migratory patterns and can lead to whale beaching.

1. Drilling and processing oil

This is often considered as the most harmful stage because it is a permanent phase, unlike other possible accidents that could happen occasionally such as oil spill. In this phase, oil rigs release the wastes of oil Exploration and Production, these discharges contain mainly:

1. Produced water that form 98% of the total waste, which consists of hydrocarbons that cause water toxicity and eventually aquatic toxicity.
2. Drilling fluids (drilling muds) discharged during the drilling process. These contain toxic substances like: benzene, zinc, arsenic, chromium, iron, mercury, barium, and other contaminants that are used to lubricate drill bits and maintain pressure, e.g. barium acts as lubricant and increase the density of mud. Tests have found a high concentration of these metals accumulated in the sea floor, often causing: malformation, smothering organisms, genetic damage and mortality in fish embryos.

In addition to these discharges, oil Exploration and Production release other dangerous substances among them: cutting (crushed rock), diesel emissions, and chemicals associated with operating mechanical, hydraulic, and electrical equipment such as biocides, solvent, and corrosion inhibitors.

2. Air pollution

Statistics have shown that over its lifespan, a single oil rig can pollute as much as 7,000 cars driving 50 miles (80Km) per day. The main polluter factor is greenhouse gases (GHG) that are generated directly by offshore rigs, and indirectly through refineries' emissions. These gases are behind climate change including: global warming, melting ice at the poles, and ocean acidification which means that oceans absorb all CO₂ therefore carbonate become less available to marine organisms that need it to build shells and skeletal materials.

3. Oil spills

Oil spills are becoming more consistent due to different factors such as: equipment failure, transportation accidents, human errors, tectonic events, and unstable weather conditions (Otu & Enyia, 2015). For instance, 115 platforms were destroyed and 124 spills were reported during Hurricane Katrina and Rita. Toxins within spilled oil have been related to a myriad of detrimental impacts to both marine and human life. In aquatic ecosystem, those toxins act as hormones or anti-hormones that cause unusual phenomena such as: developmental deformations, genetic mutations, and reproductive problems. Birds die from hypothermia as their feathers lose their waterproofing. Turtles die after ingesting oil-coated food. Since toxic components bioaccumulate in fish, which represent an important food all over the world, the threat reaches human life as well. It has been demonstrated that people who eat fish and seafood from affected waters may experience neurological problems that can be even more severe when affecting children and fetuses, causing impairment of physical and cognitive development. Dermal contact with chemical materials of workers in the drilling sites, especially those who were victims of oil spills in addition to rescue workers, can cause among other diseases: hypokalemia, renal toxicity, respiratory distress, unconsciousness, anemia, leukemia, reproductive problem, developmental disorders, asthma attacks and cancer.

In Guyana, we do not have to look too far for a vivid reminder of the reality of the devastating effect of an oil spill. In fact, one of the worst oil-spills the world has ever seen occurred just next door in Trinidad and Tobago. In 2013, Trinidad experienced the Petrotrin oil spill, which was a series of oil spills that occurred on the island of Trinidad and Tobago. In total, eleven oil spills occurred between 17 December 2013 and 29 December 2013. It is the largest oil spill in the history of Trinidad and Tobago, with a reported leakage of 7,000 barrels. However, the Trinidad Guardian reported that when one of its teams walked along the river bank the next morning, several catfish were seen swimming away as the oil made its way into the Gulf of Paria, and that Crabs were already covered by the oil.

To reiterate, therefore, while it is admirable that the GSDS lays out the strategies and initiatives to be implemented by State in pursuit of green growth, it would not be possible to truly achieve this goal if the direct environmental impacts of oil exploration and production are not anticipated and adequately regulated for.

GUYANA'S PAST EXPERIENCES WITH NATURAL RESOURCE EXTRACTION

Guyana has experienced rapid growth in its mineral sector in recent years, both in production and value, especially in the gold industry. Exploratory activities have increased dramatically in the traditional areas of gold, diamonds, 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 directly and indirectly impact 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 (CI et al., 2013).

Economic Benefits from Natural Resource Extraction in the Past

1. Gold

Since the early 1990s, gold production in Guyana has experienced significant growth. A significant contributor to this growth was the operation of Guyana's only large-scale mine to date at Omai. From its inception in 1993, Omai created rapid production growth, with overall production peaking in 2001. While Omai's closure in 2005 harmed overall production, the continued operations of small and medium scale operators have led to year-on-year increases in production since that time. For example, declared gold production rose 48% in the five years between 2007 and 2013, all from small- and medium-scale production.

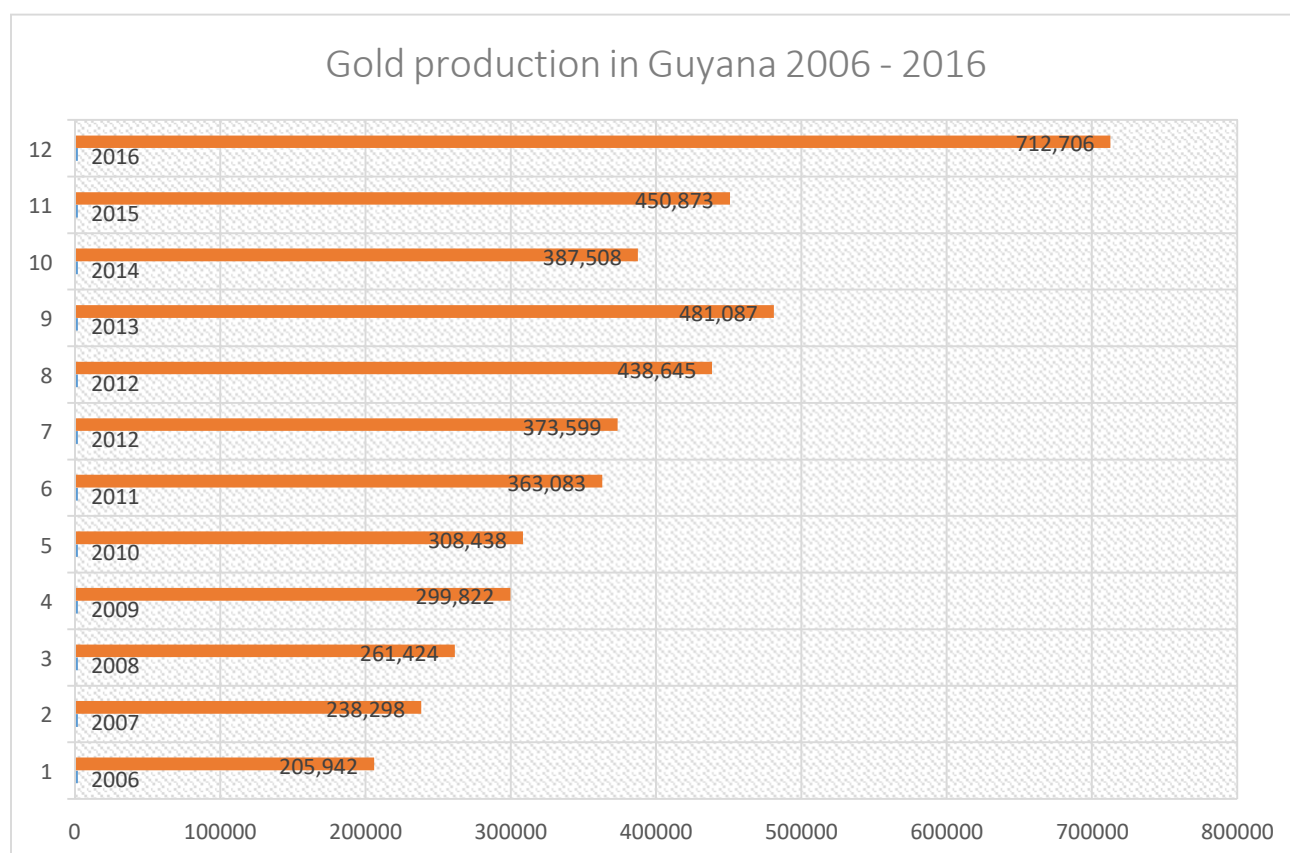


Figure 1: Gold production in Guyana 2006 – 2016 (Source: Bureau of Statistics data)

The observed increase in declared production has been driven by several factors, including the rapid increase in the international gold price, the availability of mining properties, and 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 (CI et al., 2013).

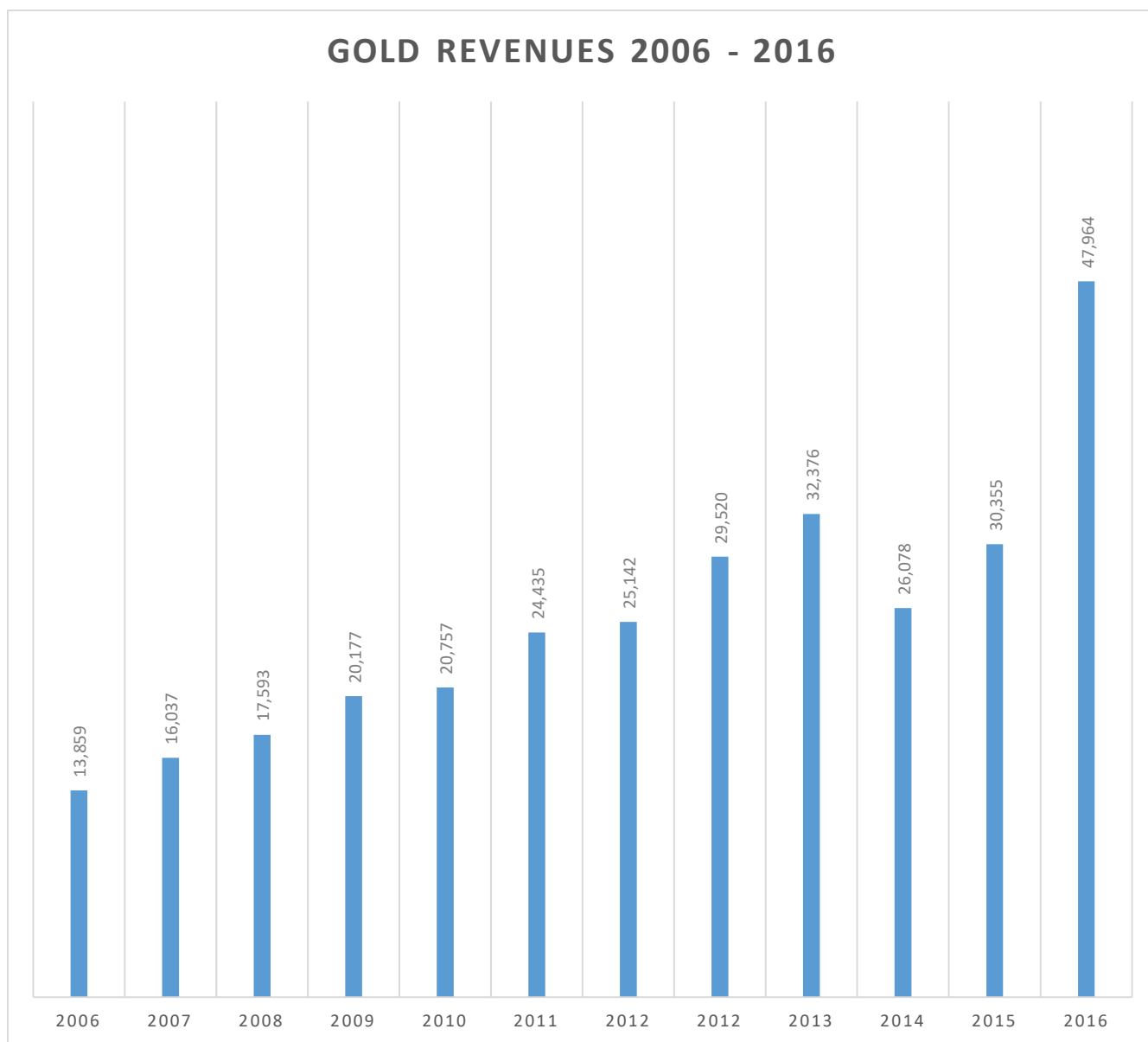


Figure 2: **Gold Revenues 2006 – 2016** (Source: Bureau of Statistics data)

Further, 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.

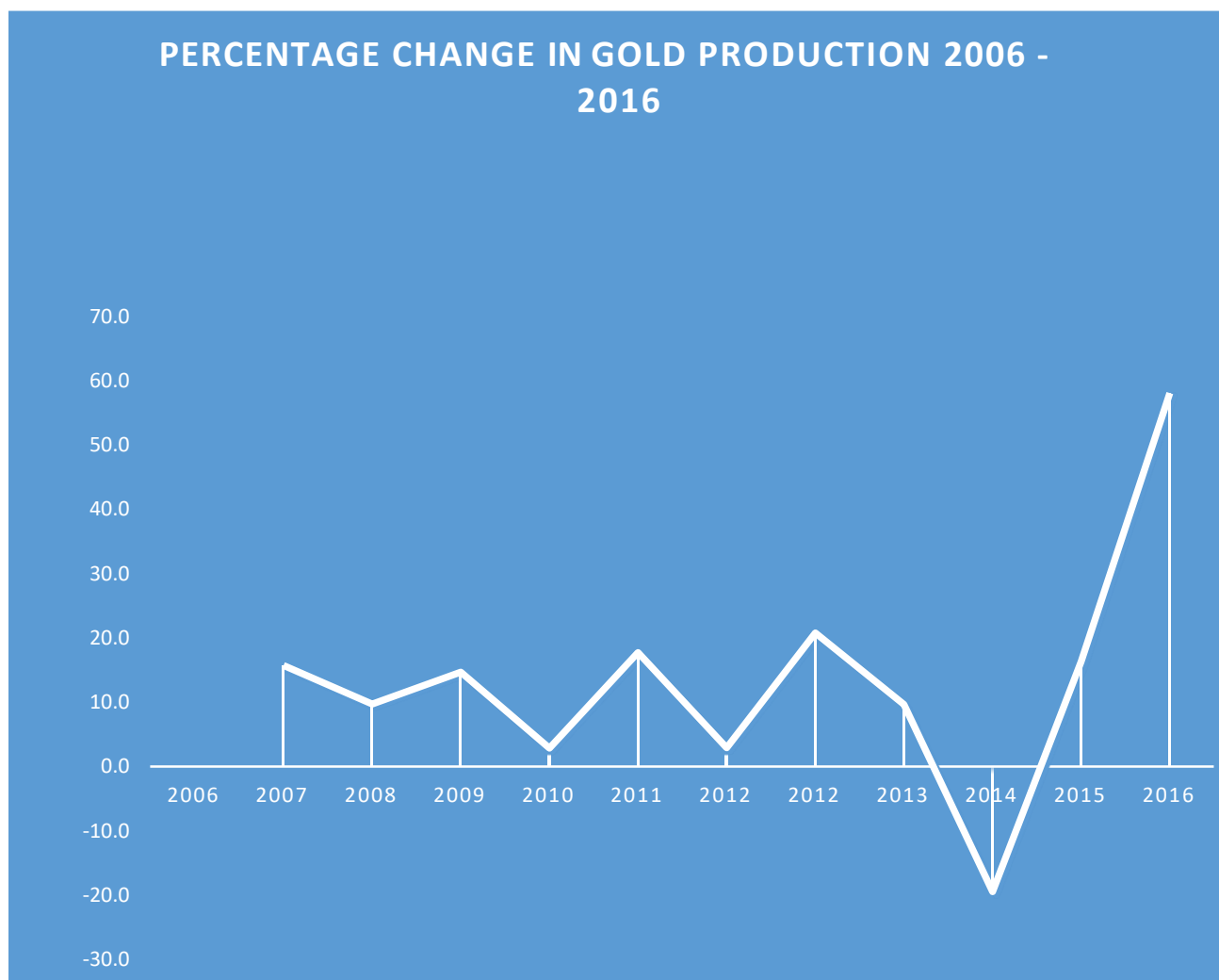


Figure 3: Percentage change in gold production 2006 – 2016 (Source: Bureau of Statistics data)

Other Minerals

Guyana is also an important producer of other minerals, notably bauxite, diamonds, sand and stone. Of particular note is the fact that diamond production has fallen recently, likely 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.

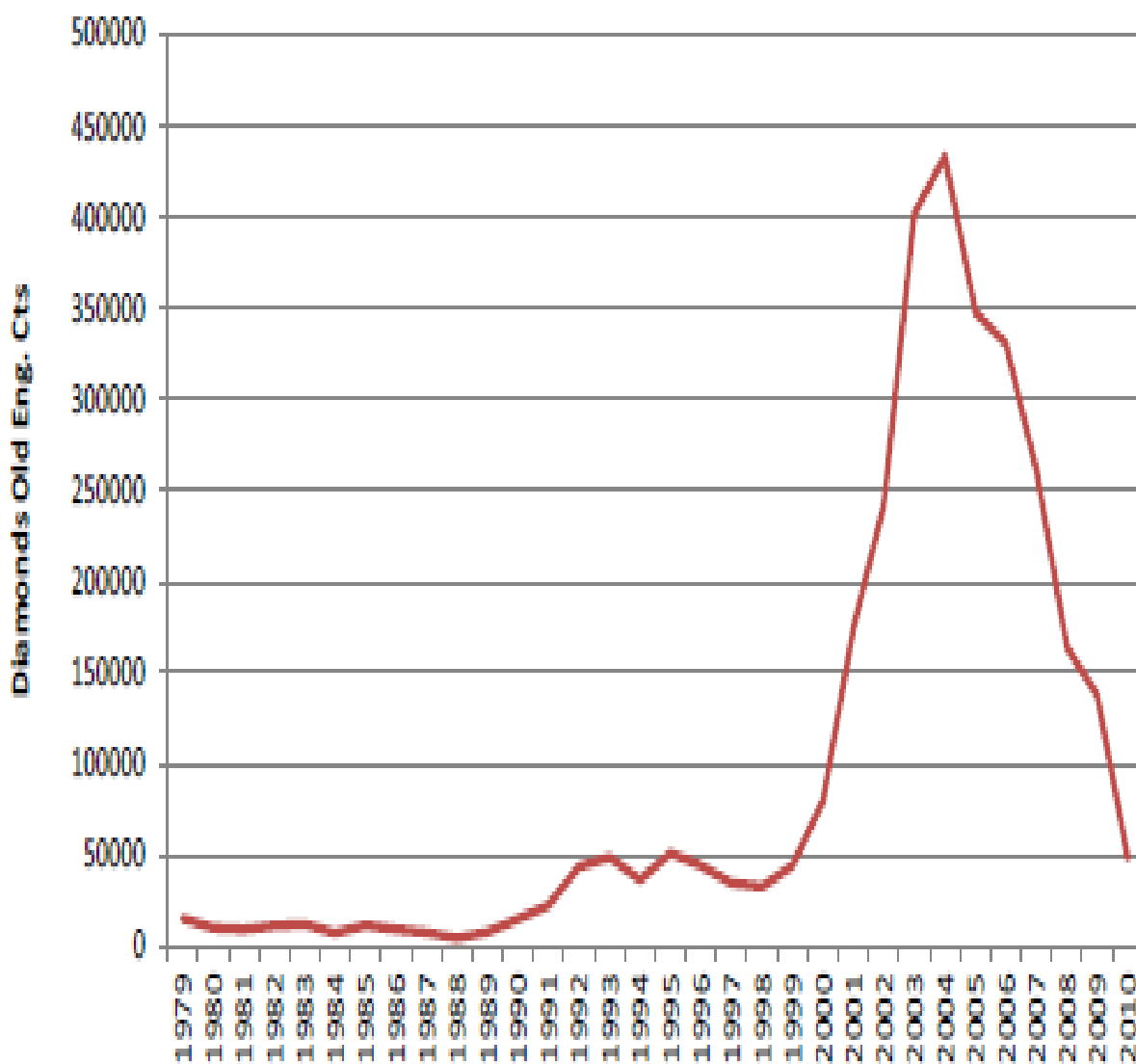


Figure 4: Diamond production in Guyana 1979 – 2010 (Source: GGMC)

The report by (CI et al., 2013) also notes that bauxite production has fluctuated over the last 20 years, experiencing growth and decline in response to economic and technical circumstances. Production historically focused on the town of Linden, but there are also essential facilities at Kwakani and Aroiama. According to the report, 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 regarding environmental, social and economic issues for the planned development of large-scale manganese, copper and gold mining operations.

Mining has also made an essential economic contribution as a provider of foreign exchange, being the primary export industry in Guyana (Bureau of Statistics, Guyana,

2012). An essential factor to consider in the analysis of the importance of the extractive industry sector is that all the gold produced today is from small and medium-scale producers, the majority of which are Guyanese. This means that a larger share of this foreign exchange most likely remains within the country than if large, international operators generated it.

In addition to providing foreign exchange, mining is also a valuable contributor to employment in Guyana, both directly and indirectly. A study by Thomas (2009), using the 2008 GGMC estimate of direct employment of 14,130, computed a total of 90,412 individuals who are directly and indirectly dependent on the industry (Thomas, 2009). In 2012, it was estimated that the industry directly employs 16,500 persons (OP, Guyana, 2013). Crucially, mining is an essential provider of employment in remote areas and mainly employs relatively low-skilled labour. 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 (Lowe, 2008). Therefore, small operations can provide an essential source of unskilled labour, and an essential source of livelihoods, although the lure of the wages can affect traditional activities in indigenous and other communities.

In addition, mining also provides essential 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.

ENVIRONMENTAL CONSEQUENCES

Those economic gains discussed in the previous section came at a very high environmental cost. Mining operations affect ecosystems in Guyana in several far-reaching ways. Most notably, mining is acknowledged as a significant threat to freshwater ecosystems, particularly in industries in Guyana, where the more significant portion of the sector is made up of smaller-scale operations, which tend to be less efficient in processing. This is a severe problem since the degradation of freshwater systems reduces their ability to provide many of the critical ecosystem services required to maintain the biodiversity on which human populations depend. Freshwater ecosystem services include clean drinking water, food, medicines, filtration, transportation, and flood regulation (WHO, 2005). Approximately 70 per cent of all anthropogenic use of freshwater is for agricultural purposes, and a significant portion of the world's energy generation is provided by freshwater systems (UNEP, 2008). Freshwater ecosystems' aesthetic and recreational services are mirrored in local and national economies.

Some of the specific impacts of gold mining on various elements of marine life, as elaborated in the (CI et al., 2013) report, are summarized below. It is essential to point out that mining operations typically are conducted in regions populated by the indigenous peoples of Guyana, who depend heavily on water from the rivers and streams for their domestic activities. These areas are often not provided with potable water through the mechanism used on the coast. Hence, harmful effects on the waterways in those areas are likely to affect those communities that utilize the water severely. A further effect comes from the harm caused to the marine life, which also provides an essential food source for the indigenous communities (Yte et al., 2020; Umukoro et al., 2020). Fish are essential food sources for humans and wildlife and are essential for maintaining a healthy ecosystem. High sediment loads can cause drastic decreases in species diversity and, in extreme cases, complete collapse of local fish populations (Cordone, 1961).

Omai Cyanide Spill

One of the most significant environmental events that resulted from gold mining in Guyana was the Omai cyanide spill. Omai operated the largest gold mine in Guyana and the second largest in South America. However, in August 1995, a dam broke. More than 400 million gallons of cyanide-saturated waste gushed into the Omai River and subsequently the Essequibo River. A few days after the accident, PAHO reported that aquatic life in the Omai creek and at the confluence of the Essequibo River was completely destroyed in the spill. Residents of the communities dependent on the river and creek could not utilize the river water for drinking, cooking, feeding animals, watering plants, washing clothes, and every other domestic use. There were also massive economic consequences, as the revenues earned from the Omai operations contributed significantly to GDP. Further, both locals and foreigners feared all seafood from Guyana, which affected exports and subsequently export revenues.

Moreover, the *Washington Post* reported that “Government health workers and the mine company last week spent millions of Guyanese dollars along the river, dispensing fresh water supplies, pumps, buckets and tankers to supplement their clean rainwater supplies.”

Mercury Pollution

The Conservation International report further discussed the effects of mercury on aquatic organisms. It was stated that miners use metallic (inorganic) mercury that can be converted into highly toxic methyl-mercury by micro-organisms in rivers and streams. It has been known that mercury adversely affects reproduction, growth, behaviour, metabolism, osmoregulation, and respiration and ultimately kills aquatic organisms. The (CI et al., 2013) report further elaborated that, in fish, levels of 10–20 $\mu\text{Hg/g}$ or more in muscle tissues are found to have lethal effects while 1–5 $\mu\text{Hg/g}$ has sublethal effects. In Guyana, mercury levels of 5–20 $\mu\text{Hg/g}$ were found in carnivorous fish, and 0.2–0.5 $\mu\text{Hg/g}$ 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 (CI et al., 2013).

Methyl-mercury affects reproduction in fish by reducing egg production, the viability of sperm, frequency of hatching, and survival of offspring. Maternal muscle concentrations of $> 1.35 \mu\text{Hg/g}$ are associated with lower offspring survival. In Guyana, average concentrations for carnivorous fish exceeded the level associated with lower offspring survival (1.35 $\mu\text{Hg/g}$). Mercury pollution also affects wildlife health and reproduction, particularly those that rely heavily on fish for food, such as otters (CI et al., 2013).

IMPACTS OF LAND MINING

Deforestation and forest degradation

The leading causes of deforestation include the 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 hectares of forest were cleared for gold mining activities between 1990 - 2009. Studies conducted in Suriname indicate that forest recovery rates following small-scale gold mining activities are prolonged and qualitatively inferior compared to other anthropogenic disturbances.

Deforestation and forest degradation result in the loss of wildlife habitat and a reduction of wildlife carrying capacity, ultimately reducing local wildlife numbers.

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. Material deposited on the riverbanks affects the hydrological continuity between the river channel and the floodplain. Wetlands in the riparian zone and floodplain provide habitats for invertebrates and birds. Some species of birds make their nests on riverbanks. Dredging is therefore likely to disturb or destroy suitable feeding and nesting sites. Amphibians may also lose habitat diversity and spawning areas.

Sediments

Increased sediment load occurs from tailings' direct and indirect discharge 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.

Mercury pollution

Pollution of watercourses occurs in the same way as those described for river dredging.

CONCLUSION

The points above cast doubt on Guyana's potential to attain green state development. Despite laws, Guyana continues to struggle with mining's environmental impact. The Mining Act, the EPA Act, the OSH Act, and many codes of conduct and mining rules control the Commission's activities. Guyana signed the Minamata Convention to reduce mercury usage in mining. Despite various rules, Guyana has not been able to address or avoid some of Guyana's worst environmental impacts.

Mercury's effects on humans and marine life are a sensitive point. According to a Global Environmental Facility (GEF) project proposal, "previous attempts to tackle mercury in Guyana's mining have typically failed." The plan cited lessons from prior efforts in this area. Inability to represent the relevance of economic incentives and more enormous implications on livelihoods, and failing to incentivise good practises across the supply chain. Another major lesson was the limited availability of cash for investment in new technologies and the lack of profit-driven firms to lead a transition. These lessons concern "top-down" techniques vs a comprehensive response to miners' and communities' demands that considers their whole lives and situations.

Replanting mined areas has been ineffective. According to the *Stabroek News*, the GGMC recovered 44 acres of mined ground for \$100 million during the previous three years. According to Commissioner Dennison, the sites have two previous bauxite mines and four former gold mines. Despite having a legal duty, the head of GGMC's Environmental Department said land reclamation was second. According to the head of the Environmental Department, the regulation compels the miner to plan for reclamation and deposit an environmental bond. The miner, not GGMC, is responsible for land reclamation. Existing environmental bond requirements are inadequate, and the total cost of land rehabilitation must be incorporated into future mining plans.

With a flourishing oil and gas sector likely, Guyana must assess whether it fully understands offshore oil exploration and production's environmental impacts.

Environmental concerns must be addressed at every oil exploration and production stage. Guyana must plan for oil spills to minimise environmental harm. Furthermore, Environmental expenses should not be borne just by the government and authorities but also by oil companies.

When claiming to build a green state on a potentially destructive activity to the environment in its production and consumption, additional care must be taken to remedy these prospective harms. Guyana may learn from its past natural resource utilisation and other oil-producing countries' best practises. In this spirit, initiatives to manage the developing oil and gas sector have been made or are underway.

Oil And Gas Regulations Include the Following:

Petroleum Act, Cap 92:01 (1930), regulates the importation, sale, and storage of petroleum; Petroleum (Exploration and Production) Act, Cap 65:04 (1986), regulates the prospecting and production of petroleum and natural gas; and Petroleum (Production) Act, Cap 65:05 (1939), vests the state's property in petroleum and natural gas within Guyana.

In the meanwhile, the Petroleum Regulations (1930), the Petroleum (Exploration and Production) Regulations (1986), and the Petroleum (Prospecting and Winning) Regulations were issued (1986). (1967). Ancillary laws include tax, customs, environmental, marine, and occupational safety and health (OSH). The Natural Resource Fund Act, No. 12 of 2019, provides a fund to manage Guyana's natural resource wealth, while a special committee is considering the Petroleum Commission Bill.

Resources Fund

The Natural Resource Fund Act (12 of 2019) "creates the Natural Resource Fund to manage Guyana's natural resource wealth for the people and the country's sustainable development, and for other purposes." Section 3(2) of the Act explains how to do this.

1. Ensuring natural resource income does not affect government spending;
2. Ensuring natural resource income does not hurt economic competitiveness;
3. Sharing natural resource riches equally to future generations;
4. Using natural resource earnings to fund national development goals, mainly green economy programmes.

Natural Resource Funds are crucial for managing natural resource revenue. Governments may manage oil, gas, and mineral revenues using natural resource funds. They may be used to mitigate budget gaps when natural resource profits decline, save limited income for future generations, or fight Dutch disease. They may also be a source of favouritism or nepotism and hinder public financial management, harming economic growth. Nearly 40 countries with natural resource funds need openness, accountability, and operational norms to succeed (Bauer, 2014).

Inadequate management of natural resource money has undermined governmental financial management systems and led to nepotism and favouritism, with fatal results. Many funds lacked goals or standards, making public funding more problematic. In Angola and Russia, they have been used to dodge public scrutiny and squander billions of dollars (Bauer, 2014).

Transparency Initiative

The EITI was founded by governments, companies, and civil society organisations on the concept that natural resource wealth should benefit citizens and need transparency and responsibility. The EITI Standard mandates nations to provide timely and accurate information on natural resource management, such as how licences are assigned, how much tax and social contributions businesses pay, and where this money ends up in national and regional governments. Guyana joined in 2017. Through the EITI, enterprises, governments, and citizens know who works in the sector, under what conditions, how much revenue is created, and who benefits.

Guyana reported GYD 20,800 million in extractive sector income in its first EITI report. The Guyana Gold Board (GGB) earned 33% of the sector's total revenue, followed by the Guyana Revenue Authority (GRA) and the Ministry of Finance (MoF).

RECOMMENDATIONS

Regulatory control and enforcement are the responsibilities of national authorities in Guyana. Thus, these agencies must become familiar with best practises in the field for Guyana to avoid some of the pitfalls from our experience with the extractive industry, as well as the environmental pitfalls experienced by other countries from oil exploration and production. While it is acknowledged that the extractive industry, even without oil, is a significant contributor to Guyana's GDP and that its importance will skyrocket with the addition of the new sector, it is also acknowledged that much stricter regulation and control will be necessary for Guyana to truly pursue Green State Development. The following recommendations are being proposed to manage various aspects of the extractive industry effectively.

Mitigating the Environmental Impacts of Offshore Oil Exploration and Production

1. While legislation and regulations are essential, they do not provide sufficient assurance that environmental performance will adhere to legislative requirements or best practices. For increased effectiveness, these regulations need to be integrated into government agencies' formal management systems and activities. They must address all aspects of desired environmental performance (E & P Forum/UNEP, 1997). The Petroleum (Exploration and Production) Act, for instance, focuses heavily on the licencing process, disclosure of information, and financial matters such as taxes and royalties. The Act needs to be updated to directly address the environmental controls that ought to guide the operations of oil companies. The Act also places heavy weight on the contents of the specific agreements between the company and the government, which means that all provisions will not apply to all companies. This will no doubt affect the uniformity of enforcement. Instead, it would be better to have the same rules for all exploration and production companies.
2. Ecological and social factors that need to be directly regulated for their protection include protected areas, priority watersheds, critical ecosystems, indigenous territories, and proposed reserves (Finer, Jenkins, & Powers, 2013). Therefore, systems need to be put in place to collect baseline data on each of these factors and monitor changes continuously. Any damage, destruction, or degradation will be found early and stopped before it does a lot of damage.
3. Finishing and testing the draught oil spill response plan.

Improving Transparency in the Extractive Industries:

1. The first EITI report noted that "although government agencies have provided several EITI data sets, financial data sets were not systematically subject to independent audits as required by Requirement 4.9.c of the EITI Standard." As such, it is recommended that government agencies establish an EITI database in the government system by enhancing the current management information systems of the government agencies involved in the GYEITI process (i.e., GRA, GGB, GGMC, NIS, EPA, MoF) in order to allow, among other benefits, systematic publication of EITI data required to be published in the EITI report; capacity building; and raising awareness of government officials on transparency and open data disclosure (Guyana EITI, 2019).
2. Guyana EITI, (2019) also reported that in Guyana, several licence holders operate in different regions, and they may own several licences accordingly. Government agencies could not report EITI data per licence, per region, or at the project level. This was the case for GGMC and GGB, which did not report royalty payments and production details by the project. Similarly, for GRA, where the system is such that it presents information by TIN and does not necessarily capture export data or payments by project or by licence.

The report recommended that government agencies ensure the availability of disaggregated payment flows, exports, and production by the project. This would enable the reporting of relevant data at the project level by changing the tax declaration procedures and forms to be filed by extractive firms for GGMC, GGB, and GRA to mainstream information about disaggregation and reporting at the project level when appropriate.

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