

# Assessing Resource Curse Risks in Namibia's Green Hydrogen Developments with Insights from Diamond Mining.

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*A dissertation submitted to the Faculty of Engineering and the Built Environment in partial fulfilment for the degree of Master of Philosophy in Energy and Development.*

Department of Chemical Engineering, University of Cape Town

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DECEMBER 2023

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## Acknowledgments

First and foremost, I express my gratitude to my Heavenly Father for guiding and sustaining me throughout the journey of completing my Master's dissertation. I am thankful for your faithfulness, provision, grace, comfort, and unending love; you are my eternal King.

I extend my appreciation to Prof. Harro von Blottnitz, my supervisor, for his guidance and support during this academic endeavor. Thank you for permitting me to delve into this intricately complex subject. Your insights and direction have been priceless.

To my sister and closest confidante, Magano Akuaake, I want to convey my heartfelt thanks for accompanying me through every phase of this challenging journey. Your sisterly wisdom, love, constant motivation, and encouragement during the lengthy hours propelled me to the summit. Thank you for consistently holding my hand through both highs and lows.

A sincere thank you to all the interviewees who generously contributed their time and insights to this thesis. Your information played a pivotal role in gaining a comprehensive understanding of this significant and intricate topic.

Finally, I offer a special thank you to my parents, Mr. and Mrs. Akuaake. This thesis is dedicated to both of you, and words cannot adequately express my gratitude. Your prayers, love, and unwavering support were instrumental in making this achievement possible. I feel incredibly blessed, and your advice and guidance hold immeasurable value.

## Abstract

The global shift towards a green economy has garnered momentum in various countries, propelled in good part by steep growth and falling prices of renewable energy. So called "green" hydrogen, derived from electrolysis of water at times and in places with excess renewable energy is expected to become a major clean energy carrier. It holds the dual role of energy storage and supply, as well as decarbonizing challenging sectors such as aviation and maritime transport and steelmaking. Several countries with abundant wind and solar resources are envisioning to become major green hydrogen producers and exporters. Economic history, however, cautions against a high resource-sector dependence, with a well-developed literature on the resource curse.

Namibia is one of these countries. This dissertation offers an exploratory assessment of resource curse risks which might emanate from Namibia's green hydrogen developments, focusing on the Southern Corridor Development Initiative. Drawing from historical experiences in the diamond sector, and building on institutional framework theory, the research examines the nuanced interplay between institutions and risks in the emerging green hydrogen industry. The study's objectives include assessing historical resource curse experiences in Namibia's diamond sector, identifying potential risks and their implications in the green hydrogen industry, and understanding the role of historical factors in shaping green hydrogen development.

To achieve these objectives, the dissertation presents a mixed methods approach. The historical review utilizes secondary data sources to gather information on Namibia's diamond sector pre- and post-independence. The anticipatory part presents an expert elicitation, combining a survey with semi-structured interviews. The two parts are jointly analysed to offer quantitative and qualitative insights into the nuances of the green hydrogen industry and potential risks. The study acknowledges limitations related to the number of respondents and their willingness to participate but underscores the importance of the valuable insights provided by those who participated.

Findings from the diamond sector analysis reveal a historical colonial curse rather than an economic resource curse. Post-independence, institutional shifts increased government ownership but left lingering socio-economic impacts unaddressed. Findings from the anticipatory study reveal that the green hydrogen industry faces potential resource curse risks, most likely concerning environmental impact, talent distribution challenges, expatriates dominating high-income jobs and more income

inequality. The analysis suggests that the country's success with major green hydrogen industry ventures hinges on institutional responses to labor dynamics, environmental protection, and equitable economic benefits. Historical parallels underscore concerns about transparency, land concessions, and overexposure to a single dominating economic actor, calling for responsible industry development. The research highlights the importance of learning from past experiences to ensure sustainable development. The dissertation ends with recommendations for future research and for practice.

## List of main acronyms and abbreviations

CDM	Consolidated Diamond Mines
GDP	Gross Domestic Product
GH2	Green hydrogen
GW	Gigawatt
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EITI	Extractive Industry Transparency Initiative
EMA	Environmental Management Act
IMF	International Monetary Fund
IPPR	Institute for Public Policy Research
NDP	National Development Plan
NDTC	Namibian Diamond Trading Company
NSA	Namibian Statistics Agency
RE	Renewable energy
SACU	Southern African Customs Union
SCDI	Southern Corridor Development Initiative
SEA	Strategic Environmental Assessment
TVET	Technical and Vocational Education and Training

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## Chapter 1: Introduction

This thesis addresses the core research question: ‘*To what extent has Namibia historically experienced a resource curse in its diamond mining sector, and what role have institutions played over time in the distribution and benefits of the resource, and how does this historical context inform the potential risks and implications for the emerging green hydrogen industry?*’. It does so by using a mixed method approach.

### 1.1 Background

The notion of a green economy based on hydrogen has been enjoying renewed and widespread momentum in many developed and developing countries. This is mainly driven by the cheap renewable energy supply which is required for making hydrogen cost competitive and therefore a viable option (IEA, 2021). Green Hydrogen is expected to play a crucial role in decarbonizing hard-to-abate sectors such as the aviation and the maritime sectors. Given the intermittency of renewable energy (RE), the storage of energy has and will continue to play an essential role in the energy transition which can also be solved by green hydrogen (IEA, 2021). This means that green hydrogen can carry out both these functions (Noussan *et al.*, 2021). As a result, more than 30 countries are engaging in adopting green hydrogen strategies (IRENA, 2020) such as research and development programs, vision documents and roadmaps, as seen in Figure 1. This is largely driven by governments, intergovernmental organizations, think tanks and the private sector.

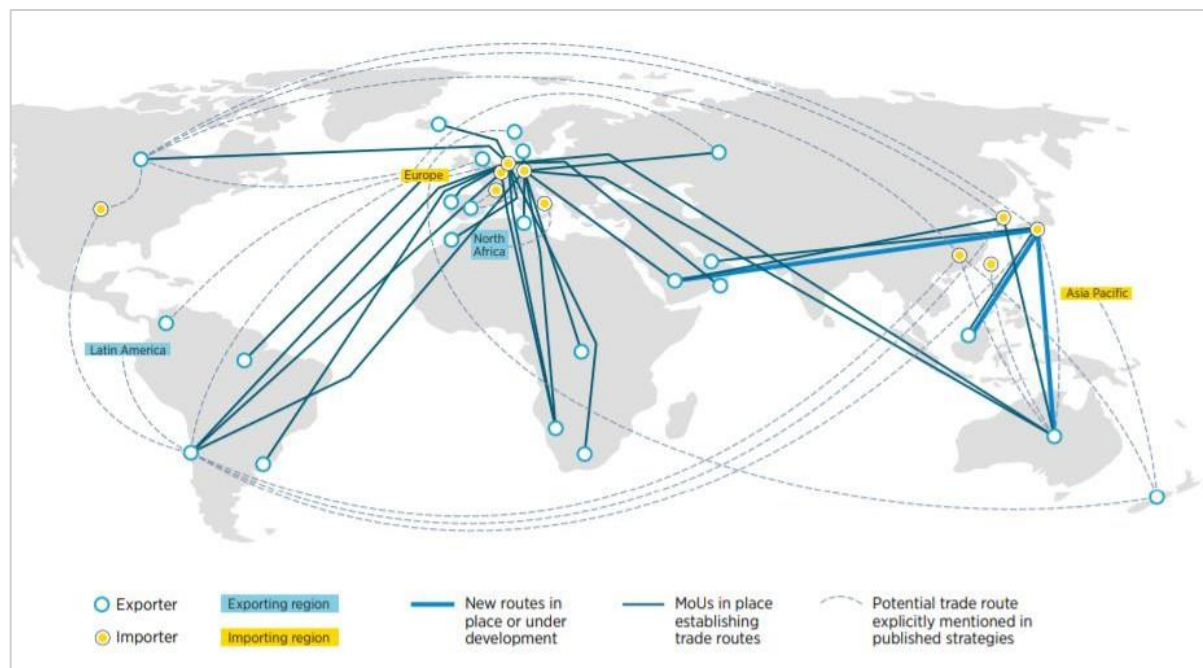


Figure 1: Expanding network of green hydrogen trade routes, plans and agreements (Source: Natural Earth, 2021)

Namibia is uniquely positioned to be one of the largest green hydrogen producers globally. The country has top resource-rich locations for wind and solar as well as significant land availability located near coastal areas (Hyphen, 2022). Therefore, Namibia has ambitions to become one of Africa’s first green

hydrogen export hubs. Plans are currently in place to develop a green hydrogen project estimated to cost US\$9.4 billion with a target of 300,000 metric tons of green hydrogen production a year, in the Southern region of Namibia as shown in Figure 2 (Hyphen, 2022). The project is being developed to support the country's economic growth and to assist in decarbonizing the global energy system. However, the net benefits are still unclear for developing countries looking to base their economies on these multiple Giga-Watt projects (von Oertzen, 2021). These projects could potentially bring good benefits to developing countries and may result in economic spillovers, however, they may also have negative effects such as those related to the resource curse. For decades, Namibia has relied on its diamond resources as a significant driver of its economy.

The diamond industry has contributed substantially to the country's economic development, foreign exchange earnings, and job creation. However, this dependence on a single resource has also raised concerns about the resource curse, a phenomenon where nations with an abundance of natural resources are often seen to experience negative consequences, in terms of social and economic development.

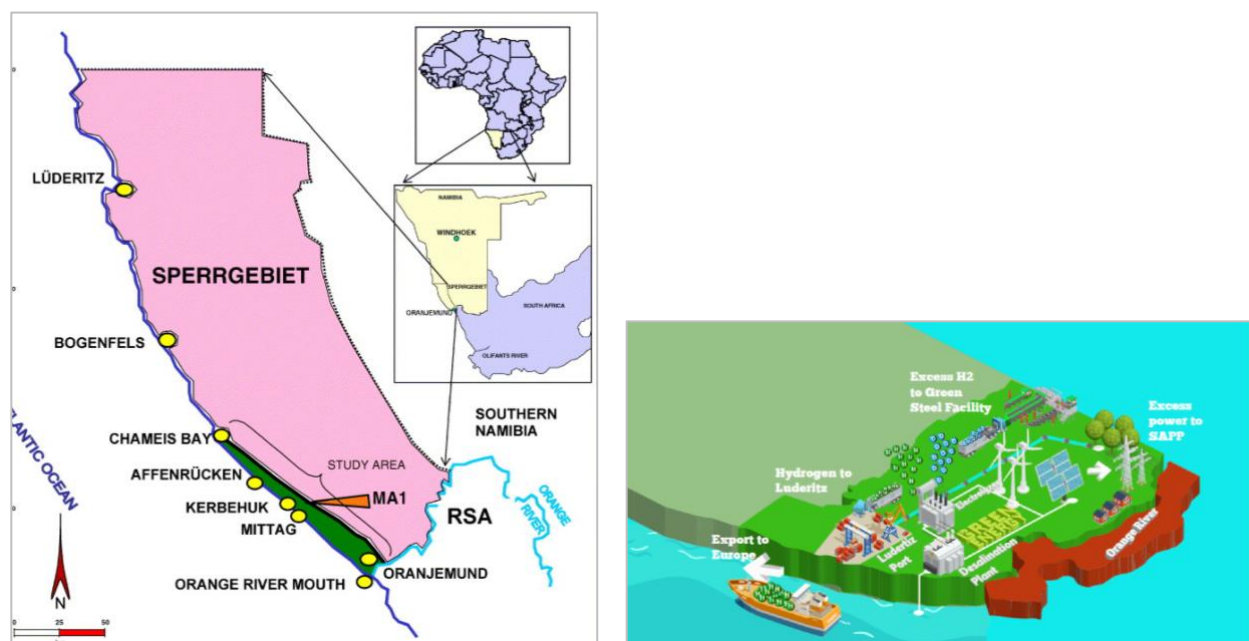


Figure 2: Proposed green hydrogen industry in the southern region of Namibia (left), in the Sperrgebiet Area (left) (Source: Hyphen, 2022; Jacob et al., 2006)

Early scholars have studied the resource curse in fossil fuels and mineral resources, and more recently a focus on renewable resources has started taking place. Internationally, as more renewables are taken up due to climate change, scholars have more recently applied the resource curse in renewable resources. The uptake of renewable energy has increased, especially during the period between 2005 to 2011. This period involved building much wind and solar and was mainly driven by the cheaper prices of renewables as well as the need to limit carbon emissions (Trudeau et al., 2011). A few studies have explored the likelihood of a resource curse in solar energy developments (Leonard et al., 2022a), wind

energy developments (Gennaioli *et al.*, 2011) and hydropower (Hancock and Sovacool, 2018). The empirical evidence provided in these studies confirm the presence of several resource curse symptoms.

Anticipating a significant capital inflow for green hydrogen projects in Namibia, ongoing efforts to establish and refine legislation and regulations will be essential to prevent the recurrence of resource curse challenges observed in other resource extraction endeavors. The thesis addresses the paradox between the substantial potential of a hydrogen economy and the potential for a resource curse. Its objective is to evaluate the probability of resource curse risks in green hydrogen initiatives and extract insights from Namibia's well-established diamond history. The geographical scope of the thesis focuses on the "Sperrgebiet" in Southern Namibia.

## 1.2 Purpose and Significance of the Research

The resource curse theory, grounded in empirical evidence from various countries, has demonstrated the multifaceted and far-reaching impacts on societies, politics, and economies that can detrimentally affect a nation's overall economic growth and development. These challenges have been observed in the context of traditional resource sectors such as fossil fuels and minerals. The study of resource curse risks in the context of green economies based on green hydrogen presented a compelling and underexplored research area. Namibia, a country with a rich mineral resource development history and new interest in becoming a global leader in green hydrogen, serves as a pertinent case study for this research. Despite its significant potential for green hydrogen production and export, Namibia's ambitious plans may be encumbered by the presence of resource curse risks. If left unaddressed, these risks could divert the nation from realizing its green hydrogen aspirations and may potentially exacerbate the country's existing socio-economic and developmental challenges. These effects on the green hydrogen have not yet been studied for Namibia as identified in the literature review.

This study draws inspiration from Leonard *et al.*'s innovative risk assessment framework tailored for renewable energy. The framework proves valuable in examining the risks associated with green hydrogen development in Namibia, utilizing a resource curse perspective that effectively balances the potential of such developments with a pragmatic understanding of associated risks. In contrast to conventional economic and statistical regression analyses typically employed to assess the resource curse, this study takes a distinct approach. Leonard *et al.* (2022) underscores the significance of evaluating resource curse risks early in the energy transition of low to medium-income countries, highlighting the importance of addressing potential negative impacts before they become entrenched.

## 1.3 Objectives and Scope

The objective of this dissertation is to conduct a comprehensive assessment of the potential resource curse risks associated with green hydrogen developments in Namibia, focusing particularly on the

ambitious large-scale export project envisioned under the Southern Corridor Development Initiative (SCDI). The following research questions will be answered:

- To what extent has Namibia historically experienced a resource curse in its diamond mining sector and what role have institutions played over time in the distribution and benefits of the resource?
- What potential risks does the green hydrogen industry in Namibia face, and what are their implications?
- How do historical factors related to resource management affect the sustainable development of the green hydrogen industry?

It is crucial to note that the findings and conclusions of this research are inherently context-specific to Namibia and aren't meant to provide a one-size-fits-all representation for all countries seeking to embark on green hydrogen development projects. Rather, this study offers a valuable case study that can serve as a reference point for other nations considering similar initiatives, shedding light on the potential pitfalls and opportunities associated with resource curse risks. The outcomes of this research, in its uniqueness and specificity to Namibia, are intended to offer decision-makers and stakeholders a foundation upon which they can chart a course toward sustainable development, a critical endeavor for the advancement of the entire continent.

## Chapter 2: Literature review

This section serves as a comprehensive review of the relevant literature underpinning this dissertation, with a primary focus on the resource curse theory. To gain a thorough understanding of this theory and its evolution over time, it is imperative to examine the diverse perspectives presented by economists and political scientists. The literature review chapter encompasses two distinct sections. The first segment explains the historical perspective of resources as an advantage to resource-endowed nations and the gradual shift in this perception over recent decades.

Prominent scholars in the field have identified two primary channels through which the resource curse manifests: the economic and political channels. In the first section, a comprehensive evaluation of these channels is presented, explaining the manifold arguments associated with each and providing empirical evidence derived from the existing literature. Furthermore, insights are drawn from the unique case of Botswana, a nation heavily reliant on a single resource, which has managed to mitigate the most adverse effects commonly associated with the resource curse. The second section of this literature review extends its exploration to the application of the resource curse theory within the context of renewable resources, particularly within the ongoing energy transition. The concept of 'green extractivism' is introduced and a concise overview of the existing body of literature concerning the developmental risks and outcomes associated with hydrogen-based economies is offered. Through these two sections, the literature review provides a comprehensive foundation for the subsequent analysis, offering a holistic perspective on the resource curse theory.

### 2.1 Natural resources: a mixed legacy

Natural resources underpin the foundation of human activity and cover a wide range of resources, from commodities to fuels and minerals. For decades, human activity has relied on the extraction and use of resources for economic growth and development. This has however been without much consideration of their emissions and the fact that these resources are finite. Before the 1980s, studies showed natural resource endowments to be a favorable basis for economic growth and development, referred to as a 'blessing' (Brunnschweiler, 2008). Rostow (1961) argued that resource endowments were critical in a country's industrial take-off. He further argued that the big push theory (Rosenstein-Rodan, 1961) provided a mechanism by which the exploitation of these resource endowments would generate resource rents which would help set a country's industrialization into motion. Countries such as the United Kingdom, Australia and United States are commonly cited to have benefited greatly from their resources, propelling the economic powerhouses they are today. Developing countries on the other hand, as Dogan *et al.* (2020) argued, have not made much progress in industrializing their countries

due to a lack of capital and technological innovation. As a result, many low- and middle-income countries have focused on export-led strategies, that prioritize boosting exports as a primary driver of economic growth.

Starting from the 1980s, scholars and institutions like the World Bank and International Monetary Fund (IMF) began to perceive resources in a different light. According to Rosser (2006), resources were seen as linked to economic downturns, insufficient social development, and, in some nations, civil conflicts. Subsequent studies have proliferated to explore the adverse effects associated with an abundance of natural resources. Wu et al. (2018) observed that if a region's economic growth relies excessively on the exploitation and output of its natural resources, it may impede economic advantages and hinder industrialization progress. Similarly, Ross (2016) noted that countries rich in resources face a heightened risk of evolving into rentier states, where governments overly rely on resource-based income, leading to decreased accountability to citizens through reduced tax collection. Acemoglu and Robinson (2001) also argued that natural resource benefits may accrue at the initial stage for developing countries however after some time, these benefits would dissolve. These negative impacts associated with resources are all attributed to what is called the 'resource curse'.

#### 2.1.1 Resource curse theoretical framework

Over the past two decades, several scholars have sought to examine the impact of abundant natural resources on different countries (Sachs and Warner, 2001; van der Ploeg, 2011; Adams et al., 2019). To understand and illustrate the inverse relationship between overly relying on resources and economic growth, Auty (1993) coined the term 'resource curse'. Various theoretical and empirical approaches have been employed, yielding diverse outcomes as different countries exhibit varied experiences. By the early 1990s, the optimistic perspective regarding the role of resources in growth and development was empirically tested, confirming the validity of the resource curse theory. Countries primarily in Africa and Latin America, endowed with resources, displayed lower and more volatile growth, along with subpar performance in development indicators compared to resource- scarce nations (Sachs and Warner, 1997). These adverse economic outcomes (Sachs and Warner, 2001) have been attributed mainly to weak institutions and excessive dependence on specific resources, affecting countries like Nigeria, Angola, and the Democratic Republic of the Congo. This evidence supports the notion that resources can have detrimental consequences. Scholars argue that the effects of the resource curse are contingent on various factors. A landmark study by Sachs and Warner (1995) found that natural resources don't always hinder growth, and Andersen and Aslaksen (2008) demonstrated that the impact of natural resources depends on constitutional arrangements. Other scholars such as Khanna (2017), Clootens and Kirat (2020), Menaldo (2016), and

Belarbi et al. (2021) point to factors like regime types, the current state of the country, institutional strength, and governance as reasons for sluggish economic growth.

The resource curse problem is complex, and there is no universally accepted explanation (Sachs and Warner, 2001). Economists assert that the resource curse is not solely an economic issue but also a political one. The conflicting findings in resource curse studies can be attributed to the diverse selection of variables used. Hence, ongoing scrutiny is necessary in the field of resource curse, and the question of whether it exists remains a continuous discussion in academia. Resource curse transmission channels have been explored by scholars in the field to elucidate this curse, which are now often categorized into economic and political mechanisms.

i) Dutch Disease

The Dutch disease phenomenon emerged in the Netherlands during the 1970s and is elucidated by the appreciation of the real exchange rate resulting from a substantial influx of foreign currency due to natural resource exports (Corden and Neary, 1982). Consequently, this has repercussions on non-resource sectors by diverting resources and labor away (Ross, 1999) and by causing an escalation in the prices of non-resource commodities, rendering them more expensive and less competitive (Badeeb et al., 2017). The interpretation of the Dutch disease phenomenon has evolved over time. Some scholars refer it to as a country's inability to develop and sustain a competitive manufacturing sector, while others view it as the primary macroeconomic explanation for the resource curse (Sarraf & Jiwanji, 2001). A notable limitation identified in the literature regarding the Dutch disease is its prediction that all countries will experience the adverse effects of the resource curse (Wick & Bulte, 2009). Although perhaps relevant for some developing countries, many developing countries remain with relatively small manufacturing and agricultural industries compared to the Netherlands. Ross (1999) supported this by arguing that resource sectors do not necessarily draw capital and labor away from other sectors in developing countries due to labor surpluses found in these countries as well as increases in foreign capital. Similarly, countries with a currency peg may be shielded from real exchange appreciation with the use of the monetary policy rate (Schmitt-Grohé and Uribe, 2001). The authors in their statistical analysis found that under a currency peg, smaller real exchange rate appreciation occurs, partially insulating the resource sector from the Dutch disease. As a result, the application of the Dutch disease theory as a macroeconomic channel may play a minor role in developing countries and should be carefully considered.

ii) Price Volatility

Another economic challenge with natural resource exports is the volatility of commodity prices. Countries highly dependent on natural resource extractions are at risk of great fluctuations of

macroeconomic variables such as the price volatilities in international markets (Gylfason and Zoega, 2004). This can induce inconsistent flows of fiscal revenue for governments which may lead to macroeconomic disproportions. Empirical evidence provided by Ramey (1995) showed the inverse relationship between economic growth and macroeconomic volatility. Van der Ploeg and Poelhekke (2009) and Frankel (2010) similarly support the existence of the channel. A diversified economy can protect it to survive commodity shocks (Kaplinski *et al.*, 2011).

### iii) Rent-seeking and corruption

Two common political channels of the resource curse are rent-seeking and corruption. Different approaches have been taken on this channel however an overall set of common ideas are evident. The literature on rent-seeking recognizes that elites in resource-rich countries are likely to adopt institutions that promote their rent-seeking behaviors (Fors and Olsson, 2007). Rent-seeking is also attributed to a negative impact on government accountability, whereby governments have been associated with lower spending because of being freed from the need to raise taxes (Savoia and Sen, 2021). This makes the government less accountable towards their citizens and therefore rents may not necessarily be spent in ways that promote economic development. Mehlum *et al.* (2006) used regression analysis carried out by Sachs and Warner (1995) and included institutional variables to show how rent-seeking can be avoided with strong institutions. Conversely, corruption has demonstrated adverse impacts that appear more pronounced in economies relying heavily on natural resources. Sala-i-Martin and Subramanian (2013) contend that corruption has detrimental effects on economic growth. Adika (2020) further linked this to the role that institutions play by showing that corruption often occurs under weak institutions. Both concepts are pivotal in the resource curse theory as they link the role that governments play and their effects on economic growth.

### iv) Institutions

The role of institutions has been highlighted to play a major role in the growth and development of an economy. The institutional theory provided by Acemoglu and Robinson (2001) states that resources are not the cause of poor economic growth but rather the institutions that govern them. The extensive literature on the subject can be divided into two categories. Some scholars argue that resource endowments can shape the functioning of institutions (Ross, 2016; Scholvin, 2021) while other scholars argue that the quality of institutions determine whether resource endowments are advantageous or disadvantageous (Sachs and Warner, 2001; Mehlum *et al.*, 2006; Henry, 2019; Adika, 2020). The latter explanation has received more attention.

Mehlum *et al.* (2006) analyzed yearly economic growth in 42 countries with resource exports making up more than 10% of GDP. The authors found that weak institutions led to lower economic growth compared to stronger institutions as seen in Figure 3. Similarly, Botswana’s remarkable economic performance is attributed to the presence of strong institutions (Acemoglu and Robinson, 2001). Considerable importance has been placed on the notion that nations possessing robust institutions can broaden their economic base and reduce dependence on natural resources as a means of achieving economic growth.

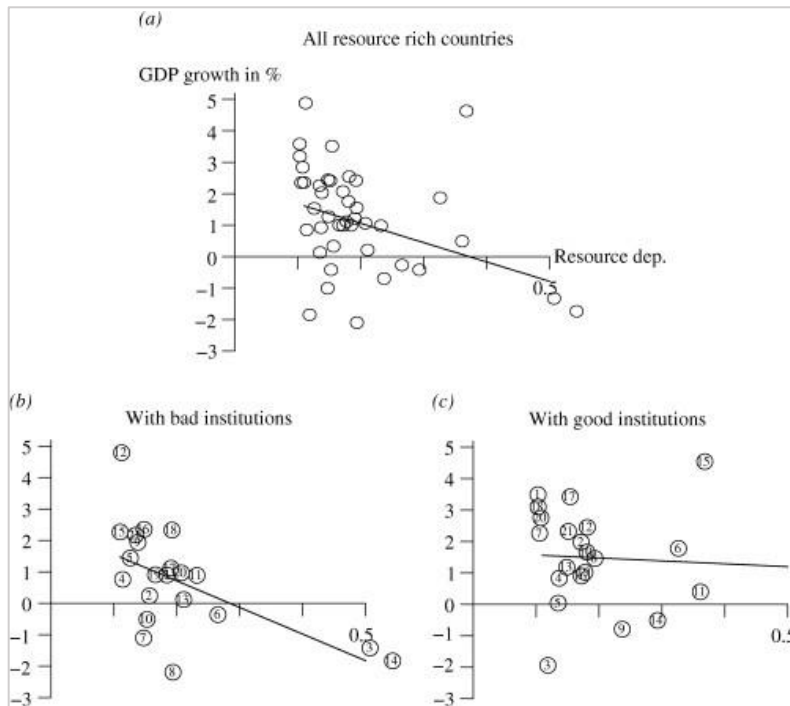


Figure 3: Regression analysis of the relationship between resources and institutions (Source: Mehlum *et al.*, 2006)

Weak institutions, also referred to as extractive institutions, have been shown to result in activities such as corruption and politicians sustaining their power by buying votes (Acemoglu and Robinson, 2001; Rosser, 2006; Gylfason, 2018; Savoia and Sen, 2021). The notion of extractive institutions leading to corruption is contrary with Orihuela (2018) who argued that good economic growth can exist despite weak institutions – ‘it is possible for corrupt, rent-seeking economic authorities to run the macro-economy of a resource-abundant country reasonably well – after all, it is in their rational self-interest too!’. He supports his statement by providing an example of President Fujimori of Peru who kept weak institutions to hold those in power accountable and still enabled Peru to grow during the period under his rule. It is therefore important to take caution with the assumption that corruption leads to poor economic growth (Orihuela, 2018). The history of a country, the type of economic and

political institutions and the type of leadership all play a role in the outcomes of natural resource outcomes, which will be demonstrated in the next section.

### 2.1.2 Escaping the resource curse: Botswana

As previously stated, certain nations have managed to avoid the resource curse. Botswana, heavily reliant on a singular resource - diamonds, is frequently regarded as one of the rare success stories, sustaining consistent economic growth and political stability for nearly five decades. The country has managed to transform its poor economy into a middle-income country, by exploiting its diamond resources (Gwebu, 2012). Botswana’s success can be attributed to a few key aspects. First, the country developed inclusive political and economic institutions while other African countries created the same extractive institutions as during their colonial era (Acemoglu and Robinson, 2001). They achieved this by leveraging its stable governance, prudent resource management, and commitment to democracy, which facilitated broad-based participation in decision-making and equitable distribution of wealth. Second, the type of leadership Botswana had at the time of discovering its diamond resources, led to natural resources being vested in the nation which gave impetus to the process of state centralization (Acemoglu and Robinson, 2001; Karstens, 2021). This allowed diamond revenues to be used for the development of the country. In other countries, diamonds have unfortunately fueled conflict (Richards, 2003). Botswana’s governance indicators as indicated in Figure 4, rank the country well above middle-income countries (Iimi, 2007) with its good governance ultimately contributing to its success and escaping many resource curse symptoms.

**Table 3: Governance Research Indicator Country Snapshot (GRICS). 2002**

	Botswana	Lesotho	Namibia	South Africa	Swaziland	Sub-Saharan Africa	Low-income countries	Middle-income countries	High-income countries
Voice and accountability	0.75	0.53	0.66	0.75	0.28	0.42	0.38	0.57	0.82
Political stability	0.78	0.57	0.69	0.52	0.64	0.45	0.40	0.59	0.82
Government effectiveness	0.66	0.40	0.48	0.59	0.36	0.30	0.27	0.42	0.77
Quality of regulation	0.72	0.44	0.59	0.66	0.50	0.38	0.34	0.51	0.85
Rule of law	0.67	0.48	0.60	0.53	0.34	0.33	0.29	0.47	0.84
Control of corruption	0.62	0.39	0.47	0.51	0.36	0.29	0.25	0.39	0.76

Source: Iimi (2006, p.9)

Figure 4: Indication of Botswana’s governance resource indicators in comparison to other Sub-Saharan African countries (Source: Iimi, 2007).

The question of whether the resource curse exists continues to be of discussion in the literature today. Studies in the field have shown that there are certain effects that contribute to the absence or presence of a resource curse. Therefore, one could argue that the resource curse is a broad topic that can be viewed from different angles. To put it differently, different outcomes may be achieved as to which countries may be suffering from the curse based on the mechanisms used to explain or confirm it. Therefore, the benefits or disadvantages of natural resources would rather be based on an individual

case and would be largely influenced by policymakers (Frankel, 2010).

## 2.2 Resource curse in renewable resources

While the concept of the "resource curse" has traditionally been associated with the exploitation of natural resources such as oil, gas, and minerals, there is growing recognition of its potential relevance to the renewable energy sector. Renewable resources, such as solar, wind, and hydroelectric power, hold promise for sustainable development, offering clean alternatives to fossil fuels. However, the mere presence of abundant renewable resources does not guarantee economic prosperity or social well-being. This section explores the emerging discourse surrounding the "resource curse" phenomenon in the context of renewable energy.

### 2.2.1 Energy transition and extractivism

The current energy transition has been referred to as the era of 'green extractivism' (Voskoboynik and Andreucci, 2022). The term extractivism originates from the Latin-American context and refers to the accumulation of capital by exploiting natural resources at a large scale without further processing prior to exportation (Gudynas, 2018). Warnecke-Berger et al. (2022) argued that extractivism shapes the economy because of its profitability and its ability to subsidize other economic sectors. And since extractivism drives welfare, the possibility for political power to outperform economic efficiency surfaces. This is evident in the way that political decisions may determine the way export earnings are spent. The authors further argue that these political dynamics may affect institutional settings by creating extractive institutions which may eventually hinder social, political, and economic transformations (Warnecke-Berger et al., 2022). Regarding the transition to renewable energy, Bruna (2022) contends that green extractivism serves as a means of appropriating nature by implementing low-carbon technology projects funded through climate change policies. Although the term has mainly referred to mining, it has been extended to agriculture, fishing and forestry (Ye *et al.*, 2020) and more recently to renewable resource developments (Dunlap, 2021). This is categorized by intensive resource exploitation compatible with climate change and necessary for reducing global emissions. Dunlap (2021) explored industrial-scale renewable energy projects in Mexico and compared them to having a similar extractive nature of fossil fuels. This leads back to the discussion of the resource curse in countries with an abundance in resources.

### 2.2.2 Empirical evidence

The literature on the resource curse in renewable energy resources is still in its infancy stage. Leonard et al. (2022b) emphasize that studies in the field are few. The earliest work on the subject is quite widespread when considering the geographic location of the cases and the different methods used. The few studies that have been published, agree on some issues. All authors do also conclude that the existence of a resource curse is connected to institutional qualities as seen in fossil-related resource

course research. Overall, there seems to be some agreement that renewable resources are just as prone to resource curse as non-renewable resources (Gennaioli *et al.*, 2011; Bae, 2013; Månsson, 2015; Leonard *et al.*, 2022a).

The earliest reference to the theory in the context of renewables comes from Gennaioli *et al.* (2011), who discovered reasonable evidence suggesting the existence of a resource curse in wind developments in Italy. However, subsequent studies challenged the likelihood of a resource curse in renewable energy projects. For instance, Bae (2013) conducted a qualitative analysis of the potential for a resource curse in solar developments across five African countries, finding that the rent in solar developments is relatively small, indicating the absence of a resource curse. Similarly, Menegaki (2013) used economic modeling to examine the validity of a resource curse for renewables in Europe and concluded that it did not exist. Eisgruber (2013) investigated the resource curse in large-scale renewable electricity exports and found that effects are either non-existent or less pronounced in RE exports. For instance, renewable resources are finite, reducing the risk of resource depletion and providing more stability for countries dependent on these resources, resulting in a more secure investment environment (Eisgruber, 2013). Other studies and arguments have discussed the possibility of a resource curse in hydropower (Hancock and Sovacool, 2018), mineral resource mining for renewable energy production (Månberger and Johansson, 2019), wind developments, and land- use conflicts in renewable energy projects (Månsson, 2015). Despite the varied discussions of the resource curse theory in different contexts in the literature, there has been limited conceptualization.

More recently, Leonard *et al.* (2022b) introduced a novel framework for assessing resource curse risks in renewable energy resource developments. This framework takes a different approach from traditional econometric and statistical modeling used in non-renewable resources and the limited studies in renewable resources. The authors conceptualize the resource curse phenomenon as an outcome of a complex system comprising symptoms, institutions, and policy instruments. They identified eighteen resource curse symptoms and applied this framework to renewable energy developments in Morocco (Leonard *et al.*, 2022a) to evaluate the likely risks and to come up with mitigation measures. The Moroccan case study indicated that resource dependence, technological expertise dependence, and environmental damage were the most probable resource curse impacts.

### 2.2.3 A hydrogen-based economy

The outcomes of an economy based on hydrogen are still unknown (Dillman and Heinonen, 2022; Ijäs and Mitri Kitti, 2022). Several countries have started developing strategies to develop their green hydrogen economies like South Africa, Egypt and Morocco, Namibia. These are countries with high renewable energy potential. South Africa for example, has the potential to become a key player in the global market since it has good wind and solar resources as well as technological capabilities regarding

the Fischer–Tropsch process (AbouSeada and Hatem, 2022). In Egypt, green hydrogen is viewed as the ‘fuel of the future’, and the government has signed contracts to develop five green hydrogen pilot plants. Namibia on the other hand recently awarded a project estimated to cost US\$9.4 billion to develop green hydrogen assets in the Southern region of Namibia (Hyphen, 2022). These developments create win-win positions for developed and developing countries. Developing countries have the opportunity to grow their economies and tackle their developmental challenges from the rents generated from these projects. Developed countries can decarbonize their economies and meet their climate obligations using green hydrogen.

Developing an economy overly dependent on hydrogen exports may however have negative effects. According to van den Berg (2020), for countries to ensure economic and societal benefits flow from hydrogen economies, careful custodianship is required for the chosen development path. The author developed two scenarios of possible development outcomes of a green hydrogen economy. Resource dependence, as indicated in Figure 5, may result in a resource curse. The resource curse literature has extensively analyzed and demonstrated that countries dependent on resource exports often tend to be associated with poor economic performance (Arezki and van der Ploeg, 2007). Wu et al. (2018) determined that if a region exclusively relies on leveraging its natural resource strengths and the economy of the country overly relies on the output of these resources, the economic advantages that should come from the resources may decelerate. A parallel conclusion was drawn by Acemoglu and Robinson (2001), suggesting that although countries may experience initial economic growth, it is typically short-lived, leading to the phenomenon known as the 'resource curse.' Numerous scholars have begun examining potential developmental outcomes of a green hydrogen economy, engaging in discussions primarily centered on two key themes: the geopolitics and governance of a green hydrogen economy, and the injustices associated with a hydrogen-based economy.



Figure 5: Possible outcome of resource dependence in green hydrogen economy (Source: van den Berg, 2020).

The geopolitics of natural resources are evolving with the current energy transition. Geopolitics have shown the demand and competition over natural resources to be important for resource-rich developing countries and developed countries (Sarpong, 2021). In retrospect, geopolitics has played an integral role in driving access to vital resources globally. Geopolitical risks in the resource curse literature have often been related to the global dynamics around resources such as power relations, conflicts, and competition and scramble over resources. The geopolitics of natural resources has mainly centered around fossil fuels such as oil and gas. In the past decade, literature around the geopolitics of renewable energy-based energy systems has also picked up. Crikemans (2011) analyzed similarities between renewable energy and fossil fuels and points out that control over infrastructure is expected in both. Overland (2019) believes the geopolitical risks associated with renewable energy may be less because renewable energy resources are often evenly distributed, from a geographical perspective. Paltsev (2016) finds that new centers of global power are expected with the energy transition. A more recent broad overview of the geopolitics of renewables is provided by (Vakulchuk et al., 2020).

In the broader context of geopolitics, similarities and differences between non-renewable resources and green hydrogen are worth considering. More recently, studies have started looking at the geopolitical dynamics linked to green hydrogen developments especially its trade (Pflugmann and de Blasio, 2020; Scita, 2020; van de Graaf et al., 2020; Griffiths et al., 2021). How green hydrogen will affect geopolitical dynamics is still unknown (Pflugmann and de Blasio, 2020) however the hydrogen economy is expected to create or alter dependencies between states, especially in the context of large-scale exports/imports. The global north is expected to become a net importer of green hydrogen while the global south is expected to become a net exporter of green hydrogen (IRENA, 2021). In their review of more than 700 publications on green hydrogen use and production worldwide, Griffiths et al. (2021) did a comparison on the geopolitical consequences of fossil fuels, RE, and hydrogen adoption (Figure 6). The questions posed show the overlapping relationship between renewable energy and hydrogen as well as the reduced geopolitical risks associated with renewable resources because of their distributive nature. A study by Scita et al. (2020) analyses the expected geopolitical consequences of a green hydrogen economy by looking at how relationships between states may be altered, the type of hydrogen trade agreements that might emerge and the impacts on developing countries. The authors argue that there still remains a high number of unresolved issues, relating to technical challenges and geopolitical implications.

Existing fossil energy paradigm	Open issues for the renewable energy paradigm	Open issues for the hydrogen economy paradigm
Energy security is uneven across nations and presents national security implications	Will a renewable energy-based society be more secure given that energy production can be localized?	Will the adoption of large-scale hydrogen systems improve energy security given that energy production can be localized, stored and used across multiple sectors?
Fossil energy resources can be used as foreign policy instruments	What elements of renewable energy systems are used as foreign policy instruments when the materials and technologies that produce renewable energy may have greater relevance than the energy sources themselves?	Will hydrogen provide new opportunities for use of renewable and fossil energy as foreign policy instrument, particularly when international trade is involved?
Fossil energy-based foreign policy instruments can be used to create military advantage	Which renewable energy-based foreign policy instruments (if any) can be used to gain military advantage, particularly given the important role of cybersecurity of the electricity grid?	Can hydrogen-based foreign policy instruments (if any) be used to gain military advantage, and to what extent are the instruments related to fossil fuels and electricity for hydrogen production as opposed to hydrogen trade?
Existing fossil energy-producing countries possess geopolitical cache and strong positions in international affairs	Which countries will have primacy in international affairs in renewable energy when electricity is the dominant energy vector?	Will hydrogen production leaders strengthen their positions in world affairs or will hydrogen trade use lack such international relevance?
Geopolitical tensions have been negatively impacted by fossil energy producing countries	What are the potential geopolitical tensions and risks associated with a renewable energy paradigm when critical materials, electricity and cybersecurity gain prominence?	Will the adoption of large-scale hydrogen systems improve international security and peace by mitigating the importance of any single energy source or vector?
The emergence of new fossil energy producers (e.g., newfound fields, novel fossil energy sources such as shale or deep-sea) has shifted the energy dynamics among countries during the past century	Will a new set of major energy players emerge in a renewable energy paradigm?	How will new and emerging renewable energy and fossil energy producing countries engage in a hydrogen transition?
Fossil energy is largely expected to lose prominence over time due to associated emissions and environmental impacts	Will renewable energy become the dominant source of energy due to associated avoidance of emissions and environmental impacts?	Will low-carbon hydrogen systems that perhaps leverage carbon capture, storage and utilization, provide a bridge opportunity for continued fossil energy production or will renewable hydrogen serve as a compliment to a primarily renewables-based energy system?
Development of fossil energy sources led to the economic development of petrostates	Which countries are expected to benefit most from a renewable energy transition and what will be the scale of economic benefits?	How can hydrogen support the continued economic success of current petrostates and bring economic opportunity to new energy players?
International supply chains present security risks and defensive strategy concerns	Will electricity from renewable and/or trade in core renewable energy technologies, such as solar panels and batteries, create supply chain security risks?	If hydrogen is traded via land and maritime routes, will it incur a unique set of supply chain risks?

Figure 6: Comparison of geopolitical consequences of fossil fuels, RE and hydrogen adoption (Source: Griffiths et al., 2021).

Primary energy plans are most likely to reinforce rather than challenge the colonial character of some of the developing countries looking to exploit their renewable resources. Colonialism in the past was mainly centered around resources. In some perspectives, developing nations might be perceived primarily as suppliers of raw materials, and the term 'green colonialism' has been introduced by van de Graaf et al. (2020). Various studies have highlighted instances where resource exploitation has resulted in elevated poverty and inequality in numerous Latin American and sub-Saharan countries, disproportionately favoring a small elite group of colonial elites (Zografos, 2022; Auty, 1993). In Tunisia, a large export-oriented renewable energy project was scrutinized given that the country suffers from blackouts (Hamouchene, 2021). In Morocco, issues around water exploitation, untransparent land acquisition, and the country's debt burden were raised concerning the development of large-scale renewable energy projects (Hamouchene, 2021). These issues all relate to similar symptoms found in the resource curse theory with Orihuela (2018) arguing that the management of resources needs to consider colonial institutions and how they have evolved. Kalt and Tunn (2022) emphasize that green hydrogen developments should not be secluded from global inequalities and the colonial history associated with the country looking to develop its economy using hydrogen. The institutions governing the development of green hydrogen developments are crucial.

Furthermore, an unjust hydrogen economy may lead to potential economic and social risks. In a recent study by Dillman and Heinonen (2022), the focus is on uncovering potential social injustices along the hydrogen value chain with the aim of prevention or mitigation. The study reveals the likelihood of encountering distributional, procedural, and recognition injustices akin to those observed in other

resource contexts.

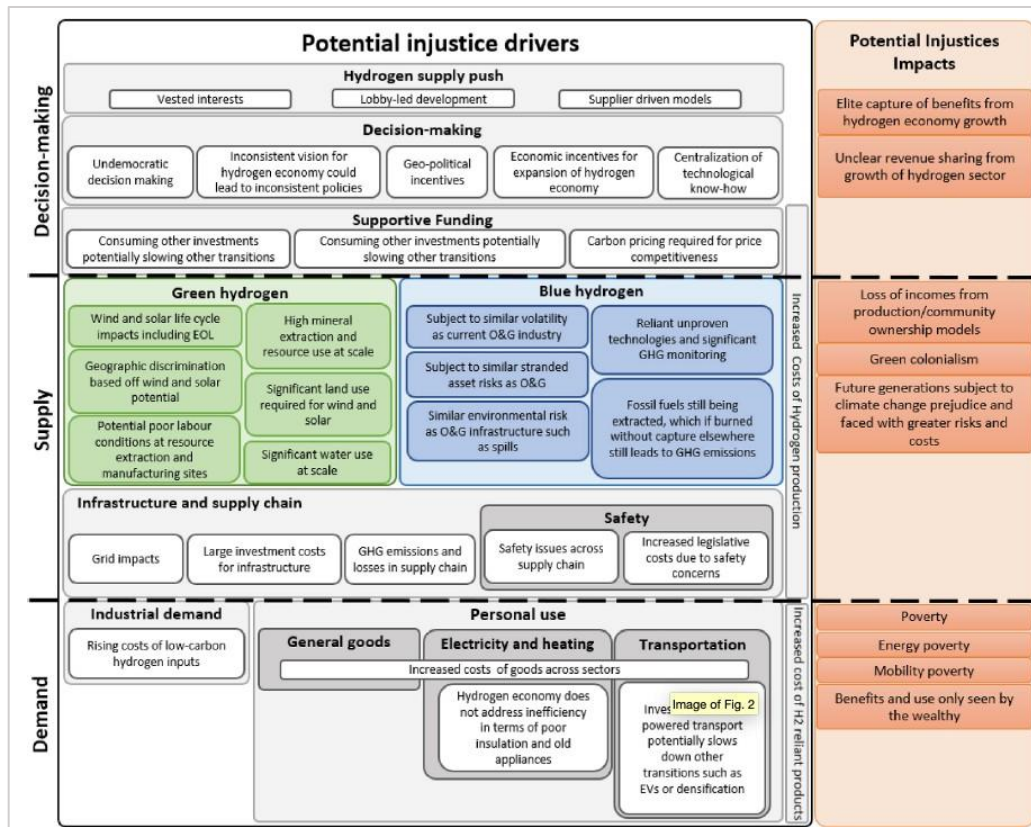


Figure 7: Mapping of potential drivers of injustices and their impacts on the growth of a hydrogen economy (Source: Dillman and Heinonen, 2022)

In conclusion, this comprehensive literature review delves deep into the resource curse theory and its application in various contexts, particularly in the realm of natural resources and renewable energy. It explores the historical evolution of perceptions regarding resource endowments, from being considered a 'blessing' for economic growth to a potential 'curse' associated with poor economic performance, social development challenges, and even conflicts. It emphasizes the importance of effective governance, institutional strength, and responsible resource management in mitigating the potential adverse effects of resource dependence and the critical need for policymakers to carefully navigate these complex issues in the pursuit of sustainable economic growth and development. The literature review reveals that no resource curse approach has been taken towards green hydrogen developments and so this study was guided by the objectives set out in Chapter 1 to assess the possibility of resource curse symptoms in the development of one of Namibia's largest green hydrogen developments.

## Chapter 3: Methodology

The literature review revealed that the developmental outcomes of a hydrogen-based economy are still unknown. This has been supported by a few authors who have started to look at hydrogen economies (von Oertzen, 2021; Dillman and Heinonen, 2022). This chapter discusses the methodology that was utilised to answer the research questions.

### 3.1 Research Approach

This research study is completely focused on Namibia's development and took a mixed-method approach, combining a historical analysis on Namibia's century-old diamond mining sector with an anticipatory study on the proposed green hydrogen project. The exploratory part of the study was designed to be empirical, taking a quantitative and qualitative approach using secondary data from various sources, and the anticipatory part was qualitative, using expert elicitations.

The extensive body of existing research on the resource curse has predominantly employed a quantitative approach, frequently utilizing economic or statistical modeling. Regression analysis has faced criticism for introducing endogeneity bias (Brunnschweiler and Bulte, 2008) and for presupposing a one-way cause-and-effect relationship between two variables (Leonard et al., 2022). An interdisciplinary and systemic approach to the resource curse is proposed by Leonard et al. (2022b) which requires context-specific data collection.

Expert elicitations were established in the 1970s and were used to inform decisions and policymaking for uncertain events. In the context of this study, the use of expert elicitations intends to obtain a representation of various views from a community of experts on the future risks of green hydrogen developments in Namibia. The use of expert elicitations regards the expert as the source of data (Bolger and Wright, 2017). The selection of experts takes into consideration individuals with the "best" knowledge of the domain in question (Meyer and Booker, 2001). For this study, an expert referred to an individual who has knowledge and experience in Namibia's development trajectory and whose role is/may intersect with the dynamics of a green hydrogen project. Bolger and Wright (2017) advocate for extensive data collection, but they acknowledge the difficulty of extracting knowledge from numerous experts in the field due to the scarcity of individuals with the highest level of expertise.

## 3.2 Research Design and Data Collection

### 3.2.1 Research Design

The following illustration (Figure 8) is an indication of the design of the entire study. The study took two approaches, an exploratory study on Namibia's diamond mining as well as an anticipatory study on the proposed green hydrogen development. These two approaches are discussed in more detail in the following sections.

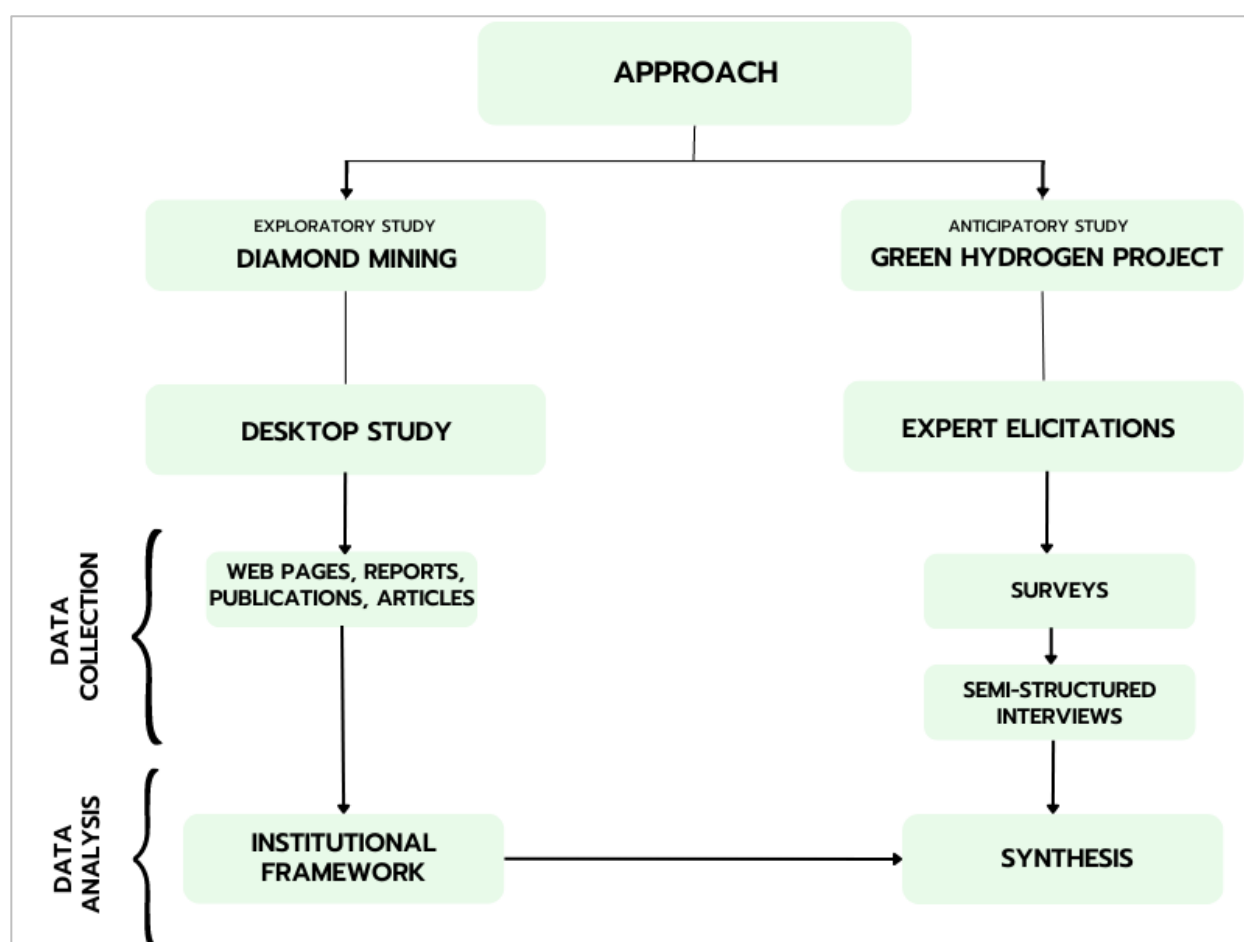


Figure 8: Research design

### 3.2.2 Historical study: Methods and data sources

To carry out the exploratory study on Namibia's diamond mining sector, a desktop study was conducted using secondary sources from reliable sources and websites focused on Namibia. The information collected was mainly focused on the historical development of Namibia's diamond industry, pre-, and post-independence. The data was sourced from officially published sources such as the Namibian Statistics Agency (NSA), Bank of Namibia and reports and literature on Namibia's diamond industry from journals and think tanks such as the Institute for Public Policy Research (IPPR). The data collected was grouped into two common resource curse channels, namely economic and political impacts, which are presented in the results section.

### 3.2.3 Anticipatory study: Methods and data collection

Namibia's Southern Corridor Development Initiative proposes a large-scale green hydrogen project situated in the Tsau //Khaeb National Park, aiming for gigawatt-scale capacity (Hyphen, 2022). The project is designed to be implemented in stages, ultimately targeting an annual production of 350,000 metric tons of green hydrogen from approximately 7 gigawatts of renewable generation capacity. Valued at U\$10 billion, the project represents a significant portion of Namibia's annual GDP. An anticipatory study, conducted alongside an exploratory study, focused on identifying potential risks associated with this project. Expert elicitations were carried out through surveys, followed by semi-structured interviews, chosen as the primary data gathering method to ensure data relevance within the project's specific context. The entire expert elicitation process was modeled after the resource curse risk assessment framework developed by Leonard et al. (2022).

#### *Resource curse risks framework alterations*

Several alterations were made to the original resource curse assessment framework, to contain those symptoms that are relevant to green hydrogen developments and those that are relevant to the Namibian context. From the 17 symptoms presented in the original framework, ten potential negative social and economic impacts of the resource curse were identified as relevant to the study and are presented in Table 2. The following potential symptoms are left out of the scope of this study:

- Crime refers to theft of project equipment and is omitted because the project is in a restricted area and therefore reduces the likelihood of increased crime activities. Crime does not refer to any forms of corruption, which is covered under the symptom 'weakening of institutions'.
- Diversion of land (from agriculture) is omitted because the land where the project is to be developed is unproductive. The area is within the desert and receives very little rainfall and is therefore not suitable for agriculture.
- External and internal conflicts are both omitted due to the unlikelihood of conflicts occurring in the country. Namibia is a democratic country and is considered a country of relative stability (Melber, 2018).
- Gender inequality is omitted because it is a complex subject requiring deeper study in its own right. Gender inequality is already prevalent in Namibia with the country being ranked 111 out of 170 in the United Nations' Gender Inequality Index (UNDP, 2021).
- Land grabbing is omitted because the project will be taking place in a restricted area so it is very unlikely that this will occur.

- Material dependence is omitted because Namibia imports its renewable energy technologies due to the absence of a manufacturing sector in-country. This symptom is mainly applicable to those countries that produce energy technologies.

Table 1: Resource curse symptoms as applicable to Namibia's green hydrogen development (Symptoms adopted from Leonard et al., 2022b.)

<b>Environmental Damage</b>	→	The developments of a green hydrogen industry may pose damage to the environment. In Namibia, the major project will be developed in a protected national park.
<b>Diversion of investments away from human capital</b>	→	Resource-abundant countries may see little need to invest in human capital given the high benefit of their resources. This can manifest in the underfunding of public services and education which may lead to an under-skilled workforce, poor economic diversity, and low education levels.
<b>Diversion of talent from other sectors</b>	→	Resource jobs in boom industries are frequently better paid than jobs in other sectors. This could incentivize workers to join the green hydrogen sector, draining other industries of skilled staff.
<b>Economic dependence</b>	→	Substantial capital is required to construct the infrastructure for large-scale resource extractions. This may need to be borrowed from other countries or international organizations, creating economic dependence.
<b>Reduced economic diversity</b>	→	Large-scale resource developments may result in national economies becoming disproportionately dependent on revenues from these sectors, limiting economic diversification. Namibia's green hydrogen development could be at the expense of other sectors, or it may stimulate other sectors.
<b>Expatriates dominating high-income / skilled jobs</b>	→	Green hydrogen developments require specialized skills. If training is unavailable in-country, expatriates may dominate the job market for technical and specialized roles.
<b>Income inequality</b>	→	Resource abundance can increase the wealth of resource owners (i.e. rent seekers) with minimal consideration for the productivity and wages of workers, increasing income inequality.
<b>Income volatility</b>	→	Commodity prices increase so the types of arrangements will determine the risk of income volatility. However, trade imbalances may be further exacerbated since Namibia is already a net exporter.
<b>Loss of competitiveness of other export sectors</b>	→	The export of RE could lead to trade imbalance and currency appreciation, making other local industries suffer. This effect, known as the 'Dutch disease', arises when a sharp increase in exports of one sector leads to exchange rate appreciation. This causes the export of products from other sectors to become more expensive, and imports to become cheaper.
<b>Weakening of institutions</b>	→	High wealth from green hydrogen development may create a 'self-sustaining dynamic' of low accountability, elite appropriation of resources, and the weakening of institutions. Green hydrogen revenues could therefore potentially render a government sufficiently wealthy to disregard the will of its people.

### Survey and semi-structured interviews

The first data collection tool used is a survey that incorporated the revised resource curse risks relevant to green hydrogen developments. The survey was designed with two sections. The first section required each participant to rate the likelihood of each symptom on a 5-point Likert scale, and the second section required each participant to rank the symptoms based on the expected level of impact. The survey was designed using Microsoft 365 forms, and a link to the survey was sent to each participant after receiving their signed consent forms. All responses were received through the application and data was exported to Microsoft Excel for analysis.

After all surveys were returned, semi-structured interviews were scheduled with all participants who completed the survey. The purpose of the interviews was to analyze the aspects of the three symptoms that each participant ranked highest. This was based on the answers provided in the survey.

The semi-structured interviews were structured in a way that enabled a set of responses consistent with three themes that encompass the research questions for this study. A blend of targeted and open-ended inquiries was employed to create a comfortable environment for interviewees, encouraging them to share extensive insights within their areas of expertise. The interviews, conducted through Microsoft Teams, typically lasted one hour on average. Transcription of all interviews occurred electronically in real-time, facilitating subsequent qualitative data analysis. The interview scripts and a sample consent form can be found in Appendix B.

Some of the benefits of taking the above Delphi-like approach is that participants are given an opportunity to see how other experts rated the resource curse symptoms in the survey. With this information, they could reevaluate their own choices, offer more extensive explanations for their decisions, or express their reservations regarding the selections made by other participants during the interview phase. Participants were shown the survey results at the beginning of the semi-structured interview.

### 3.3 Data analysis and interpretation

#### 3.3.1 Exploratory study

For the exploratory study, secondary data was collected to analyze the effects of the diamond industry on Namibia's economic and social development, for three distinct historical periods - German occupation, South African occupation, and post-independence. The data was placed into two categories, namely economic and socio-political effects. The analysis mainly focused on common resource curse symptoms from the literature as well as those in the resource curse framework listed above.

#### 3.3.2 Anticipatory study

Survey results were extracted from Microsoft 365 forms as an Excel file and organized for analysis. The analysis method was obtained from Leonard et al. (2022). High risk on the 5-point Likert scale is defined as a ranking of 4 and above; a ranking of 3 is ranked as a medium risk; a ranking below 3 is ranked as low risk. The average likelihood score and impact ranking for each risk were transformed into a relative value ranging from 0 to 1, representing the minimum and maximum likelihood and impact, respectively. These values were utilized to derive coordinates for visualizing the results. The coordinates for each risk were determined using the following formulas:

**Impact x-coordinates.** Participants were tasked with ranking the symptoms based on their perceived impact in the event of occurrence. Using individual rankings  $r_{i,j}$  corresponding to risk  $i \in \{1..10\}$  and respondent  $j \in \{1..n\}$ , a mean ranking score was obtained for each risk as:

$$\bar{r}_i = \frac{\sum_j r_{i,j}}{n}$$

The minimum and maximum individual ranking scores are  $r_{min} = \min_i r_i$  and  $r_{max} = \max_i r_i$ . A relative ranking score was calculated for each risk, ensuring that risks with the highest impact rankings (i.e., the lowest numerical average risk ranking) have values approaching 1:

$$x_i = \frac{r_{max} - \bar{r}_i}{r_{max} - r_{min}}$$

**Likelihood y-coordinates.** For each risk  $i$ , respondent  $j$  was asked to provide a likelihood score  $l_{i,j}$  on a 5-point Likert scale, from very unlikely (1) to very likely (5). A mean likelihood score was obtained for each risk as:

$$\bar{l}_i = \frac{\sum_j l_{i,j}}{n}$$

The minimum and maximum individual likelihood scores are  $l_{min} = \min_i l_i$  and  $l_{max} = \max_i l_i$ . A relative likelihood score was subsequently derived for each risk, ensuring that risks with the highest average likelihood scores approach values of 1:

$$y_i = \frac{l_{max} - \bar{l}_i}{l_{max} - l_{min}}$$

The survey results were then presented in a risk matrix to map out the high-risk symptoms.

The interviews were analyzed using qualitative methods, which involved several steps to interpret the gathered data. First, the responses from interviewees were transcribed electronically in real-time, ensuring accurate documentation of the discussions. These transcriptions served as the basis for subsequent analysis. Second, the responses were categorized into relevant thematic areas within an Excel sheet, focusing on social, political, and economic aspects related to the resource curse phenomenon. This categorization helped organize the data and identify recurring themes or patterns across interviews. Third, a thorough analysis was conducted on the categorized data. This analysis involved examining the responses within each thematic category, identifying key insights, and exploring connections or discrepancies between different perspectives. This is detailed in the results section in Chapter Four.

### 3.3.3 Interpretation

The results from the exploratory study have been interpreted in the discussion section using Acemoglu and Robinson's (2001) institutional framework (Figure 16). The historical and institutional understanding of the development of Namibia's diamond sector was then used to interpret some of the findings from the anticipatory study.

### 3.4 Ethics Considerations

This research study involved human participants, and as such, adherence to relevant ethical standards was a priority. The study was conducted in accordance with the ethical guidelines established by the University of Cape Town, and approval was obtained from the Research Ethics Committee of the Faculty of Engineering and the Built Environment. The research adhered to two fundamental ethical principles: consent and confidentiality. Participants were fully informed about the study's details and objectives, and all interview participants provided written consent prior to engaging in the research, affirming their voluntary participation without undue pressure or coercion. The consent form also explicitly stated participants' freedom to withdraw from the study at any point.

To ensure participant well-being, potential risks associated with the research were communicated to the interviewees. Throughout the research report, confidentiality and anonymity were upheld, with no disclosure of the interviewees' identities. The information shared by participants was treated with utmost security and confidentiality, in compliance with legal regulations. Personal information collected was coded, and the data were stored on a password-protected computer.

## Chapter 4: Results

This chapter presents the outcomes of the data collection and analysis discussed in the previous chapter. These findings are divided into two sections. The first section presents empirical evidence derived from a comprehensive examination of Namibia's diamond mining sector, both before and after gaining independence. This analysis specifically focuses on the macroeconomic outcomes stemming from diamond resources and the governing institutions. The aim is to provide insights into whether Namibia's diamond sector may have played a role in mitigating or exacerbating resource curse dynamics and their associated consequences. The second part of the results section presents the data gathered through expert elicitations on the likelihood of resource curse symptoms developing in Namibia's proposed green hydrogen project. The findings from both sections, along with the interconnections between past and future aspects, will be thoroughly examined in Chapter Five.

### 4.1 A century of diamond mining in Namibia: a blessing or curse?

#### 4.1.1 Evolving resource ownership: Colonialism to Independence

Namibia's diamond legacy has deep roots tracing back to its colonial history with several key events marked on the timeline in Figure 9. This journey commenced with the discovery of diamonds near Lüderitz in 1908 during the era of German rule and marked the inception of commercial diamond mining in Namibia, specifically in the renowned Sperrgebiet, or "forbidden area" (MET, 2017). The revenue generated during this period was strategically allocated toward developing vital infrastructure and kickstarting an agricultural export economy (Hope, 2018). In 1915, following World War I, South Africa took control of Southwest Africa. A pivotal figure in this narrative is Ernest Oppenheimer, a British-born entrepreneur, who established the Anglo-American Corporation of South Africa. He shrewdly engaged in negotiations with the conglomerates overseeing diamond interests in the region, collectively known as the 'Lüderitzbuchter producers' (Amupanda, 2017). This culminated in the formation of the Consolidated Diamond Mines (CDM) of South West Africa in 1920 (Schneider, 2008), with Anglo American Corporation holding a majority share. The "Halbscheid Agreement," was inked in 1921 whereby the Southwest African Administration accorded CDM exclusive mining rights in the Sperrgebiet area (Pallett, 1995). Notably, in 1929, Ernest Oppenheimer assumed the chairmanship of CDM and concurrently became the chairman of De Beers. In 1930, De Beers acquired Anglo American's interest in CDM, thereby establishing De Beers' unchallenged dominance over diamond mining interests in South West Africa for the ensuing six decades (Schneider, 2008).

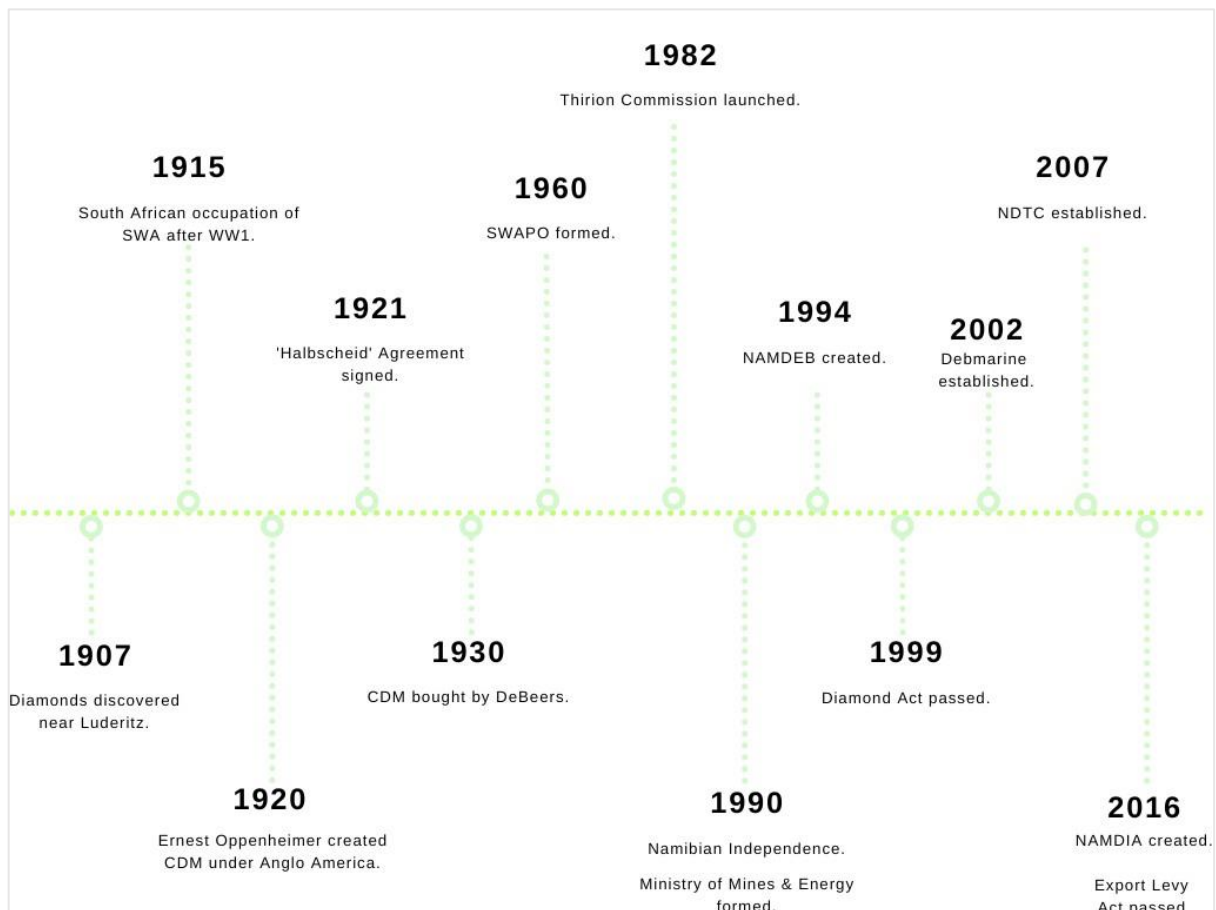


Figure 9: Key events in Namibia's diamond sector and political history (timeline not to scale).

The Thirion Commission represents a seminal episode in Namibia's pre-independence diamond history. In 1982, the Thirion Commission was convened to probe corruption and the activities of multinational mining corporations in Namibia (IPPR, 2016). It brought to light mounting concerns that the economic benefits of the diamond industry were inadequately benefiting the Namibian populace, particularly in the areas directly impacted by mining operations.

Following Namibia's independence, the South West African People's Organisation (SWAPO) Party, founded in 1960, pursued a distinct strategy to overhaul the diamond industry. This strategy particularly focused on enabling government participation in mining and development. Nonetheless, the government continued to rely on De Beers for critical functions, including the extraction of existing diamond reserves, exploration for future sources, provision of capital for new discoveries, access to global markets, and a substantial portion of government revenue (Amupanda, 2017). Over time, a series of legislative acts have progressively bolstered the government's negotiating power. These include the Diamond Act, which introduced a 10% export tax, a 10% royalty, a 55% corporate tax rate, and the establishment of a 50:50 ownership structure in Namibia (NAMDEB), shared between the government and De Beers. Additionally, the creation of the Namibian Diamond Trading Company (NDTC) was aimed at overseeing the sorting, valuation, and sales of raw diamonds.

Namibia, in the post-independence era, has taken significant strides in assuming greater control over its diamond resources through direct ownership, the enactment of various laws, and the establishment of resource management institutions. Notably, Namibia's diamond production has witnessed substantial growth, primarily driven by the operations of Debmarmine, a subsidiary of De Beers. Debmarmine specializes in offshore diamond mining along Namibia's coastline and now accounts for a larger portion of the country's diamond output compared to traditional inland mining methods. Unlike traditional inland mining methods, offshore diamond mining allows access to diamond-rich deposits that were previously inaccessible or uneconomical to mine. Additionally, offshore mining operations benefit from advanced technology and expertise tailored to marine environments, enabling more efficient extraction and recovery processes.

#### 4.1.2 Macroeconomic analysis

This section of the study delves into a comprehensive macroeconomic analysis that traverses the historical continuum of Namibia's diamond mining industry. The exploration begins by examining key macroeconomic indicators, including GDP growth, economic dependence, and diversification. These metrics provide insights into how the diamond industry has influenced Namibia's economic trajectory. Furthermore, the analysis delves into income volatility emanating from resource revenues as well as an investigation of whether Dutch Disease has prevailed in Namibia. This section seeks to offer a comprehensive perspective on the impact of diamond mining on the nation's economic development.

##### i) GDP growth

In terms of GDP growth, the data presented in Figure 10 indicates that the Namibian economy faced challenges a decade prior to independence, with an average growth rate of only 1.1%. Post-independence, during the 1990s, a transitional phase, growth remained relatively sluggish, averaging 3.6%. However, there are signs of a more pronounced growth trend during the period spanning 2000 to 2015, with an average output growth rate of 4.9%. Notably, the mining sector has consistently played a pivotal role in bolstering economic growth throughout this trajectory.

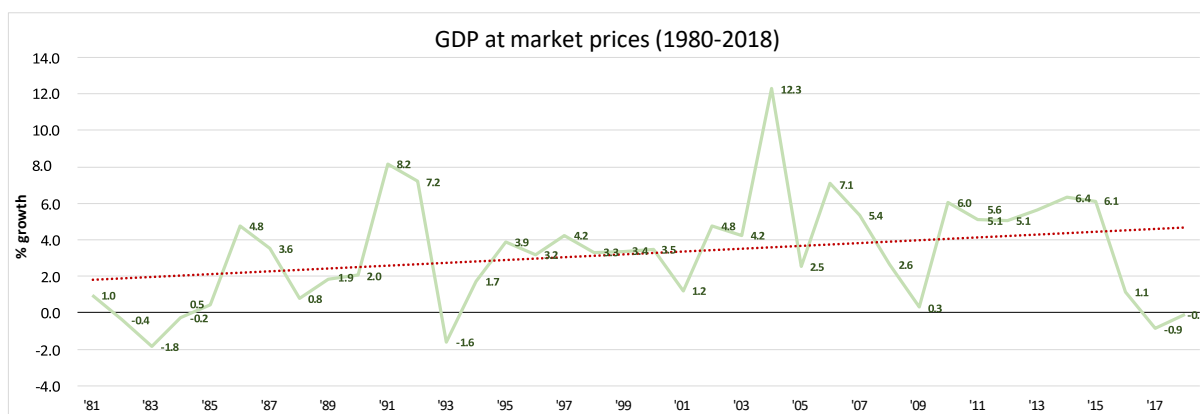


Figure 10: Namibia's GDP at market prices indicating an average output growth of 4.9% from 1980 to 2018. Data source: Namibia Statistics Agency (National Accounts)

Specifically, the diamond sector emerged as a prominent and steadfast contributor to economic expansion over the years. Data from the Namibian Statistics Agency (NSA) reveals in Figure 11 that the diamond sector accounted for 9.3% of the GDP between 1980 and 2018. Post-independence, this contribution slightly decreased to an average of 7.4%. This figure pertains to the total value generated by the diamond sector's output. Data presented by the Economist Intelligence Unit (EIU) in Table 2 reports a larger contribution of diamond mining made to the Namibian economy under South African rule, averaging 18% from 1950 to 1985. A key finding of the Thirion Commission was that CDM increased production during the 1960s and 1970s leading up to the country's independence.

Table 2: Average contribution to GDP by the diamond sector (1950-1985) at 18.1%. Source: EIU, Namibia country profile

Year	1950-59	1960-69	1970-79	1980-85	1950-85	1994
Diamond mining	20.7	23.1	24.5	12.6	18.1	10.2
Total mining	38.6	36.6	36.6	32.0	34.4	15.9

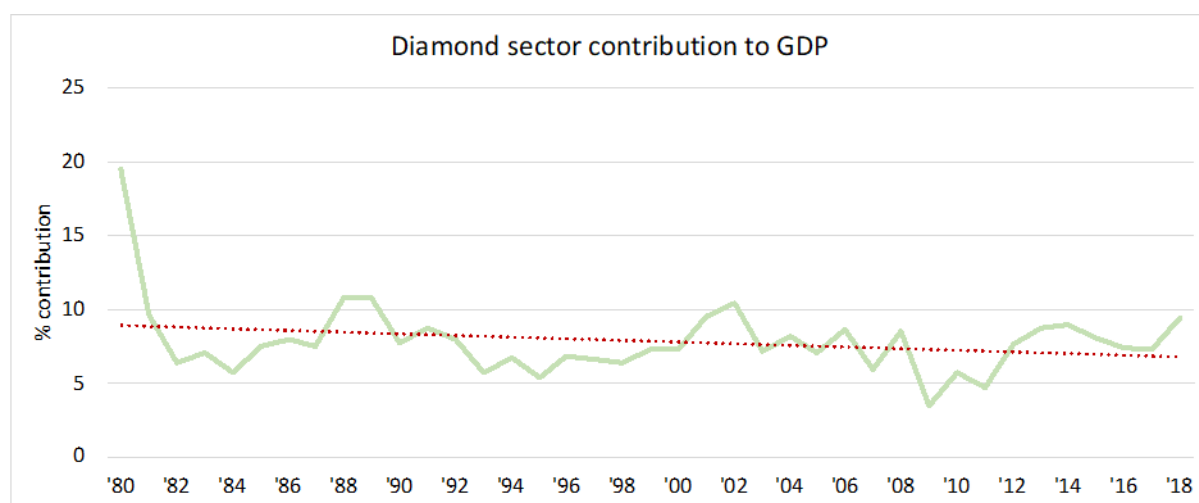


Figure 11: Average contribution of 9.3% from the diamond sector contribution to Namibia's GDP (Data source: NSA)

The analysis of GDP growth trends reveals an evolving economic landscape in Namibia, shaped significantly by the diamond mining industry. While pre-independence growth rates were modest, the years following the country's independence witnessed a gradual acceleration in economic expansion. Notably, the diamond sector's consistent contribution underscores its significance in sustaining and fostering economic growth.

i) Income volatility

While natural resources generate additional income for the government, the fluctuations in global financial markets significantly affect this revenue. These fluctuations either affect the price of

diamonds or they affect the exchange rate, both affecting revenues. Income from the diamond sector to the government has been in various forms over the years because of the different institutional arrangements as seen in Table 3. This initially constituted of a corporate income tax however over the years, an export tax, royalties and dividends have been imposed on the diamond sector.

*Table 3: Revenue generated by the diamond industry for the state (in millions of Rand at current value). Data source: State Revenue Fund, Republic of Namibia, and EIU's annual reports, Namibia: Country Profile, 1981-1993.*

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Value of CDM sales	399	210	199	243	232	409	616	431	654	814	669	961	1050	1200
Diamond income tax	75	70	11	15	31	28	35	85	24	97	73	-	53	60
Export duty	31	29	19	20	24	22	30	45	35	54	-	91	95	80
Total government revenue	133	124	35	41	67	60	85	165	68	171	87	114	151	160

Note: '-' indicates no data.

Prior to gaining independence, diamond mining served as the most lucrative sector in Namibia's economy and was subjected to various taxation mechanisms. In 1980, income taxes derived from CDM represented approximately half of the total government revenues (van der Linden, 1992). Consequently, at the time of independence, tax revenues from diamonds played a critical role for both the state and De Beers. Presently, diamond revenues average around 2% of GDP, compared to total public expenditures, which account for approximately 32% of GDP (Bank of Namibia, 2012). The Southern African Customs Union (SACU) revenue constitutes a larger share of government income, averaging about 9%. This suggests that Namibia's budget may be more susceptible to volatility due to fluctuations in SACU revenues compared to diamond revenues. SACU revenues are susceptible to volatility, primarily due to factors such as changes in global economic conditions, fluctuations in international trade, and shifts in tariff rates and customs duties within the SACU region. SACU revenue distribution is heavily reliant on import tariffs collected at member countries' borders, making it vulnerable to changes in trade volumes and patterns.

Fluctuations in exchange rates can significantly affect government revenues, primarily as a result of variations in export earnings. The Namibian dollar is pegged one-to-one with the South African rand, and changes in the Namibian dollar real exchange rate closely track shifts in the nominal exchange rate of the rand. Currency depreciation typically leads to an increase in mineral incomes and the overall GDP. Both of these aspects grow in contrast to the incomes and expenditures within the non-mineral economy (IMF, 2008). An illustrative example of this occurred in 2002 (Figure 12), when the rand depreciated, leading to increased revenues in Namibia's mineral sector and, consequently, higher diamond revenues for the government. This depreciation was a result of various factors related to macroeconomic performance, slow reforms and other financial market dynamics (Bundia & Ricci, 2006).

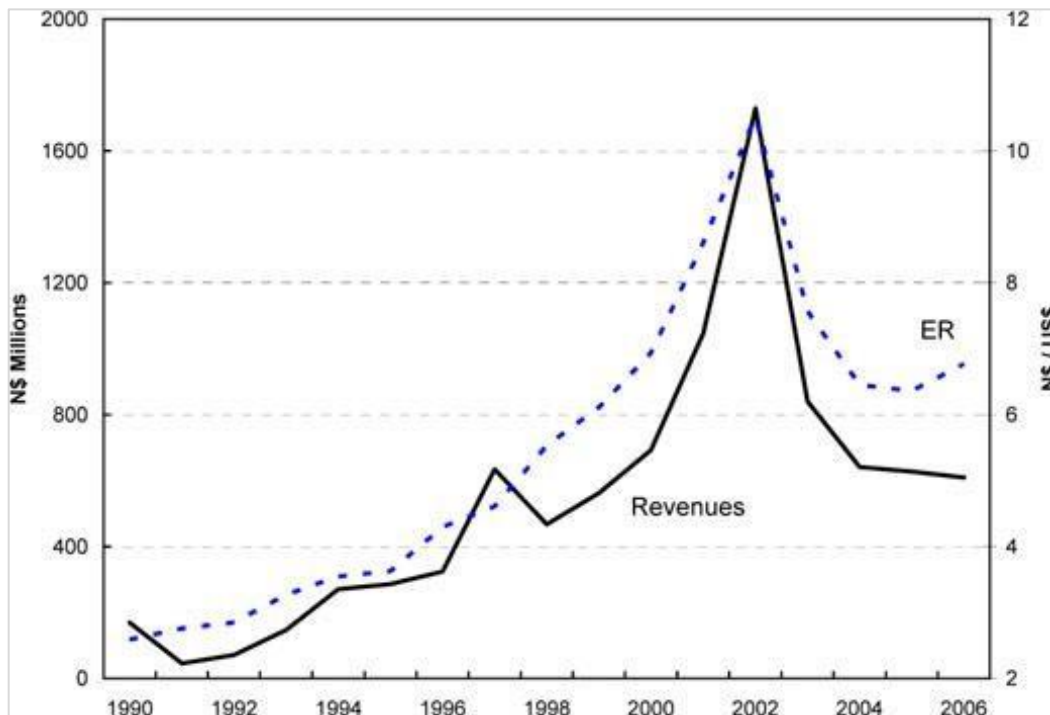


Figure 12: Mineral Tax Revenues and the Exchange Rate, 1990–2006. (Source: IMF)

ii) Dutch disease

Dutch disease, as revealed in the literature review, is a lesser concern for Namibia for several reasons. This traditional mechanism doesn't significantly impact Namibia due to its exchange rate being closely linked to that of its larger neighbor, South Africa. Notably, diamond mining has been a pillar of Namibia's economy for well over a century. The effects typically attributed to Dutch disease would have been more pronounced during the initial phases of diamond resource discovery, particularly during the colonial era. Another critical consideration for Dutch disease is the volume of foreign inflows, often stemming from the resource sector. In Namibia's case, the contribution of the diamond sector to the GDP indicates a moderate level of foreign inflows.

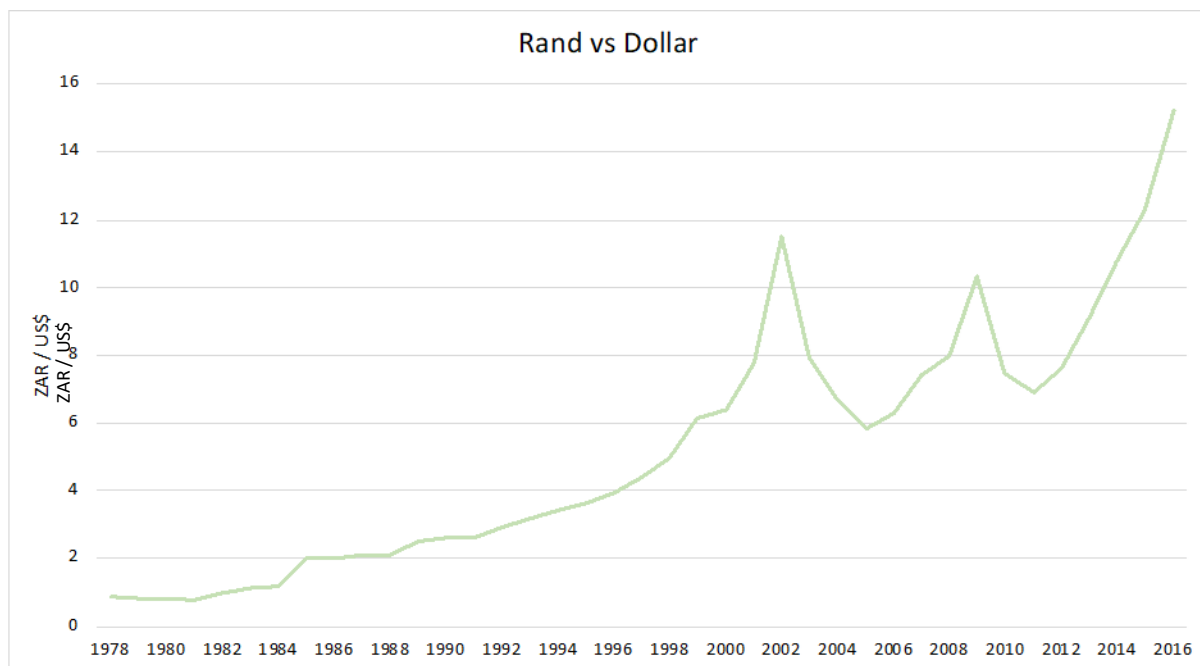


Figure 13: Historical rand vs USD (Data source: Business Tech)

South Africa had a very strong currency up until the early 1980s as seen in Figure 13. This was on the back of its extractive industries such as gold and diamonds (Wilson, 2001). The increase in global demand for South Africa's mineral resources, especially gold and diamonds, led to a substantial increase in export revenues. Since SWA was under South African administration during that period, it is possible that some of the effects associated with Dutch Disease may have had spillover effects on Namibia. However, the specific impact of Dutch Disease on Namibia during that period is not as extensively documented and no evidence was found to confirm this.

#### 4.1.3 Socio-political analysis

Beyond the economic dimension, the influence of diamond mining on Namibia extends into the intricate tapestry of its social and political spheres. This section of the study delves into a comprehensive socio-political assessment, aiming to unravel the multifaceted ways in which the presence and practices of the diamond mining industry have shaped the social fabric and governance of the nation. We explore the implications for employment dynamics, the prevalence of inequalities, the emergence of rent-seeking behaviors and corruption, the dynamics of political conflicts, the capitalist framework, and issues of oppression. These findings offer a comprehensive perspective on the interplay between Namibia's diamond wealth and its broader socio-political landscape, shedding light on both the opportunities and challenges that have arisen in the wake of diamond mining activities.

- i) Inequalities and social relations

Disparities commonly pertain to the distribution of wealth and available opportunities among genders, urban and rural regions, and various segments within the population. In Namibia, inequalities trace back to the poor prioritization of development under both German and South African colonial regimes. The colonial approach of the CDM is illustrative of this, as it entailed minimal developmental investments in Oranjemund and the nearby communities, despite extensive diamond extraction in the area for over 80 years (Kaira, 2012). The //Karas Region, where CDM operations were concentrated, remained impoverished and marked by inequality despite its mineral wealth. Despite the construction of a bridge by CDM over the Orange River in 1951, creating a link between South Africa and Oranjemund, it was not until 2017—eight decades later—that a paved road from Oranjemund finally connected to the national road network. These historical actions reflect a colonial mindset primarily focused on resource extraction with little regard for the well-being of the indigenous population and their territory.

#### *Inequalities in access to land*

Land is regarded as an asset that could be used by the poor to gain access to other assets (NHDR, 2019). A historical perspective reveals that the influx of Germans led to increased land demand, often acquired through forced sales or violent means, effectively dispossessing locals (Gann and Duignan, 1977). The expropriation of land not only dispossessed local communities of their primary means of subsistence but also disrupted their traditional lifestyles and systems of resource ownership. The land policies enforced by the South African apartheid regime, as highlighted by Nghitevelekwa (2022), introduced strict boundaries and a dual land tenure system, significantly altering these established systems. At the time of CDM, mine workers had no access to land in the diamond mining area and were contract workers, meaning they were only there for temporary periods (Amupanda, 2017). The Sperrgebiet area has since then remained a national park with DeBeers holding a part of it under its mining license.

#### *Education disparities*

Despite CDM's inability to create substantial economic opportunities it stood as one of the largest employers in South West Africa, with a majority of its workforce being Aawambo natives. The diamond mining industry predominantly offered low-skilled and manual labor positions, hampering the development of a skilled workforce in Namibia due to limited investment in education and skills development outside the resource sector. Although economic opportunities in the mining areas were limited, local workers worked hard uplifted their communities. As reported by Amupanda (2017) and Schneider (2008), Aawambo employees at CDM consistently set aside substantial portions of their incomes, sending these savings to their families in Owamboland. These remittances played a crucial role in financing the acquisition of goods, groceries, clothing, as

well as the construction of homesteads and houses in Owamboland. The heightened purchasing capability in Owamboland, driven by the repatriated earnings of CDM workers, contributed to the emergence of numerous retail establishments, banking branches, and enhancements in overall lifestyles.

In the post-independence era, Namibia embarked on efforts to address historical inequalities and improve employment prospects. The country has recognized the importance of tackling inequalities through plans and policies such as Vision 2030 and all National Development Plans (NDPs). Investments in education and skills development aimed to create a more versatile and skilled workforce, with affirmative action policies introduced to foster inclusivity in the labor force. Today, the diamond mining industry employs a relatively small percentage of the national workforce, but efforts are underway to promote transformation and inclusivity, as evidenced by initiatives such as Women in Mining. It's important to note that these measures may have a more significant impact on reducing regional inequalities than national inequality rates, given the limited employment scale of the diamond mining sector in the overall labor market.

ii) Rent-seeking, corruption and governance

Rent-seeking, defined as "activities that aim to create, maintain, or change the rights and institutions on which particular rents are based" (Khan, 2000), plays a central role in understanding the dynamics of corruption. During South African rule, instances of rent-seeking were evident when De Beers assumed control of CDM. In 1974, the United Nations Council for Namibia invalidated all mining licenses granted by the South African government because Namibia was under illegal South African administration. The United Nations considered South Africa's presence in Namibia to be in violation of international law and the rights of the Namibian people. Despite this decree, De Beers and CDM continued diamond extraction in defiance of international decisions. In 1982, a pivotal development occurred with the establishment of a South African commission, led by Judge Pieter Thirion. This commission was tasked with investigating political corruption and governmental oversight within the diamond mining industry (Pallister et al., 1987).

The Thirion Commission's findings shed light on the exploitative nature of CDM, deeply rooted in colonialist and imperialistic ideals. The Commission exposed how African resources were extracted without regard for the native population and their land. The colonial state was implicated as complicit in this arrangement, and it was further revealed that De Beers actively supported the maintenance of a symbiotic relationship that allowed them to exploit Namibian resources for over 80 years, without ensuring substantial, direct benefits to the local population, who held disproportionately less bargaining power.

Key revelations from the commission included:

- De Beers had engaged in over-mining of its claims and tax evasion.
- CDM had deliberate plans to deplete Namibia's diamond reserves before the country's independence.
- De Beers effectively controlled and funded the Diamond Board of South West Africa, rendering it subservient to their interests.
- De Beers manipulated the Mines Inspectorate to their advantage.

Several arguments suggest that De Beers received excessive profits from Namibia. While estimates vary across several sources, most suggest that De Beers obtained a larger portion of its profits from Namibia. Kempton & du Preez reveal that in 1977, CDM contributed to 14% of De Beers' production but accounted for an estimated 50% of its profits, showing the extent of its profits. These findings highlight the complex interplay of rent-seeking, corruption, and governance challenges within Namibia's diamond industry during this era.

After gaining independence, Namibia's legal framework for natural resource exploitation underwent scrutiny in 2006 by the IMF. The assessment concluded that Namibia's Minerals Act and Diamond Act adhere to international best practices. Despite this, Namibia has yet to become a member of the Extractive Industry Transparency Initiative (EITI). A report by the Institute for Public Policy Research (IPPR) of Namibia revealed that:

*“What is very interesting is that Namibia makes money from its resources through taxes and royalties. It can also make money through ownership in the mining company such as some mines including Namdeb. So with Namdeb, the government receives revenue from the corporate tax, royalties, and export levies for raw diamonds. The government has 50% equity in the company as well however no one knows the benefit of the equity stake or what it entails. Is the 50% for risk-sharing, or profit-sharing? No information on it. The reason why the government probably felt the need to strike this deal was to prove to the country that it is not taking ownership of its resources and selling it off to international companies”.* The IPPR of Namibia also highlights a lack of transparency regarding the resources available for exploitation, the pace of exploitation, the funds received by governments, and the purposes for which these funds are utilized (IPPR, 2004).

In conclusion, this results section has undertaken a thorough examination of the resource curse theory's applicability to Namibia's diamond history, both in the pre-independence and post-independence eras. The historical analysis sheds light on the complex dynamics surrounding diamond mining, from its early exploitation by colonial powers to the more recent efforts of an independent Namibia. During the

colonial and occupation periods, the diamond-rich regions saw extensive expropriation of land and exploitation, with significant economic gains channeled away from the local population. Post-independence, Namibia has made commendable strides in resource revenue management and economic diversification. The government's increasing control over diamond revenues, despite their relatively small contribution to GDP, reflects a positive shift towards more equitable resource governance. However, on the socio-political front, questions linger about the social relations within the diamond sector. Minimal efforts at institutional reforms to address social aspects hint at areas that merit further attention. As Namibia moves towards new resource horizons, it carries a legacy of both progress and ongoing challenges, underlining the importance of holistic resource governance that not only manages revenues but also nurtures equitable social relations within the sector.

## 4.2 Anticipated green hydrogen resource curse risks

### 4.2.1 Survey data analysis

This section presents and analyses data obtained through the surveys conducted as the first component of the anticipatory study on possible resource curse symptoms related to the development of a green hydrogen industry in Namibia. The primary objective of the survey data analysis is to provide a comprehensive overview of participants' perspectives regarding the likelihood and impact of various resource curse symptoms. Through the survey responses, quantitative insights were captured that would enabled identifying prevalent attitudes, perceptions, and quantitative trends among the participant cohort. By examining these ratings, the collective sentiment and concerns surrounding resource curse symptoms were uncovered within the surveyed population. Additionally, this analysis sets the stage for the subsequent exploration of participants' qualitative perspectives, as gleaned from semi-structured interviews, allowing a holistic understanding of the complex phenomenon of the resource curse and its potential implications.

Respondents were chosen based on their specialized and technical expertise related to the research subject. The selection of experts for this study was particularly directed towards obtaining data essential for addressing the research questions and was tailored to align with the selected resource curse symptoms for the study. An individual's level of expertise was assessed through their years of professional experience in their respective fields. 16 experts were identified representing governmental and governance actors, financial actors, and industry (private sector). 11 experts responded to participate in the survey (Table 4) with all disciplines being covered by 2 or more participants (Figure 14). For the analysis and discussion chapters, respondent codes were used to maintain anonymity.

Table 4: Expert participation and expertise

Respondent code	Expertise	Survey participation	SSI participation
P1	Economic affairs; Renewable energy and/or green hydrogen developments; Industrial development; Strategic investments and project financing;	yes	yes
P2	Corruption and transparency; Public policy analysis; Socio-economic development;	yes	yes
P3	Socio-economic development; Public policy analysis; Environmental management; Corruption and transparency; Research and skills development;	yes	yes
P4	Renewable energy and/or green hydrogen developments; Public policy analysis; techno-economic assessments;	yes	yes
P5	Economic affairs; Socio-economic development; Public policy analysis;	yes	yes
P6	Natural resource management and/or law; Socio-economic development; Public policy analysis; Research and skills development; Development planning;	yes	yes
P7	Environmental management; Industrial development; Natural resource management and/or law; Renewable energy and/or green hydrogen developments; Strategic investments and project financing; Socio-economic development; Corruption and transparency	yes	no
P8	Natural resource management and/or law; Renewable energy and/or green hydrogen developments; Strategic investments and project financing;	yes	no
P9	Economic affairs;	yes	no
P10	Environmental management; Industrial development; Natural resource management and/or law; Renewable energy and/or green hydrogen developments; Socio-economic development; Corruption and transparency; Development planning; Public policy analysis; Research and skills development; Energy transition;	yes	no
P11	Renewable energy and/or green hydrogen developments; Research and skills development;	yes	no



Figure 14: Number of survey and interview respondents in each discipline

### Identification of high-risk symptoms

The outcomes of the survey were recorded, and the mean and relative scores were calculated for the

likelihood and impact of each of the symptoms (Table 5), using the formulas presented in Chapter 3. The relative scores for each symptom were then used as x and y coordinates, to map out the rankings for the ten symptoms, as displayed in Figure 15.

Table 5: Survey mean and relative scores for resource curse symptoms.

	Likelihood		Impact	
	mean likelihood	relative likelihood score (x)	mean ranking	relative ranking score (y)
Environmental damage	3.91	0.78	8.5	0.94
Diversion of investments away from human capital	2.73	0.55	5.5	0.62
Diversion of talent from other sectors	3.55	0.71	7.2	0.80
Economic dependence	3.09	0.62	5.2	0.58
Reduced economic diversity	3.00	0.60	4.6	0.52
Expatriates dominating high-income / skilled jobs	4.09	0.82	8.4	0.93
Income inequality	3.73	0.75	5.8	0.65
Income volatility	3.27	0.65	3.7	0.41
Loss of competitiveness of other export sectors	2.36	0.47	3.2	0.35
Weakening of institutions	4.09	0.82	2.9	0.32



Figure 15: Risk matrix for anticipated hydrogen-related resource curse symptoms.

The risk matrix outlines four resource curse symptoms deemed high-risk due to a clear consensus on both high likelihood and impact: expatriates dominating high-income jobs, environmental damage, diversion of talent from other sectors, and income inequality. While the possibility of other symptoms cannot be completely dismissed, respondents did not consider them to be as significant. For example, P5 discussed the potential exchange rate risks associated with the resource curse, highlighting that a substantial influx of foreign exchange might lead to an appreciation of the real exchange rate. P5 concluded that despite the anticipation of a significant inflow of foreign currency due to the project's scale, it may not be potent enough to impact the exchange rate of the South African rand, given the substantial difference in the magnitudes of the South African and Namibian economies, and thus concluded: *“Therefore, I don't really expect a strong impact on the exchange rate if we still continue to be pegged to the South African rand”*. Although the weakening of institutions was rated to less likely to occur, it was ranked to have a slightly higher impact. The results from the survey provided a good spread of the perception among the different participants, which also provided the basis upon which the interviews were conducted, by getting a deeper understanding of the choices made. This two-step method is similar to the Delphi method which provides participants an opportunity to rethink their choices, taking into consideration the results provided.

#### 4.2.2 Semi-structured interview analysis

This section shifts the focus from quantitative data to qualitative insights gathered through semi-structured interviews with participants. The purpose of the semi-structured interview analysis is to provide a nuanced exploration of the underlying factors and motivations behind the likelihood and impact ratings of resource curse symptoms as revealed in the survey data. While the survey data offers valuable quantitative perspectives, the interviews offer a deeper, qualitative understanding of the intricate dynamics that inform participants' perceptions and assessments. The interviews aimed to uncover the nuanced narratives, personal experiences, and contextual nuances that underpin participants' responses. Conducting in-depth interviews, illuminated the "why" behind the numerical ratings, shedding light on the rationale, beliefs, and, where applicable, the existing policies that participants believe may mitigate the resource curse symptoms. This qualitative analysis adds depth to this study, providing a richer and more comprehensive picture of the complex phenomenon of resource curse and its potential mitigating strategies. Of the 11 survey participants, 6 participated in the semi-structured interviews (Table 4) and all disciplines were covered by at least one or more participants (Figure 14). Saunders et al. (2019) confirmed that, even with a limited size, qualitative research samples can yield substantial depth and detail about the relevant issue. All interviewees responded to all questions posed to them in the interview, which they answered with a level of detail based on their expertise and knowledge.

##### 4.2.2.1 Brief synopses of interviews

The semi-structured interviews allowed for a deeper dive into the participants' individual viewpoints, exploring what set them apart in terms of their survey responses and offering valuable qualitative insights into their reasoning. By questioning the uniqueness observed in their survey data, a comprehensive understanding of their perspectives was gained. The synopses provided here encapsulate the distinct characteristics of each participant's viewpoint, focusing on what was distinctive about their survey responses, how this distinctiveness was explored during the interviews, the main themes that emerged during the discussions, and any policy suggestions or additional observations they shared. These individual narratives contribute to the richness and depth of the overall findings, providing a well-rounded view of the resource curse symptoms in green hydrogen developments.

Participant 1 (P1) expressed several significant concerns in their survey responses, namely related to environmental impacts, income volatility, and the prevalence of expatriates in the industry. These concerns align with the recognized high-risk symptoms from the survey. Much of the interview

revolved around the necessary institutional arrangements for the development of the green hydrogen industry in Namibia. Notably, P1 stressed the imperative need for policy certainty, a clearly defined national green hydrogen strategy, secure land rights, the establishment of special economic zones, and fiscal stability. P1 also highlighted the potential for the green hydrogen project to generate economic wealth for the country, drawing parallels to the diamond industry model. They suggested mechanisms such as royalties, equity participation, and taxes as potential avenues for wealth creation, though noting the need for different settings. In summary, P1 held a positive outlook on the green hydrogen project's development and recommended creating an enabling environment to kickstart the industry.

P2 shared a high concern for environmental damage and the dominance of expatriates within the industry. They also expressed worries about the loss of competitiveness in other export sectors, though this concern was generally regarded as less significant. P2 consistently emphasized the importance of maintaining a diversified economy to prevent over-reliance on a single sector that might not meet expectations. Regarding the policy environment related to the high-risk symptoms, P2 mentioned existing but under-implemented or outdated policies. The interview underscored the crucial need for transparency within the industry, a concern derived from previous issues observed in sectors such as fishing and diamond mining. P2 recommended that, upon Namibia's inclusion in the extractive industry transparency index, the government should consider applying similar standards to the green hydrogen industry.

P3 rated seven out of ten symptoms as having a high likelihood of occurrence, with weakened institutions being one of particular concern. P3 compared Namibia's approach to institution strengthening with that of Botswana, highlighting Namibia's perceived reliance on its independence without a deliberate agenda to rectify colonial legacies. P3's responses centered on Namibia's National Development Plan (NDP) and its potential role in mitigating social risks, along with the significance of social infrastructures. In conclusion, P3 recommended that the green hydrogen industry draw lessons from the mining and fisheries sectors, as these sectors have not effectively addressed Namibia's existing inequalities.

P4 expressed a high concern for all identified symptoms, indicating them as likely or very likely. Their responses were detailed and backed by experience. P4 made extensive references to Namibia's uranium industry and the lessons the green hydrogen industry could learn from it, especially in addressing expatriate dominance and talent diversion from other sectors. P4 was the only participant who represented the economic dependence symptom. They argue that Namibia's approach to a project that is about the same size as its economy, carries substantial risk, referring to it as a single-

project approach. Participant P4 eloquently characterized the situation, describing it as *"a tsunami that is the same height as the entire economy in all its facets"*. This approach was deemed unrealistic and extremely risky. The concentration of economic activities and funding within a single project was likened to putting all eggs in one basket, which poses considerable risks. P4 recommended a more structured approach, advocating for the division of the project into manageable sub-projects with diverse funding sources to mitigate the associated risks - *"One would be better served if you had structured the deal to include many sub-projects that are not related to the same source of funding, simply because you would then also diversify their risk of funding and you would reduce the leverage that investors would have in terms of creating special rules for this gigantic investments. To manage economic risks - splitting the project into manageable small parts; use this in hedging the risks against this overwhelming single dependence on a single finance provider"*. P4 also referenced historical events in the Sperrgebiet area, suggesting parallels with the green hydrogen development as *"the invitation of new colonial processes in a neocolonial way."* In summary, P4 recommended splitting the project into sub-projects to diversify risks and facilitate learning by doing opportunities.

P5 expressed concerns for all the high-risk symptoms except economic dependence. They provided insights into the existing policy environment, referencing Namibia's National Development Plan, Harambee Prosperity Plan 2, and the Growth at Home Strategy. P5 highlighted the importance of understanding that when the state could participate in the diamond industry, risks were already known. The green hydrogen industry is different because there is an expectation for ownership of the resource, however, risks aren't well known yet. They concluded that there was sufficient time to identify key risks and develop mitigation measures before the industry commenced operations.

P6 particularly emphasized the concern of talent diversion from other sectors. P6 stressed the importance of maintaining the relevance and funding of other labor-intensive sectors to address existing inequality issues in the country. Regarding the policy environment, P6 introduced the concept of a regulatory freeze problem which refers to a situation when regulatory frameworks fail to adapt or keep pace with rapid technological advancements, societal changes, or emerging risks, thereby impeding effective governance and decision-making. They also suggested that, in theory, revenues from green hydrogen developments could benefit the country but cautioned that vested interests within the government might hinder these benefits from reaching certain groups.

The synthesis of these six interviews offers a nuanced perspective on the expected resource curse symptoms in green hydrogen developments. Each participant brought a unique set of concerns, experiences, and insights to the table, enriching our understanding of the complex interplay between perceived risks and potential policy solutions.

#### 4.2.2.2 High-risk symptoms

##### i) *Expatriates dominating high-income jobs*

The symptom of the job market being dominated by expatriates has been identified as the highest possible risk within the context of green hydrogen developments in Namibia. This risk is particularly significant due to the following contextual factors. Firstly, the green hydrogen (GH<sub>2</sub>) value chain of the project is relatively new and highly specialized. Namibia lacks a well-established industrial base in renewable energy (RE) and the chemical industry, resulting in a shortage of specialized skills within the country. P1 explained that the industry's novel nature means that there is a limited pool of skilled individuals, further stating that *“You're going to need some very experienced people operating in the value chain and because almost all of this value chain is completely new to Namibia, there just isn't the skill set there. There will be a high reliance on the import of the higher skill levels”*. Secondly, Namibia possesses a small population relative to the employment opportunities expected to be generated by the green hydrogen project. The country also grapples with a high unemployment rate. While there are some skilled individuals with relevant qualifications, many of them could lack practical experience in the specialized roles. Lastly, developing a substantial local workforce with the necessary expertise will require a significant lead time. P4 highlighted the uranium mining sector as a precedent, which has been active since 1976 and has gradually trained a substantial number of Namibian professionals. This development took decades to establish, emphasizing that a similar process in the green hydrogen industry might take at least a decade before a significant number of Namibian professionals can participate effectively. In light of the above factors, there is an expectation of substantial dependence on skills transfer from expatriates to local workers over the initial years of the green hydrogen industry's development.

None of the participants who spoke on this particular risk were familiar with a policy that would mandate a certain level of skills development or local content in the industry. P1 recommended the development of a skills development framework for the country. While there is a skills development plan for the Technical and Vocational Education and Training (TVET) sector, P2 suggest a broader national framework encompassing all skills. Such a framework would help align the demands of various sectors, including the hydrogen sector, and facilitate the development of a skilled local workforce over the coming years.

In summary, the dominance of the job market by expatriates in the green hydrogen sector in Namibia poses a significant risk due to the industry's specialized nature, the country's population size, and high unemployment rate, and the extended lead time required for skills acquisition. The absence of specific policies regarding skills development and local content highlights the need for a comprehensive skills

development framework to ensure the sustainable growth of the green hydrogen industry while creating employment opportunities for Namibian citizens.

ii) *Diversion of talent from other sectors*

The diversion of talent from other sectors has emerged as a high-risk symptom within the context of green hydrogen developments in Namibia. This risk is primarily attributed to the sheer volume of jobs required for the project's development, construction, and operation, which is expected to create intense competition for skilled individuals and may have several implications. The development of a gigawatt scale project will require a significant number of technologists and technician especially for construction and for the regular maintenance of 1000s of wind turbines and electrical switchgear. Namibia's relatively small talent base is expected to lead to intense competition for many qualified individuals. P4 particularly noted that various industries, including manufacturing, finance, legal, and technical fields, may experience human capital poaching as talent is drawn into the burgeoning green hydrogen sector. P4 further explained that another contributing factor is the allure of high-income jobs within the energy industry which could further exacerbate talent diversion. They suggested that the potential for lucrative careers in the green hydrogen sector may attract individuals from other fields.

None of the participants were aware of existing policies designed to address talent diversion. P4 however introduced the concept of self-regulation as a potential solution. They noted that in *“the absence of formal policies, industries sometimes establish their own structures or systems”*. Drawing from the example of the uranium mining sector, where the Namibia Uranium Association has a charter that adheres to principles, including not actively poaching highly qualified individuals, it was suggested that the green hydrogen industry might follow a similar path, particularly as it matures. P4 further recommended a policy intervention to prevent talent diversion, emphasizing the need to focus on growing Namibia's employed population rather than poaching skilled individuals from other sectors. P6 also emphasized the importance of ensuring that other sectors remain relevant and funded, particularly those with higher labor intensity, as extractive industries tend to be less labor-intensive. They emphasized the importance of balanced policy attention to ensure that a portion of the population is not neglected - *“So the balance between policies for the energy and the extractive sectors versus policy for other sectors that are more important for employment really comes down to how the political leadership focuses attention not only on one but the broader spread”*.

In summary, the high-risk symptom of talent diversion in the green hydrogen sector in Namibia is driven by factors such as limited talent base, attractive high-income jobs, and the absence of specific

policies to address this challenge. Participants suggested self-regulation, policy interventions, and a balanced approach to sector development as potential solutions to mitigate the adverse effects of talent diversion while ensuring the overall growth and sustainability of Namibia's workforce.

iii) *Income inequality*

The potential reinforcement of income inequality, both at the regional and national levels, has been identified as a significant high-risk symptom associated with green hydrogen developments in Namibia. Four contextual factors contribute to this concern. Firstly, the green hydrogen project is expected to cause a substantial spike in average income, particularly in the //Karas region. This increase in income is expected to be further compounded by a shortage of specialized skills (P1). Secondly, P3 drew attention to the historical context of income inequality in Namibia, emphasizing that the neoliberal agenda, which is being applied to green hydrogen arrangements, has the potential to exacerbate income inequality. This is especially pertinent given Namibia's history of economic inequality stemming from colonialism and corruption. Thirdly, P3, P5 and P6 noted the exclusionary nature of the green hydrogen project due to its specialized nature. This exclusion could contribute to income inequality as only low-skill job opportunities may be accessible to some individuals, while strategic positions and resource ownership remain limited. The following comments were made: *“The Extractive industry brings opportunities but who seizes them can be very narrow”* (P6); *“Beneficiaries are those in the higher income categories which could result in increased income inequality”* (P5); *“The project is not one that generates a lot of employment during operations, and it is very specialized in nature requiring people with high levels of skills and experience”* (P6). Lastly, P5 pointed out that high- technology jobs may not necessarily address the challenge of high unemployment, potentially leading to income inequality as the benefits primarily accrue to those in higher income categories. This was also discussed by P6 further stating that *“Investments don’t always flow across all education levels, often to those who already have high levels of skills and experience”*.

Regarding the policy environment, P2 and P3 referenced Namibia's National Development Plan (NDP) as a potentially relevant policy to address income inequality. However, concerns were raised regarding the timeliness and implementation of NDP updates. P2 mentioned that the current NDP 5 is outdated (March 2022) and will only be updated and implemented from the new presidency period. Participants emphasized the need for the NDP to ensure opportunities and local participation in the green hydrogen sector and to focus on a social agenda that protects communities and resources, thus preventing further income inequality. Fiscal policy was also considered as a tool to address income inequality, contingent on effective governance and targeted expenditure. However, the challenge lies in navigating political and economic interests that may influence revenue allocation.

P3 further supported the reliance on the NDP, in particular on the social agenda, to make sure that social infrastructures are built to protect the community, the locals, and of course the country's resources, ensuring that they will not be exploited in such a way that they will intensify income inequality - "GH2 revenues could be used to address our main development challenges like inequality, poverty and so forth, but that depends on how effectively the government spends the money on projects that really address these issues" (P1). P6 explained this in more detail stating that the decision to hypothecate revenue from an extractive sector to a particular expenditure, or to let it run via the national budget through parliament, works in theory but not always in reality.

*"It would be much better if everything goes through the national budget and parliament decides on the priorities that go beyond the extractive sector. But for that, you need a certain political economic consensus that you're using the extractive or the energy sector to support other sectors and not to rent seek that sector for the benefit of certain groups. It needs that cost-conscious decision to use the national budget to support other sectors where employment is created or where you improve people's livelihoods. That however doesn't happen very often because parliament has vested interests. If parliament does decide to take certain parts of revenue generated in this sector hypothecated towards local economic development, the challenge is then you need the administrative capability to implement this at that level where you hypothecate revenue. This may be a waste if this is not implemented properly because of local and regional interests that may override what is important in the short term versus what is an investment in the long term".*

P6 mentioned Botswana as a model where revenue reallocation aligned with developmental priorities at the national level, contributing to diversification and employment opportunities.

In summary, the high-risk symptom of income inequality reinforcement in the context of green hydrogen development in Namibia is influenced by regional income disparities, historical factors, the industry's exclusionary nature, and the potential concentration of benefits in high-tech roles. While the National Development Plan and fiscal policy present potential avenues to mitigate income inequality, their effectiveness hinges on timely updates, effective governance, and aligning revenue allocation with developmental priorities. The case of Botswana serves as a valuable reference for effective resource revenue reallocation at the national level.

#### *iv) Environmental damage*

Environmental damage emerged as a prominent high-risk symptom, with more than 80% of participants expressing concerns about its likely occurrence and significant impact. Participants attributed the inevitability of environmental damage to two key factors, namely the size of the project and the project's proposed location. P1 emphasized that the sheer size of the green hydrogen project contributes to the inevitability of environmental impact. They explained that the project requires extensive land utilization to house the numerous solar panels and wind turbines necessary for green hydrogen

production, which translates to a significant land footprint due the thousands of megawatts of generation planned. This expansive development footprint raises concerns about environmental disruption, especially when compared to the ecological footprint of coal power stations and associated coal mines. P2 drew attention to the project's proposed location within a critical biodiversity area, specifically a National Park. The pristine nature of this area and the allocation of land to the project without a comprehensive assessment of potential biodiversity losses raise red flags regarding environmental preservation and impact.

Participants expressed varying views on the policy environment in place to manage potential environmental impacts stemming from the project. P1 praised Namibia's environmental regulations, highlighting their high standards and the well-established Environmental Clearance Certificate (ECC) process - *“Namibia’s environmental regulations are very high standard”*. They believed that no updates were required to existing regulations. They, however, did raise concerns about developing in a national park and noted that while national laws may not necessarily address this issue, global rules and standards mandate responsible development in protected areas – *“The whole issue of the environment and developing in a critical biodiversity area is actually a rule imposed by the financial institutions in Europe and whether funders from outside will support the project based on their own stringent rules”*. P6 also expressed confidence in Namibia's ability to manage environmental challenges, indicating that the country did not appear to face significant environmental issues. However, P2 identified flaws in the Environmental Management Act (EMA) and called for its improvement through planned amendment acts. They specifically cited shortcomings in the application of the EMA, with room for enhancement in the consultation process. Participant P4 also highlighted gaps in the environmental monitoring processes and the need for more robust stakeholder engagement processes. They also advocated for a strategic environmental assessment (SEA) to comprehensively understand cumulative impacts.

In summary, the high-risk symptom of environmental damage associated with green hydrogen development in Namibia is driven by the project's size and location. Participants voiced concerns about the environmental impact of a large-scale renewable energy project and the potential disruption to critical biodiversity areas. While some participants expressed confidence in Namibia's environmental regulations, others pointed out flaws and gaps in the existing policy environment, emphasizing the importance of robust monitoring, stakeholder engagement, and adherence to global standards for development in protected areas.

#### 4.2.2.3 Lessons from other resource sectors in Namibia

Participants were invited to share their observations of resource curse phenomena in other resource sectors in Namibia and whether these experiences might have relevance for the green hydrogen project's outcomes. Several key themes emerged from these discussions, shedding light on the potential risks and challenges that could affect the green hydrogen industry.

Three participants (P2, P3, P4) raised concerns about the lack of transparency in existing resource sectors, notably the diamond industry. They expressed worries that a similar lack of transparency could occur in the green hydrogen industry if not adequately addressed – *“The diamond sector still does not have much data which makes it hard to know about what's going on in the diamond sector. There's just very little information public. A publication on Namibian diamonds by a renowned Namibian economist says that over the years, things have become more secretive and Namdeb has published less and less information. So I hope we don't find ourselves in the same situation”* (P2). P2 emphasized the need for transparency standards similar to the Extractive Industries Transparency Initiative (EITI) to be applied to the green hydrogen industry. The proposed development of an access to information law was also mentioned as a potential step toward addressing this issue. P4 suggested that clear definitions are required when referring to the project structure - *“In terms of the government acquiring a 24% stake, what do we really mean and how are we going to use the ownership of such a big project for greater benefits for the country?”*.

Local participation is another theme that emerged. P3 highlighted the limited participation of locals in industries like mining and fishing, where foreign companies dominate. Given its specialized nature, this observation could hold true for the green hydrogen project. Ensuring opportunities for local involvement will be crucial in addressing potential inequalities.

Corruption was also raised, with P3 and P4 citing corruption concerns in resource sectors such as fishing, illustrated by the 'Fishrot case' (Coetzee, 2021). Corruption leading to the concentration of benefits among political elites and well-connected individuals was noted - *“What we have seen is really the plundering of those resources to benefit the elite. So, it is not trickling down to the locals, to the majority of the Namibian people, but it has really benefited only a few Namibians, mostly politicians and the well-connected elites”* (P3). Vigilance against corruption will be essential for the green hydrogen industry to prevent similar issues.

P4 also drew attention to historical land distribution issues related to resource projects, reflecting colonial processes. The concern raised was that the current resource development approach may not adequately value Namibia's resource base - *“In the view of the history of the Sperrgebiet and the*

*mining operations that took place, from 1908 onwards, where a previous Namibian had sold for a couple of rifles and a couple of pounds, large areas of Namibian soil were sold to a German colonizer. Captain Joseph Fredericks in 1883 basically sold off this entire area around Luderitz not knowing or not realising the intrinsic value that this had. And unfortunately, we are seeing a repeat of exactly that. More than 100 years later, we seem to be using the same logic, and this is something that I find extremely worrying that we have not progressed beyond valuing our own resource base, which is this fantastic Sperrgebiet that we have". It is essential to rectify historical inequities in resource allocation.*

Another key lesson for the industry is the importance of creating forward and backward linkages. The development of manufacturing activities in the diamond sector, such as diamond cutting and polishing, served as an example of forward linkages (P3). The green hydrogen industry is encouraged to capture more of the whole value chain to produce more of the required inputs and goods and services that are being used in these industries and maybe even some of the tools, equipment and so forth. *"We need to encourage creating linkages for the GH2 project otherwise we risk it to be an enclave industry that sits on its own with relatively low levels of linkages to the rest of the economy"* (P3). Encouraging linkages within the green hydrogen industry will be crucial for its integration into the broader economy.

Lastly, P6 introduced the concept of a 'regulatory freeze' observed in the absence of well-developed legal and regulatory frameworks for resource industries. Contracts with specific terms for specific projects were cited as a result of this absence, potentially hampering later regulatory developments. *"There is experience in the mining sector where this has happened in the 90s, where in the absence of laws and regulations, one has put everything in contracts because the legislation will develop later. But then you end up with the problem that is like a regulatory freeze. This means that you are not able to develop the legislation well, meaning that the legislation doesn't retrospectively apply to those contracts that you've already signed. Unless there are clauses in the contract that allow for that adaptation later"*. P6 fears that this risk may occur for this particular project in the absence of regulation and proposes that attention should be focused on tailoring the industry to the concept of learning by doing and adapting. *"I think that it is important to recognize and make sure that if clauses are put in contracts for this green hydrogen project, provisions should be in place that allow adjustments on the basis of a due process not to freeze it in a way that you can't change it as a government later on, because you then tie your hands through a contract"*.

### 4.3 Summary

In conclusion, the participants' resource curse observations in various sectors of the Namibian economy have highlighted potential risks and challenges that could apply to the green hydrogen

project. These include issues related to transparency, local participation, corruption, historical legacies, weak institutions, government equity participation, development of economic linkages, and regulatory challenges. These will be further discussed in more detail in the proceeding chapter.

#### 4.4 Limitations

The following limitations have been identified in the course of this study:

- The exploratory study solely relied on secondary data sources, without engaging in primary data collection. While secondary data provided valuable insights, the absence of primary data gathering may have restricted the depth and nuance of the findings.
- The study's geographical scope was confined to onshore diamond operations in the southern region of Namibia. The omission of marine diamond mining, which gained prominence in 2002 and now constitutes a significant portion of Namibia's diamond industry, may have limited the comprehensiveness of the research.
- During the interview stage, the study encountered constraints related to the number of respondents and their willingness to participate. The interview participation was less than ideal, with half of the survey participants participating. However, it is worth noting that the interviewed participants provided valuable insights on broader industry dynamics, contributing to a more holistic understanding of the subject matter.
- The study excluded the examination of certain resource curse symptoms, which may have implications for the overall conclusions drawn from the research.

Despite these limitations, it is important to highlight that the data collection process was executed diligently, and I believe it was robust enough to effectively address the research question and bridge the identified gaps in the existing literature. While these limitations warrant consideration, they do not undermine the overall quality and validity of the study's findings.

## Chapter 5: Synthesis and Discussion

The results section reveals that Namibia's diamond sector did not necessarily suffer from an economic resource curse but rather a colonial curse. Whilst, post-independence, the government established institutions that increased its ownership of resources, some negative social and environmental impacts of this industry persist. The anticipatory study provides results that indicate that the green hydrogen industry likely faces resource curse risks, primarily in the form of environmental impact, income inequality, expatriates dominating high-income jobs, and talent diversion. This discussion section delves into the findings and insights gathered from Namibia's historical experiences in its diamond sector and analyses how inherited institutions and practices from the past could be relevant and critical to addressing the unique challenges and opportunities presented by green hydrogen developments in Namibia.

### 5.1 Institutional Insights into Green Hydrogen Risks

Acemoglu et al. (2001) argued that resources are not the cause of poor economic growth but rather the institutions that govern them (Figure 16). This section delves into the nuanced interplay between institutions and the potential risks associated with the green hydrogen industry, drawing upon Acemoglu et al.'s influential institutional framework. The exploration of institutions as governing structures is thus assumed to be central in understanding how they shape the trajectory of emerging sectors. A pivotal moment in the diamond sector's institutional landscape was marked by the Thirion Commission, a catalyst that brought about significant shifts in governance and resource management. Examining the trajectory of institutions post-independence in the diamond mining sector provides valuable context, showcasing the evolution of regulatory frameworks. Notably, outcomes in diamond mining have shown improvement, raising pertinent questions about the role of institutions in shaping industry practices. The findings presented herein are compared against established theories, offering insights into the alignment or divergence between observed outcomes and theoretical expectations. This section unfolds as a journey through the historical and contemporary institutional landscape, shedding light on their role in shaping the likely risks associated with the green hydrogen industry.

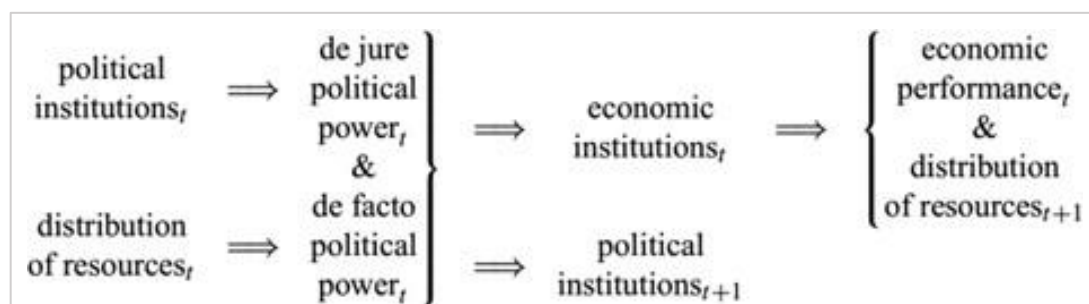


Figure 16: Acemoglu et al.'s institutional framework.

### 5.1.1 Labor market dynamics and talent redistribution

The risk assessment for the development of the green hydrogen sector in Namibia has revealed two prominent labor dynamics-related risks, each posing its own challenges. The first risk pertains to the potential dominance of expatriates in high-income positions within the industry. The second risk is associated with the diversion of talent from other sectors to meet the demands of the new industry, in particular the mega-project.

As the green hydrogen industry takes root, the influx of expatriates in crucial roles becomes a necessity due to their possession of essential skills and knowledge vital for driving industry progress. The roles taken up by expatriates will mainly be around hydrogen production and storage as this is a new area for the country which also lacks a chemicals industry. Although necessary in the early stages, the reliance on expatriate expertise may discourage investments in education and skills development for the local population, as found by Weber (2014). Evidence from the diamond mining industry tells us that locals mainly took on contract labor jobs which were likely not high-income nor of a specialized nature. A multinational organization such as de Beers would have likely used expatriates to provide the more specialized (and high-income) jobs, which would have been implemented and reproduced through their de facto power.

Following independence, the process of hiring foreign labor remains intricate (Carletti, 2023). By law, *'it is required to train a Namibian citizen as an understudy for every non-Namibian citizen employed by any relevant employer, as set out in subsections 19(3) and (4) of the Affirmative Action (Employment) Act'*. There is however a growing perception that foreign workers are reluctant to impart skills to local staff. Aside from the policy concerning the training of understudies for foreigners, there is a lack of explicit regulations regarding the importation of labor (Kasika & Dangarembizi, 2019). Policies focused on skills development and knowledge transfer to the local workforce are essential and the establishment of a comprehensive skills development framework could be a strategic response. If this is not addressed, this may perpetuate a cycle of dependence on expatriate labor and hinder the development of a skilled domestic workforce capable of accessing high-income jobs.

The second risk pertains to the potential diversion of talent from other sectors. This poaching would particularly occur as a result of the higher wages and incentives offered by this new resource-based sector. This concentration of talent can lead to a shortage of skilled workers in other sectors, hindering their growth and development (Satti et al., 2014; Smith, 2015). Policies that discourage the poaching of human capital are deemed essential. Respondent P4 particularly referred to policies that promote talent development in multiple industries and discourage the poaching of human capital as being

essential. In the mining industry, specifically the uranium industry, the absence of institutions that prevent poaching enabled the establishment of de facto institutions. Self-regulation was introduced as a means of managing talent distribution and minimizing the negative impacts on other sectors. Given the absence of regulations in Namibia's green hydrogen industry, self-regulation becomes crucial. Self-regulation can be viewed as a mechanism by which industry participants voluntarily commit to inclusive practices that prevent the concentration of talent and benefits in a few hands. The green hydrogen industry, through self-regulation, could establish guidelines and standards to ensure that talent is not diverted disproportionately from other sectors. This might involve commitments to training and then employing local talent, fostering collaboration with educational institutions, and ensuring fair and transparent hiring practices. This is emphasized by Acemoglu et al. (2018) stating that collective action is required in shaping institutions. For the green hydrogen industry, this would require cooperation among industry stakeholders, including companies, associations, and educational institutions. The concern about the green hydrogen sector becoming an "enclave industry" that draws skilled professionals away from other sectors is a legitimate one and in the absence of policies, self-regulation may therefore be a form of managing this risk.

#### 5.1.2 Environmental losses

The anticipated environmental risks are rooted in the scale of the proposed project and its location. In terms of scale, the project's extensive land requirements to host thousands of megawatts of solar panels and wind turbines raise concerns about disrupting the biodiversity within the area. The *Sperrgebiet* area was proclaimed as the *Tsau //Khaeb* National Park in 2008 with a total park area of ~22 000 km<sup>2</sup> with the diamond mining license area covering approximately 405 km<sup>2</sup> (*Tsau //Khaeb* Management Plan). The biodiversity within the area is regarded critical due to several factors. The park contains 90% of the Succulent Karoo Biome in Namibia which is internationally recognized as one of the Global Biodiversity Hotspots. The entire area is also considered a global Important Bird Area (*Tsau Khaeb* Management Plan, 2020).

Studies on the impact of renewable energy projects on the environment provide an idea of the extent of damage that may be caused in the park. The project has been awarded 4000 km<sup>2</sup> of land (i.e. some 20% of the national park), with an expectation of 7 GW of solar and wind capacity to be built. Wind farms' land disturbances are less compared to that of solar parks. NREL (2009) refers to these disturbances to be approximately 1-2 ha per MW for wind plants and 4-8 ha per MW for solar PV plants. Installation of 3.5 GW of wind power would require the erection of about 650 wind turbines. This would require disturbance to create access roads to each turbine, disturbance to erect the turbine as well as lay down areas for all the equipment required. This has raised concerns which some participants believe can sufficiently be addressed by existing policy.

From an institutional perspective, the regulatory environment around environmental protection has evolved over the years through changes in political power. During the colonial era, de facto power, often wielded by colonial authorities and mining companies such as CDM, played a significant role in shaping environmental management practices. This informal or de facto power structure allowed Ernest Oppenheimer and CDM to influence policies and practices to maximize resource extraction without sufficient regard for environmental protection. Post-independence, Namibia began to establish their own legal frameworks for environmental management. De jure power, or legal authority, shifted from colonial administrators to the newly established government, giving them the ability to regulate and enforce environmental protection measures. Assessment of environmental impacts of several activities was first developed under the Environmental Management Act (No. 7 of 2007). This now includes compulsory processes such as obtaining an environmental clearance certificate, public participation and environmental impact assessments which require full compliance through a legally binding environmental management plan. The current legislation further allows for economic activities to take place within the park by application to the Minister of Environment, Forestry and Tourism. Moreover, a Tsau //Khaeb Management Plan has been developed which has several objectives such as the protection of biodiversity within the park. Several participants have noted though that these processes need improved oversight to make them more effective.

The evolution from de facto to de jure power post-independence has provided the legal and institutional foundation for more sustainable environmental management. However, although Namibia may have a good regulatory framework around environmental conservation and management, the implementation of the existing environmental legislation will need to be further strengthened as green hydrogen production and storage processes have not been incorporated yet. This has been emphasized by a few participants. Namibia may also consider adopting more stringent environmental regulations that are in line with international standards. This can be to the benefit of the green hydrogen industry which heavily relies on international financiers who have a mandate for responsible development in protected areas.

### 5.1.3 Economic prosperity for whom?

The question of who truly benefits from the proposed green hydrogen developments is centered around Namibia's existing income inequalities, which emerged as one of the higher risks in the survey. Participants particularly attributed this risk to the spikes in income that are expected to arise, Namibia's free market economy, and the exclusionary nature of the project. Namibia already has a

status as one of the most unequal nations in the world (Levine & Roberts, 2013) which comes from a combination of historical, social, and economic factors.

Findings from the exploratory study reveal that the distribution of income from diamond resources during the colonial era was marked by a stark imbalance. The colonial powers exercised substantial control over the diamond-rich regions and prioritized the extraction of diamonds and the maximization of profits, mostly at the expense of poorly paid local migrant labour. This is evident in the extractive economic institutions which the colonial powers implemented allowing them to prioritize resource extraction over broader development, leading to an economy heavily reliant on diamonds. Despite extensive diamond extraction in areas like Oranjemund, minimal investments were made in the development of infrastructure, leaving these regions impoverished and marked by inequality. The land distribution, especially during the influx of Germans, resulted in land dispossession, disrupting traditional lifestyles and systems of resource ownership among the indigenous communities. The mining sector primarily offered low-skilled and manual labor positions, further contributing to disparities in education and skills development.

Given that the allocation of resources was predominantly controlled by colonial powers, a specific group—namely, the shareholders of CDM, and by extension, De Beers—held political power. As indicated by Acemoglu et al. (2008), a group of individuals, even without official allocation of power by political institutions, can still wield political influence. The de facto power is contingent upon the economic resources of the group. Specifically, it has been reported that powerful corporations within the diamond industry often possess economic leverage that grants them de facto power, beyond legal structures (Gapa, 2016). Indeed, De Beers, as a dominant force in the diamond industry in Southern Africa and globally, has wielded significant de facto power. Its historical control over diamond mining interests in Namibia, as well as its influence in areas such as the formation of CDM, has been substantial. De Beers' de facto power extended beyond formal ownership to shape the industry's practices and policies. De Beers' substantial profits from Namibia, even beyond its percentage of diamonds mined as found in the Thirion Commission, exemplify the economic influence it held. As per Acemoglu et al. (2001), regions where Europeans established robust settlement patterns witnessed the creation of institutions marked by robust protection of property rights and effective contract enforcement. The authors contend that these institutions, originating from colonial rule, have endured over time, continuing to shape economic performance even after gaining independence. This helps explain why Namibia has faced challenges in addressing its historical inequalities. Mehlum et al. (2006) referred to "grabber friendly" institutions as those that facilitate rent-seeking and corruption, leading to a decrease in aggregate income and an increase in income inequalities. The Halbscheid Agreement is an example of control over property rights enabled by a grabber-friendly policy environment; it enabled CDM to have exclusive rights over an area, enabling them to target rents from diamonds.

More inclusive institutions have been enacted post-independence to address the legacy of colonial rule. The National Planning Commission has been established and plays a role in formulating policies and strategies aimed at promoting inclusive economic growth and reducing income inequality. Land reform has also been a significant focus in Namibia to address historical injustices related to land ownership. With several inclusive policies in place, the issue of inequality however still prevails. The expert elicitation surfaced concerns that it may further be exacerbated by green hydrogen developments, if not considered or reviewed.

## 5.2 Déjà Vu: Repeating diamond missteps?

Following Namibia's independence, a concerted effort has been applied to enhance resource governance through various institutions. The government's increased control over diamond revenues reflects a positive shift towards more equitable resource management, impacting economic performance. Political institutions have recognized the need for economic diversification, steering away from over-dependence on diamonds. This diversification effort seeks to mitigate the vulnerability associated with resource-driven economies, further influencing economic performance (Kaplinski *et al.*, 2011). Over the years, taxation policies and royalty structures have been established to ensure a stable stream of income from the diamond sector. The introduction of measures such as the Diamond Act 13 of 1999, which imposed export taxes and royalties, aimed to counter the impact of fluctuating diamond prices. Despite the challenges of income volatility, Namibia's institutions have strived to maintain a steady flow of revenue. It is important to note that while the diamond sector has contributed significantly to government revenues, it constitutes only a small portion of the overall budget, with results indicating an average contribution of 6%. Namibia's economic institutions have also navigated the potential effects of Dutch disease with a unique set of circumstances. Traditionally, Dutch disease is associated with currency appreciation due to resource exports. However, Namibia's exchange rate regime, formally linked to South Africa's, may have mitigated the risk of even more disruptive currency fluctuations than those experienced by the South African Rand. Another notable step is the establishment of the NDTC, which oversees the sorting, valuation, and sales of raw diamonds. This initiative aimed to ensure that the benefits of the diamond sector are more equitably distributed among stakeholders, including the government. Plans and policies such as Vision 2030 and the NDPs have also been implemented, emphasizing the importance of tackling inequalities and promoting inclusivity in the labor force. Despite these changes, the government has continued to rely on De Beers for critical functions, demonstrating the enduring influence that certain political arrangements may have from a colonial era (Kahler, 1981).

With all that said, the development of Namibia's green hydrogen sector reveals some striking parallels with some historical events observed in the country's diamond sector during the colonial era. These possible similarities are noteworthy and warrant careful consideration as they may impact the success and sustainability of the green hydrogen industry.

i) Lack of transparency

A lack of transparency in the green hydrogen industry was highlighted by several participants as a major concern. This concern comes from the lack of information and data in other sectors with the diamond sector being one of them. Over the years very little information has been made available. Namibia is not part of the EITI, however it is on the agenda with participants referring to the benefit that will arise as a result of joining the EITI. Today, limited information is available regarding the award of the bid to the company that will be developing Namibia's giga-scale green hydrogen project.

ii) Land concessions

A major concern identified is the repeat of how land has been allocated in the Sperrgebiet area. For the green hydrogen project, land was awarded to a single company over a 40-year concession. P4 referred to it as a single project approach, with the government placing all their eggs in one basket. This resembles how Ernest Oppenheimer was granted a 60-year concession over the Sperrgebiet area. He was granted the exclusivity to mine in the Sperrgebiet area, and now the project company similarly has been granted the similar rights. It was because of this exclusivity that Oppenheimer was able to overmine the area for the benefit of DeBeers and at the expense of the country. A risk associated with such long-term exclusive concessions was described by P6 as a 'regulatory freeze,' where the absence of a well-developed legal and regulatory framework might lead the government to enter contracts with specific firms for specific projects without the flexibility to adapt. To prevent such issues, it is crucial to focus on tailoring the industry to the concept of learning by doing and adapting. Any clauses in contracts should allow adjustments based on due process, avoiding a situation where they cannot be changed later on. Failure to provide for this could promote the establishment of extractive and grabber friendly institutions.

iii) Free market economy

Post-independence, Namibia has maintained a free market economy. None of the country's industries have been nationalized, however in the case of diamonds, state-owned enterprises have been established to handle a portion of the value chain, in what may be termed a 'mixed economy approach'. Although free market institutions have promoted direct investment and promoted economic growth in Namibia, they have also led to the persistence of socio-economic inequities and unequal distribution of resources in postcolonial Namibia (Arreman et al., 2016). With a similar mixed economy approach being

employed for the development of the green hydrogen industry, inequalities might persist. This may also reinforce and recreate dependencies on foreign investment and technology.

iv) Colonial similarities

Historically, colonialism often revolved around resource exploitation. The diamond industry in Namibia was established under colonial rule primarily for resource extraction and export. Similarly, Namibia's green hydrogen project aims to export 300,000 tons of green hydrogen annually to the global north. Although still in its infancy, van de Graaf et al. (2020) have introduced the concept of 'green colonialism' to illustrate the export nature of these renewable resource projects. Orihuela (2018) argue that the management of resources needs to consider colonial institutions and how they have evolved. Kalt and Tunn (2022) also underscore the need to view green hydrogen developments in the context of global inequalities and colonial histories that have shaped the economic landscape of the country.

The presence of these historical 'missteps' in the green hydrogen sector calls for a thorough consideration of the steps required to develop the industry and its projects, considering the need for transparency, responsible land allocation, and a broader understanding of the historical context that has shaped the country's resource-related ventures.

## Chapter 6: Conclusion and Recommendations

This dissertation has explored the potential resource curse risks embedded in Namibia's ambitious green hydrogen developments, with a particular focus on the Southern Corridor Development Initiative. The research objective was to conduct a two-phase assessment, drawing insights from Namibia's historical experiences, notably in its diamond sector, followed by a prospective expert elicitation, both applying Acemoglu et al.'s institutional framework. The dissertation illuminated the complex interplay of institutions, economic structures, and historical legacies, framing the discussion around potential resource curse symptoms.

Namibia, in its diamond narrative, occupies a middle ground. Rather than a simple case of benefiting or failing, Namibia's experience reveals the profound impact of colonial powers that entrenched extractive institutions, creating a vacuum around the country's diamond resources. Acemoglu and Robinson's institutional framework provided a lens through which to examine the role of institutions in shaping the trajectory of resource development. The diamond sector's experiences, marked by a colonial resource curse, shed light on the intricacies of resource governance, economic performance, and the social repercussions of unchecked resource extractions. The Thirion Commission in the last decade before independence emerged as a pivotal moment in the diamond sector, triggering shifts in governance and resource management. The transition from dominance of de facto to de jure power post-independence brought about positive shifts including more inclusive institutions and resource ownership. Yet certain institutional challenges – such as limited transparency – persist, underscoring the need for a nuanced approach in developing new resource-based sectors. As the spotlight shifts to Namibia's nascent green hydrogen industry, the potential for economic growth looms large. The findings however present that there are real risks of some resource curse symptoms that may evolve out of the green hydrogen industry.

- The first two risks are on labor market dynamics and talent redistribution. This highlights the necessity of balancing expatriate expertise with local empowerment. The reliance on foreign expertise, while essential in the early stages, calls for strategic policies focused on skills development. Drawing from the diamond and uranium sector experiences, self-regulation and a comprehensive skills development framework are recommended to foster a skilled domestic workforce.
- The third risk is on the environmental impacts of green hydrogen developments. This emerged as a critical dimension, due to the scale and location of the project within the Tsau //Khaeb National Park which hosts some of the country's most important biodiversity hotspots. This will require responsible environmental management. Strengthening implementation and adopting stringent regulations aligned with international standards are imperative for

responsible development.

- And lastly, the risk of further exacerbation of income inequality emerged. The historical disparities in diamond resource rents distribution highlighted the socio-economic imbalances that persisted post-independence. The green hydrogen industry, positioned as a potential economic powerhouse, must navigate these historical pitfalls. Policies promoting a wider sense of national ownership through inclusive ownership structures, and economic diversification are crucial to address income inequality. The green hydrogen sector should find a balance between societal benefits and financial gains from the industry.

Furthermore, parallels drawn between the diamond industry and the green hydrogen industry reveal similarities in institutions, the distribution of resources and political powers, that may lead to a repeat of history. Firstly, issues of transparency as experienced in the diamond industry have been observed in the green hydrogen industry developments, which may encourage corruption. Secondly, developing the green hydrogen industry under free market principles may reinforce socio-economic inequities and unequal distribution of resources as observed in the diamond industry. Thirdly, the award of a land concession to a single player for a very long time is financially risky and carries the risk of regulatory freeze. A large and long-term land concession was similarly awarded to a single player in Namibia's colonial diamond history. And lastly, colonial export-based practices seem to be repeating themselves, involving the same area and same country. These possible historical 'missteps' underscore the importance of informed decision-making and robust institutional frameworks in navigating resource-related ventures.

As Namibia charts its course into the uncharted waters of the green hydrogen industry, the echoes of history call for a deliberate and thoughtful approach. The path forward is illuminated by the lessons of the past, guided by the imperative of strong institutions and driven by a shared commitment to sustainable and inclusive development. The theoretical underpinning that development blossoms from robust institutions becomes a guiding principle for the green hydrogen frontier. The study underscores the imperative of directing attention towards institutional building, acknowledging that the destiny of this emerging industry is intricately tied to the strength of the structures that govern it. In asking the pivotal question of whether resource curse symptoms could manifest in the green hydrogen industry, the answer resonates with an agreement that they could. This should signal policymakers, industry leaders, and global collaborators to collectively engage in a venture of institutional building to carve a sustainable and equitable future. The concluding reflections encapsulate the essence of the study, outlining recommendations for further research and practical considerations to navigate the anticipated risks.

### *Recommendations for policymakers and sector players*

On a practical level, the recommendations aim to guide policymakers, industry stakeholders, and other societal actors in navigating the resource curse risks associated with green hydrogen development. Proactive institutional measures, transparent information-sharing practices, and environmental safeguards should be integral to the industry's development. Community engagement, skills development, and economic diversification policies are essential for fostering equitable socio-economic outcomes. The following actionable steps could pave the way for effective implementation:

- The government should focus on establishing robust institutions to govern the green hydrogen sector.
- In the absence of regulatory frameworks, the green hydrogen industry should adopt self-regulation mechanisms.
- Continuous investments need to be made in comprehensive capacity-building initiatives for effective governance. This includes targeted training programs for government officials, industry professionals, and local communities, fostering a collective understanding of green hydrogen developments and sustainable resource management.
- The enforcement of existing environmental policies should be enhanced, and government should consider adopting more stringent regulations aligned with international standards. This is crucial to safeguard the biodiversity of the Tsau //Khaeb National Park. The green hydrogen industry must adhere to environmentally responsible practices and secure approval through transparent environmental impact assessments.
- Government should engage in international collaborations and frameworks, such as the EITI, to enhance transparency and accountability in the management of resource rents, including from renewable energy resources transacted in the form of green hydrogen.
- Existing policies and frameworks will need to be reevaluated to address income inequality in Namibia. This could entail developing targeted policies within the green hydrogen sector to ensure fair distribution of economic benefits as well considering wider national participation through suitable ownership structures to prevent the concentration of wealth in specific segments.
- Efforts to diversify the economy beyond the resource sector should be supported. This should involve encouraging the development of other industries and economic activities to reduce dependence on resource extraction. There are growing signs that the green hydrogen industry could become a catalyst for green manufacturing across a number of sectors.
- Adaptive clauses should be included in contracts to allow for adjustments based on evolving circumstances to avoid regulatory freeze.

### *Future work*

The complexities uncovered in this research present avenues for deeper exploration. Future studies could delve into the intricacies of institutional design specifically tailored for the green hydrogen industry, considering its unique challenges and opportunities. Advancing our understanding of the dynamics surrounding green hydrogen development in Namibia necessitates in-depth exploration through further study. The following recommendations guide future research endeavors:

- Conducting comparative analyses with other nations engaged in large-scale green hydrogen projects. This approach allows for a nuanced understanding of both successful and unsuccessful experiences, providing valuable insights and best practices.
- Exploring the evolution of institutional frameworks in postcolonial contexts. Focus on the influence of *de facto* and *de jure* power structures in shaping resource governance, shedding light on the institutional trajectory over time.
- Exploring and understanding the cumulative impacts that may result within a national park from the development of green hydrogen assets.

## 7. References

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# Appendices

## A.Ethics clearance



UNIVERSITY OF CAPE TOWN  
IYUNIVESITHI YASENAPA - UNIVERSEITIE VAN KAAPSTAD

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2023/02/21

EBE/02070/2023

RE: Research Ethics Committee Project Approval Letter

Dear Iyaloo Akuaake,

Your application for ethics review of your project titled  
Assessing resource curse risks in green hydrogen developments: a Namibian case study.

has been reviewed and evaluated by the  
CHE: Dept. of Chemical Engineering Research Ethics Committee (REC).

Based on the information supplied your application has been successful and is approved.

You may proceed with your research project titled:  
Assessing resource curse risks in green hydrogen developments: a Namibian case study.

Please note that should:

- (i) any serious or adverse effects to participants occur and/or,
- (ii) aspect(s) of your current project change and/or
- (iii) any unforeseen events that might affect continued ethical acceptability of the project occur then you should immediately report this to the approving REC. You may be required to submit an amendment to this application, in order to determine whether the changed aspects increase the ethical risks of your project.

Please note the following additional conditions associated with this approval:

- (i)

Regards,  
CHE: Dept. of Chemical Engineering  
Research Ethics Committee

## B. Consent form to participants

**Project Title:** Assessing resource curse risks in Namibia’s Green Hydrogen Developments with Insights from Diamond Mining.

**Invitation to participate, and benefits:** You are invited to participate in a research study. I believe that your experience would be a valuable source of information, and hope that by participating you may gain useful knowledge.

**Procedures:** During this study, you will be asked to fill out a survey and take part in a semi-structured interview.

**Recording:** We may take audio recordings during the interview stage. All the information gathered during this interview is confidential and will be solely used for the intended purposes of this study. If you object to this, please indicate below.

**Risks:** There are no potentially harmful risks related to your participation in this study. All data captured for this study will be stored according to a data management plan which will ensure that all information remains confidential and only accessible to the researcher.

**Feedback:** You will receive feedback about the results of this research through email communication. Research data will not be made public at any point. You will be provided an opportunity to comment on the interview summary analysis prior to integrating all other responses. Secondly, you will be notified once the dissertation has been examined and it will be shared with you, on demand.

**Disclaimer/Withdrawal:** Your participation is completely voluntary; you may refuse to participate, and you may withdraw at any time without having to state a reason and without any prejudice or penalty against you. Should you choose to withdraw, the researcher commits not to use any of the information you have provided without your signed consent. Note that the researcher may also withdraw you from the study at any time.

**Anonymity and Confidentiality:** Participants will not be anonymous to the researcher in this study however all information will be kept confidential in that you will not be identified by name or by affiliation to an institution in the dissertation write-up. Confidentiality and anonymity will be maintained through the use of codes in publications emanating from this research.

**What signing this form means:** By signing this consent form, you agree to participate in this research study. The aim, procedures to be used, as well as the potential risks and benefits of your participation, have been explained verbally to you in detail, using this form. Refusal to participate in or withdraw from this study at any time will have no effect on you in any way. You are free to contact me, to ask questions or request further information, at any time during this research.

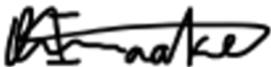
I agree to participate in this research	<input type="checkbox"/> Yes	<input type="checkbox"/> No
I agree to be audio recorded	<input type="checkbox"/> Yes	<input type="checkbox"/> No
I agree to disclose my identity to the researcher during the data collection process.	<input type="checkbox"/> Yes	<input type="checkbox"/> No

\_\_\_\_\_  
Name of Participant

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

Iyaloo Akuaake  
\_\_\_\_\_  
Name of Researcher

  
\_\_\_\_\_  
Signature of Researcher

04/04/2023  
\_\_\_\_\_  
Date

## C. Survey

# Assessing resource curse risks in green hydrogen developments

March 2023

This survey consists of two short sections which should not take more than 5-10 minutes to complete. A summary is provided in the invite email with all the resource curse symptoms and a short description of the impact of resource curse on green hydrogen developments. Please read through the summary before completing the survey.

\* Required

### Participant Details

1. Name and Surname \*

2. Email address

3. Which area(s) would you regard yourself as having expertise in? \*

- Environmental management
- Industrial development
- Economic affairs
- Natural resource management and/or law
- Renewable energy and/or green hydrogen developments
- Strategic investments and project financing
- Socio-economic development
- Corruption and transparency
- Development planning
- Public policy analysis
- Research and skills development
- Other

Assess the likelihood of each symptom (risk):

that may occur as a result of developing the Southern Corridor Development Initiative (SCDI) green hydrogen project.

**4. Environmental damage/degradation**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**5. Diversion of investments away from human capital**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**6. Diversion of talent from other sectors**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**7. Economic dependence**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**8. Reduced economic diversity**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**9. Expatriates dominating high-income / skilled jobs**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**10. Income inequality**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**11. Income volatility**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**12. Loss of competitiveness of other export sectors**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**13. Weakening of institutions**

	Very unlikely	Unlikely	Neutral	Likely	Very likely	Not qualified to comment
Likelihood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Assessing the potential level of impact of each symptom (risk).

15. Arrange the following symptoms (risks) from highest to lowest impact.

- Environmental damage/degradation
- Diversion of investments away from human capital
- Diversion of talent from other sectors
- Economic dependence
- Reduced economic diversity
- Expatriates dominating high-income/skilled jobs
- Income inequality
- Income volatility
- Loss of competitiveness of other export sectors
- Weakening of institutions

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.



## **D. Semi- structured interview questions**

### Part 1: Identified risks (tailored)

Thank you for completing the survey. You have identified these three symptoms as the most significant. This graph indicates how my other 10 participants responded. Let's discuss this in relation to your choices.

- a. Could you explain why you picked those three?
- b. Could you explain why you did not pick the others that other participants ranked higher?
- c. What was particularly relevant to the Namibian context that influenced/motivate your choices?

### Part 2: Existing policies and their implementation (is there anything in the policies space that mitigates chosen symptoms)

- d. Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three you picked or those ranked most significant by the other participants?
- e. Did you take this/these policies into account when you were choosing the most important effects? How would your choice be different if you did/didn't take this into account?
- f. Is there anything else you would like to add on the topic of policy in relation to the resource curse in green hydrogen developments?

### Part 3: Considering other sectors (identifying gaps – have we experienced elsewhere and will we experience them again)

Based on Namibia's significant dependence on resources –

- g. How do you think resource curse effects would be different for green hydrogen developments in comparison to oil and gas industries and mineral resource industries?
- h. Have any resource sectors suffered from the resource curse phenomenon? If yes, what similarities do you think may be transferred to green hydrogen developments?
- i. If risks have been avoided in other Namibian sectors, how can these be prevented for green hydrogen developments?
- j. *Is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development? (OPTIONAL)*

In conclusion, is there anything you have learned from this interview and is there anything you think I could improve or consider in my study?

## E. Interview Transcripts

Participant 1

**Question 1: You have identified the following symptoms as the most significant for the green hydrogen project. Could you explain why you picked these three?**

Environmental damage: Well, look, I think it's inevitable that you're not going to have an environmental impact because one of the big traits of the movement from fossil fuel-driven generation to renewable energy is that your footprint per MW of generation is just exponentially larger, obviously because of your Solar panel density versus a coal power station, for instance, is massively different. Likewise, even with a wind park, large commercial turbines above 6 megawatts are spaced more than a kilometer to two kilometers apart, so you're utilising quite a lot of space, although most of that is just empty space. In terms of how you conduct an environmental impact assessment, it's all included as a development area because obviously you have connecting roads and there's impacts on birds etc. So environmental impact is inevitable. There is going to be no way that you can develop this industry without the environmental impact. Your question I believe didn't have a quantum of environmental impact or the amount of negative environmental impacts. The key question is basically how do you sustainably manage environmental impact for renewable energy when the world needs so much new renewable energy to be built and where do you do it in the locations that do not destroy critical habitats and important biodiversity areas, but at the same time you've also got to take that attitude and compare it to where is the best resource. That's a very important quantum because if you were to compare solar panels in Germany with solar panels in Namibia, you would need to build three times the number of solar panels to get the same amount of energy. So although a previously farmed cow farm in Germany might be less environmentally damaging than a piece of desert that hasn't been touched for 100 years in Namibia, you still have to do three times the damage in Germany as you would in Namibia, so you have to balance responsible development with the fact that you've also got to target the best quality resources, because then you're gonna use less infrastructure on the ground and have less of an impact on the environment. So balancing that is one of the difficulties developers face right now. But I don't wanna be so reductive.

Income inequality: So I mean, I think there will be income inequality. The industry will have a huge impact at a regional level in the average income of the Karas region, okay, I'm being sort of very specific to the SCDI project, given that the Karas will be the main hydrogen hub for Namibia. You're going to have a huge spike in average income in that area relative to the rest of the country, so that's inevitable. And then what's going to compound that effect is a skill shortage. The high-quality skilled people are in very short supply, especially if you're targeting local Namibians. And one of the key parts of the bid that the government of Namibia put out for the tender was local content and local employment. So when you're targeting local employment and you've set a high threshold for local employment, plus you combine that with a skills shortage, especially in the higher skill sets, you know the engineers level people with much higher university level degrees, you are going to have to pay over the odds incentives to those people to work on the project. You're combining an income inequality spike at a regional level with a short

supply, which means your income inequality is going to be quite high. I think that will be an inevitable effect until you start bringing the average skill level up and you start addressing the supply shortage of skills and ideally you don't want to be plugging that gap with a lot of foreign labour. You want to try and bring the country's skill level up rather before you bring in loads of other people from around the world.

Expatriates dominating high-income jobs and technological dependence: I think that's also an inevitable effect because you know we're working very hard to skill, to train graduates and sort of see that vocational level people can step in and work in the industry, not just for Hyphen but the industry as a whole. But there's no substitute for experience, and you're going to need some very experienced people operating in the value chain and because almost all of this value chain is completely new to Namibia, there just isn't the skill set there. We've got teams in Germany now with 50 years operational experience on wind turbines, you need those people to come in and start transferring the skills. And we're not a gas pipeline experts, but we're gonna have to bring gas pipeline experts from Europe, North America and Asia into Namibia to operate these assets until the school level comes up. And unfortunately, because Namibia doesn't have a high industrialization and especially doesn't have a high industrialization around renewable energy and the chemicals industry, you're going to have to import those skills and transfer skills. So I think there will be a high reliance on the import of the higher skill levels.

**Question 2: What was particularly relevant to the Namibian context that influenced/motivated your choices?**

Environmental damage: The reason why environmental damage is high on there is because the project is inside of a National Park where it is being developed. The National Park is there for a reason. Historically, the reason what was previously called the Sperggebiet, was there was that it was the old diamond concession that the German government didn't want people to go into. So they put a massive barrier around where all the diamonds were. The byproduct of that is that it's been an unspoiled wilderness for 100 years and I think importantly, if I understand correctly from the biodiversity, the fact that they've never had any cattle grazing go through the area is hugely important for the species that have survived there, that haven't survived elsewhere. So you've got an unspoiled area that has some very critical biodiversity importance. Generally, it's the flora and fauna. It's not really the bird life because it's a desert. There's not much out there. So that's also why it's influenced me to put it a bit higher because in this specific context, the project is being developed in what's called a critical biodiversity area, and there are very important global rules and standards around how you can responsibly develop in those areas, bearing in mind that as I mentioned, the footprint of the project operations, although it is very spaced out on the operations, the actual disturbed area is small. If you look at the entire concession area where it is being developed, disturbance is about 3% of the ground in total for the whole operation. It's very high on the priority in terms of the potential impact. Yes, the project is in a difficult environmental area, but there is only potentially disturbance of 3% of the area. And in doing so, offsetting 6,000,000 tonnes of CO<sub>2</sub> at a global level. So you know, it's a trade-off between wanting to go build green energy, but we also don't want to destroy important environments. And how do you manage that responsibly?

So that and skills development is probably two big risks to project developers.

Income inequality and skills development: The whole skills development and income inequality, as you mentioned, they're related because one is creating the other really. And in the Namibian context, Namibia is not an industrialized nation. There's not a high number of people in the labour market that can fill those positions, particularly the higher ones just yet. And also it's a tiny population. You are trying to build one of the biggest projects in the world. So obviously skill shortage is going to be a problem. But it's something that needs to be overcome. Skills and labor can be taught and brought in but you can't change where the best sun is in the world.

**Question 3: Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three symptoms you rated to be most significant?**

Environmental damage: The environmental one is quite well covered and that would be under the Environmental Management Act, I think, which would cover the ways in which you can develop in national parks in Namibia, basically. And for that there is a well established Environmental clearance certificate process for which a developer would need to do and would need to prove that you're responsibly developing. You have an environmental management plan to show you're minimising impact and that you're supporting the parking infrastructure. So I'd say on the environmental sensitivity, the standard and the rules and the policies are very high standard already. South Africa and Namibia have some of the most stringent environmental policies in the world. It's actually easier to develop in Europe than it is in Namibia. So that is very well catered for under the current legislation and there is no need to really update it. The whole issue on the environment and developing in a critical biodiversity area is actually a rule imposed by the financial institutions in Europe. So it's not a Namibian problem. I don't think there's any risk of not getting an environmental clearance certificate, but it's whether or not the funders from Europe will support it based on their own rules. So hence it's not really a Namibian policy issue. As far as I understand anyway.

Skills development: I'm not familiar with a policy that would mandate a certain level of skills development or even local content in the industry. It's not like in South Africa where you have the BEE requirements or the minimum local procurement requirements. As far as I know, the industry has been completely exempted from that. All I know is that there is a proposal in the next few years of the Hydrogen Act that the government of Namibia is to develop and under that, there will likely be a mandatory skills development framework, but to my knowledge, I don't think there is a current piece of legislation that governs there.

Project developers such as myself, conform to the highest international standard anyway, so if we think a local policy is not strong enough, we will never develop on that basis. We would always develop on the international posts anyway, so. It's good Namibia has strong environmental laws because it actually led to Namibia protecting its entire coastline. I'm putting under government ownership, so 40% of the land mass was under the control of the moving government and it allowed them to do the tender, which is amazing. South Africa wishes they had that flexibility because it's about the South African government, can't

do a tender for hydrogen. It's gonna land. Whereas in government protected its land and did that. So it was a very smart move under Environmental Protection policy.

**Is there anything else you would like to add on the topic of policy in relation to the resource curse in green hydrogen developments?**

I still think there is lots to do because there is no current policy that would correctly govern the hydrogen industry. Some bits will fall under other acts. So nothing that we currently have in Namibia is correctly geared towards hydrogen and hence the decision as far as I know, from the Namibian Government is to implement a hydrogen act which is going to be fit for purpose for the industry. And I think it's if you look at like previous oil and gas acts, you can see the big levers that need to be clarified in there, everything about how Namibia can successfully capture the opportunities is around policy certainty to the international community. You've gotta give absolute crystal clear certainty and that flows right from the top of government where they need to have strategic alignment about what it is they're going to do. So before you even get to an act or a legislative body, you need to have a clear national strategy and everyone needs to be aligned to that national strategy. It's exactly what we don't have in South Africa where you've got one minister pushing nuclear, another coal, another renewables, another one hydrogen. But none of them are talking the same language. Namibia is much, much better than that where you know right from the President, right through to the GHC, right through to the ministers, they're all saying we're going to make the hydrogen industry work. Already the international community has ears up, looking at the media now we're focused there. The next thing is actually the nuts and bolts of legislative environment and that needs to fall under the new Hydrogen Act. And there are big pillars inside of that that any funder or developer needs to have certainty on. Land rights is a huge part of that. What kind of rights are going to be granted to developers over what tenure, you know, no one's asking for 100-year concession like the old diamond miners. But we've got equipment that needs to last at least 25 years. So you know you need accurate land rights that are secured and protected. And fiscal regime is huge, obviously. How is it going to be taxed? How is it going to be incentivised? As part of that you'll have SEZ framework so that special economic zones, skills - you want to incentivise localization? How do you do that? You create special economic zones to increase the manufacturing of components in country. All those kind of things. It's like economics 101. It's not difficult seeing it where it's happened and worked correctly. But you need to have it into legislation. Local content requirements, skills development. You have to be careful that you don't fall into the trap that South Africa did with three REIPPPP where it puts such stringent local content requirements on its bids that essentially people stop bidding because it was impossible. There just wasn't the skills or you end up having to give like a BEE holding company, almost like a 25% free carry on a project just to meet the requirement. But it kills the profitability of the project and all of those things need to fall under the act. So that needs to come and it needs to be implemented. It starts with strategic certainty and then you need land, resources, skills, local content procurement and then fiscal certainty, investment certainty, all those kind of things need to come under the Act, so it's all coming. And as far as I understand, it's been worked on, but that's certainly needs to come sooner rather than later.

**How do you think resource curse effects would be different for green hydrogen developments in comparison to oil and gas industries and mineral resource industries?**

So there's many different mechanisms you can employ to minimise the effects of the resource curse. So if you want to break it down broadly into an economic category and then perhaps a socio-economic category, right? So the economic category is the money that stays in the country. Obviously, the way in which you managed that usually is through the fiscal regime. You need a responsible fiscal regime that is gonna make sure a portion of the wealth stays in the country and then gets pushed back into the economy and has the multiplier effect etc and supports the local economy. So one of the leavers you can pull is the fiscal regime. The risk on the fiscal regime is always that you price yourself uncompetitively out of the global market if you set the bar too high. So the Namibian Government basically has to try and benchmark globally, all of the fiscal regimes, and tax the industry at an appropriate level that will unlock the industry and not hold it back, but at the same time make sure wealth is created in the country and that's something that they will be doing under the current act. So responsible fiscal regime is something that is super high on the priority of all of the government officials that we've spoken to and I don't think there's going anyone getting a Saudi Arabia 5% tax rate. You know, I think we're all quite aware that we're going to be paying a significant amount of tax, and the fact that the revenue amounts that we're talking about from this industry it's more than 20% of the country's GDP, would be coming in every year from this project and the tax portion going to the Namibian fiscus is huge. So responsible fiscal policy is key.

And then the other side of wealth creation from an economic perspective in a direct sense is firstly royalties. So there's a royalty regime as part of the project that we were due to submit and that's obviously beneficial for the country because the royalty is paid before tax and before debt. So as soon as the company starts generating revenue, it goes straight into the fiscus and that is a huge benefit to the country. And once again the quantum is so big, that's a huge amount of money for a very small population, so proportionally a big effect. This is not the same as a uranium mine. That might make \$100 million or \$50 million a year, the hyphen project at full scale will be making several billion euros in revenue a year and the government already takes 5% of that as a royalty and that's straight into the fiscus. So it's a huge effect that goes in there relative to the size of the country.

And then the 3rd way is equity participation from the government itself. And this is not unusual compared to the oil and gas industry. I know Namcor has a position in or a free carry I think in all of the oil fields and things like that. So in the hyphen project, The Namibian government has the option to take up to 24% of the company, which I believe is one of the largest shareholdings ever offered in a resource space for the government. And that is the ultimate way for a country to share in the project's economic value, because in doing so, the government and hyphen are fully aligned to the same goals. Which is the business to make profit and then as an equity holder, the country will benefit.

So in terms of direct economic benefits, the way in which the Namibian government structured the tender was to leverage those three things. And they've ensured that those things are going to generate a huge amount of income for the country. I can't guarantee that that income is spent

responsibly. That is not my job. That is the government's job. But in terms of the quantum, you're talking more than 50% of all of the revenue that is generated will stay inside of the border. It will never go offshore. Through taxation, royalties, and participation, it stays in the country. That's already a massive percentage of billion odd EUR every year that is now staying in the country.

Then you've got all the indirect effects. Things like your salary bills. And as we mentioned, we're expecting disproportionately high salaries as well. So if you then take your salary bill and the indirect effects of those salaries going to Namibians and then being spent in the local economy, you're talking about 60-70% + a multiplier going into the Namibian economy. So just the effect of all of that income going in is gonna have a huge effect and one would hope, certainly not result in a huge amount of wealth leaving the shores of Namibia and not, as my understanding of what the resource curse, really creates. So that is on the economic side.

There's perhaps a little topic as a digression as well, which is that the current project is focused on exporting raw ammonia or anhydrous ammonia into Europe and that is because the off-take schemes and the financial support is coming from Europe at the moment to get the industry off the ground. Certainly when we're talking about subsequent phases in the future and also the other developers that are to develop in the country, the argument for domestic and regional supply of, particularly ammonium derived fertilisers, is going to increase more and more because a good example here is Zambia is paying a huge premium to get fertiliser into its farming region which it is importing from China. Why shouldn't we just produce the fertiliser in Namibia and send it on on rail or on road a few 1000 kilometres? You know, it makes a lot more sense to do that, but you need the industry to develop and to do that you need a financial underpinning of a European Government, basically to start. So if you talk about the resource curse, I don't think there's been the same model in a lot of economies where your regional partners could be your strongest trading partners. Previously, a lot of the wealth was mined or extracted and sent very, very far away. Here you're talking SADC, a region that could essentially be self-sufficient on fertiliser and food production or become net food exporters in the next few years. And if you look at where the global population is going, it seems like Zambia is a great example. There is just huge amounts of very good, high yield farm area that is underutilized and it needs fertiliser and Namibia can convert its sunshine and sea water and send it there. And that's just a small sub point on product diversification.

On the social side of it, which I think is another big point of avoiding the resource curse, what are the requirements of how the bid was carried out and how the government intended, was to look at local content, both in terms of the supply chain but also in terms of the labour force. And you know, the company pledged to employ 90% of its labour force as Namibian. As part of just bringing that labour force on board, you're going to have a massive upskilling requirement. The first interns. Have already been brought into Hyphen and some will be sent to Germany to train on wind farms as wind technicians and battery plants etc. So upskilling thousands and thousands of people will most likely take place just for one project. Now extrapolate that to the next project, you're talking about the average skill level of the entire country is now coming up. And as the average school level comes up, the average income, GDP per capita. It makes it easier for the next project to get off the ground and you can

start moving forward more towards industrialization level of an economy and the average standard of living moves with that. So that is the one comment and then a final sub point on employment is that the comparisons around the resource curse have always been made on extractive industries, so your reference was mining and oil and gas. Once you finish an oil well or a gas well or mine, that's it. You rehabilitate it and then you move on to the next place. A good example here is Rosh Pinah, right where one of the mines is, I think both mines are on care and maintenance right now. And you had a whole town develop. It may turn into another ghost town. I'm just using it as an example. I'm sure there are lots of examples all over the place where that's happened. We don't currently have a better option for renewable energy other than wind and solar and hydro Electric, but it's very geographically limited. And we believe we're gonna still need energy going forward or ever. The sun and the wind never run out. Which means that as soon as the wind turbines and solar panels have reached the end of their life. We're going to be taking them down and going to be putting the back up again. It's a non-depleting industry, which means that the jobs and the skills that you train in that industry have tenure for life. And the more you build the skills level, the more you build the ability to train people. So larger universities TVET, colleges, vocational training, etc, you're actually just going to be supporting an industry that's going forever. And I think that is one of the key differentials when you look at the resource curse, that it's a non-depleting versus an extractive industry. And I think the likelihood that the industry's going to close in the next 50 years and you're going to be left with a lot of stranded highly skilled people, is very low. Not unless someone manages to get nuclear fusion working that we don't know about. But even then I think they're only predicting that to come in in 2050.

#### **How would you rank rent-seeking and corruption?**

Well, there's, there's opportunities in any industry for corruption, particularly in a high-stakes game where there's so much money involved. And one of the big reasons why we, as a company chose to go to Namibia, was its low political risk and high governance transparency factor. You know it has a very, very good democratic index etc. I suppose the only good example I can give, it's an anecdotal example, is how the bid process itself was handled in Namibia for the first big hydrogen project because that's a good indication of the level of corruption and how good a country's governance is. And you know something that South Africa regularly doesn't get right. I don't wanna say anything. `With the government of Namibia, they went through a request for information to the market, so they went out to all the interested developers and they said, OK, we see you all want to get land in this area and you want to develop, here's some questions. Go answer them. Give us your thoughts. How would you do this? How would you like to see a tender written? You know, what guarantees would you need, you know, how much land, etcetera. We wrote pages and pages and sent it back to them. And then a couple of months later, they actually came out with the tender document.

And then when it came to the adjudication of the bid itself, It was done by a diverse team of experts inside of the Namibian government and the SOE. So there was Nampower, MET, MEFT, and they brought in independent international bid adjudicators. I believe it was ENREL (National Energy Laboratory in the US) and also experts from the European Energy Commission. They brought some experts in. So you're talking about a bid committee that brought the best of the internal resources of the country,

who know the local environment and then they also took the best of some of the international experts and also to create a third party assessment of the bid and then they combine the scorings of those to a point to the final successful bidder. And with that as well, things like the the bids themselves were kept in rooms with 24 hour webcams, CCTV that was constantly monitored, that the the bidders could see. There was never any tampering with bids or anything like that. And all those things just point to a really, really good competitive process and the scoring of bids was in the matrix of the bid. One could see that if you get full marks for this, you get X number of points and this is how it adds up, etc. So as I say, it's an anecdotal single piece of evidence, but if that's the way that the country has started with a very good competitive process, the ultimate bit of evidence that you'd have to focus on is, when the bid was announced at COP in Glasgow, there was seven days for the competitive bidders to launch quick queries or complaints or objections against the award of the bid. Not one did. No one launched an objection and bear in mind, you know, when it comes to South Africa, when there's a tender, there's like 50 people launching objections and straight away because, you know, they're convinced it wasn't done correctly. So if that's ever a good metric of it was a good, fair, transparent, competitive process, none of the other bidders had any objections with the appointment, so.

I can't tell you that the industry is going to continue on that great start, but it is a great start and it was such a strong signal to the market. The amount of investment that has now flown, I mean the (IBF) has committed half a billion euro to the Namibian government for this project. They wouldn't be doing that if they didn't believe that it was being handled in a fair and competitive way. I'd be very surprised if they did the same thing for South Africa, put it like that.

**Have any resource sectors suffered from the resource curse phenomenon? Is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development?**

I think you know, it's a very good point and actually the mechanisms that you mentioned there of royalties, equity participation and taxes are exactly the three mechanisms that are also being used on the economic impact on the hydrogen industry. I mean, it's no surprise that those were the three things that the government of Namibia ranked so highly in their bid because they exactly copied the model from the diamond industry. So yes, it is a good example of the levers in which you can pull in order to basically equitably participate in the economic benefit of an industry.

What does differ significantly is the level at which you set those leavers. The diamond industry and the point at which the government set those rules, the diamond industry was hundreds of years old at that point, it was 1907 they found the first diamond in the south. It was well established that there were diamonds in the area and not only that, they are alluvial diamonds that sit loose in the material. They are not diamonds where you have to sink your shafter 1000 metres down and have complex machinery. So you're talking about an industry that has very low capital intensity, very low overhead, high margin business. If you compare the amount of CapEx you need to spend on a diamond mine in Namibia versus the amount of CapEx you need to spend on a uranium mine or a zinc mine, hugely different models. So hence why it works that you can charge such

a high royalty and such a high tax rates on the industry because when you're developing that asset, you don't have a huge amortization of debt because it's not a high CapEx up front.

Whereas in the hydrogen industry, almost all of our expenditure is up front. We have very low OpEx, but very high CapEx and when you're doing that, you sit with a huge amount of debt and if you're overly taxed, in terms of the royalty because the royalty always comes off top line before you pay off debt. What happens is the project will become unfeasible because you'll never pay off the debt and never get it financed, so hence setting a very high royalty rate, and in a very high taxation level, in a very high active participation rate on an industry which is new, where it's all upfront CapEx, it would never work. So to your point, yes, the leavers and the model is correct, but the nuance is setting them correctly so that you don't throttle the industry before it even gets starting, because from an economic point of view and I am an economist, I would say, Namibia has the opportunity.

So it comes to, do I want to have an industry at all or do I want to have a potentially smaller slice of a very very big pie? And the pie is 100 times larger than the diamond industry has ever been. I would rather have the smaller proportional chunk of the pie and get the industry going, then try and overtax it too early, and then you have nothing. You have no power at all because the industry can go to Saudi Arabia, they'll go to Chile, they'll go to Brazil and they'll develop these projects where there's more favourable tax rates or more favourable sovereign wealth fund, whatever. It's a very fine line to balance, but everything I've seen so far is the Namibian government is very open to look at what everyone else is doing. I hope that is the case, but it appears that way. You know, I don't think no one's talking about, like, slapping 50% tax on our projects because they just won't work. They just won't. We're a new industry, lots of risk. We have a huge amount of money we gotta spend immediately and we need a positive cash flow to get going as soon as possible. So if there's a massive royalty. It won't happen.

And then there's also the Namibian investment development and Promotion Board, which is the NIPDB. The really nice thing is that one of the great steps that I think Namibia got super rights is that those people led the hydrogen initiative and got the tenders off the ground. But those people came from industry. So you've got people coming from the commercial world, but now managing a government process and it is so much better because you've not got a politician involved. It's not about winning votes. It's about getting a commercial project off the ground. And I can tell you it's like night and day working with those kind of people and because you can discuss commercial problems. And if you talk to a commercially minded person, they get that. If you talk to a politician, they just care about how many jobs you are going create. They want to sell it. And it's obviously important, but the jobs is a byproduct of making the project viable. You know, the jobs will happen, but you gotta focus on the real key things that make the projects.

**Do you have any last comments?**

I think it's a massively overlooked side of what's required to get these industries off the ground is the enabling environment. I suppose the one thing that's really key for me before you get to policy and regulation, is strategy. It's very important that before you move towards any acts that regulate such a big integrated value chain, you need a national strategy that is aligned. And that's something that none of the countries

are getting right particularly just yet, but at least if you have all of the entities of government moving in the same direction, it makes everything much easier. So I suppose a focus on national strategy is always quite interesting looking at it.

## **Participant 2**

**Question 1: You have identified the following symptoms as the most significant for the green hydrogen project. Could you explain why you picked these three?**

**Environmental damage:** I think that the Environmental Management Act in Namibia is not being properly applied, has gaps in it, and areas where it's not strong enough. And of course, Hyphen is currently conducting an environmental impact assessment under the Environmental Management Act. So there's some concern there that it won't work as well as it should, although I don't have any specific evidence. In fact, I've been told that they are using the top environmental consultancy to analyse what impact they will have on the National Park. But I think there's some concern and Recon Africa is one example, as well as other examples, where the environmental commissioner seems to have given permission for projects and given the environmental clearance certificate, which have raised serious concerns as expressed by environmentalists. Another element to this is that the consultation process, even the Environmental Commissioner admits, is weak. So making sure that communities that might be affected are properly consulted, is a concern as well.

**Experts dominating high-income/skilled jobs:** It's obviously the green hydrogen industry is a new area globally and there's not many people who can say they are experts, but the majority of people who have high level technical skills are almost certainly going to be expatriates. So essentially I would imagine that there's to be an influx of expatriates because they're the only ones probably that will have the skills necessary to do this kind of work and that is a concern.

The agreement was signed this week between the government and Hyphen. So I did pick up one of the concerns of hyphen which was that they would be able to bring in the necessary skills. But sometimes Home Affairs takes a long time to decide on work permits and so on, so I think they received some guarantees that they would be able to bring in outside skills and so I just think that it would be a problem. The credibility of the project would be that it's heavily dominated by foreigners, and they would have to create ways and means for Namibians to get into the industry by learning the necessary skills so they can get involved.

**Loss of competitiveness of other sectors:** So that's a typical element of the resource curse, that the focus becomes so much on the industry that is bringing in revenue, that the government fails to focus on economic diversification and the other elements of the economy that need to be developed. I guess that's the same with green hydrogen. We've already seen that the government is devoted to this industry and so there is a danger that other things that should be developed, that would benefit other parts of the country or benefit the economy in general, are being neglected. We will have to see how it goes, but it is a concern going forward. For example, the European investment bank €500 million loan to Namibia to develop green hydrogen hasn't been signed yet, but with that amount of money being available in one way or another, there will be a danger that the preoccupation will be to primarily develop this sectors.

The other aspect of a green hydrogen industry, like oil and gas, are not really labor-intensive industries, so they're not going to produce the thousands of jobs that Namibians would like to see, especially young Namibians that might not be that highly skilled or might just have a first degree. So we need to focus on other parts of the economy and develop SMEs to make sure that we don't neglect those areas.

**Economic dependence:** I agree that there is a danger there. And again, it requires a broad policy that ensures we aren't putting all our eggs in one basket, but rather looking at developing different parts of the economy, different sectors and so on.

**Question 2: Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three symptoms you picked?**

We actually had a conference about two weeks ago with the Environmental Commissioner speaking and he did acknowledge quite a lot of the weaknesses in the Environmental Management Act and the way things are done at the moment. He said that there's an Environmental Amendment Act to the Environmental Management Act being prepared at the moment and that it will deal with some of these issues. An example is that it will make sure there are regulations requiring proper consultations and that, for example, communities will not just be reached through one small newspaper advert. There will be requirements that communities are contacted directly or through their traditional authorities or via the radio and things like that, so that there is proper consultation. So there is that in the pipeline. But I have the impression it will take a long time.

Another problem is that we produce these policies and then we don't really talk about them much afterward. So I think the growth at home policy of five or six years ago is obviously an attempt to look at improving our growth prospects and in terms of focusing on different sectors rather than just a single sector. I think some things are in place, but we probably need to revisit them. The National development plan is probably also a useful document, but the current NDP 5 is kind of outdated and they have decided not to release the next two NDPs until the next government. So we need to make sure that these plans are followed through once they have been adopted.

**Expatriates dominating high-income jobs:** There has to be some kind of training, education and entrepreneurial development policy related to green hydrogen. So we've already seen UNAM develop some courses related to green hydrogen and others that need to be developed further. We will need to have some policy in place, that will identify the necessary skills that we need, whether its vocational training or high-level university. It is going to take some time to develop the green hydrogen industry, so we have a little bit of time to try and change our curriculums and make sure we are putting resources into training. I think that a lot can be done and we have probably two or three years to try and get those training course schemes into play.

**Additional comments:** There's so much at the moment that's unknown about this industry and obviously maybe now that this agreement has been signed with hyphen, they will start to focus more on these areas. So I think it's important that they start doing it now and obviously now that this agreement is in place, I think funding from the European Union and the Germans will become even more available than it was before. So you know

there will be possibilities to include a lot of capacity building and skills training and so on. So I think that's probably coming now but the government definitely needs to focus on that.

**Question 3: Would the resource curse be similar for green hydrogen as experienced by the oil and gas industry? And is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development?**

The thing about oil and gas and to some extent the diamond industry is that at least we could try and learn from other country experiences. I think predicting the risks for the green hydrogen industry is harder because we don't have specific examples of where this has been developed because it hasn't been developed before. But one of the things that we are recommending is that Namibia joins the Extractive Industry Transparency initiative (EITI) which is actually in the current Harambe plan under the effective governance pillar, that government should look at joining or applying the same levels of or same standards of transparency. So when they published it in 2021, it says that these EITI principles should be applied to oil, gas, general mining and also fisheries and forestry which is actually beyond the usual scope of the EITI and I think a number of people feel that that green hydrogen should be added to that too. So we would like to see the EITI standards applied to green hydrogen too. So government currently has some consultants looking at the option of joining the EITI, so there's something happening. In essence, I think it would be good practice for us to apply.

I think the general principle is that there should be a high level of transparency around these green hydrogen developments, and the key agreements between the private sector and the government should be published. The ownership of the different entities involved should be clear and the financial details of who's getting what, who's paying what, when revenue starts coming in, how much it is, and where it's going to go. That's all part of the EITI so it would be good for us to start doing that from an early stage.

So I'm not an expert on diamonds, but we probably have something to learn. The diamond sector still does not have much data which makes it hard to know about what's going on in the diamond sector as well as the fisheries industry. There's just very little information public and the ministry doesn't seem to want to reform although.

We have open contracting in any sector and I think the Chamber of Mines has been generally against more openness. And the Ministry of Mines Energy has not particularly been interested. So we haven't gotten very far, but we might be forced by some international circumstances to address these issues. For example, grey listing by the financial action task force. We will have to change a number of laws and mainly company related laws but there is a general requirement in it for more openness and beneficial ownership and that kind of thing. So I think we'll have to address these issues.

Additional comment on EITI: There have been more and more requests from researchers, civil society and the media for transparency. The other element that's happening is the access to information law. It was allocated some money, 20 million in the budget this year to set up the office, to appoint the Commissioner for access to information, and the

senior staff. So we are hoping the regulations will be finished this year and then the act might become operational in 2024. A particular clause says, the government has to be proactive in releasing information, so it doesn't have to wait for a researcher to ask for information. There's a lot of information to release of its own accord, probably on websites. This includes licences, contracts and concessions with the private sector. It's quite a comprehensive clause, so there is something later in the act that says companies can withhold information if they have concerns about releasing commercially secret information. But on the whole though, there will be a demand to release these high profile documents like the agreements. So I think there will be changes but in the next two years, we'll have a change of government so we will have to see what the attitude of the new government will be. Generally, we seem to be moving in a good direction and there we have not yet felt a big pushback.

I think some people are waiting and seeing what this report on EITI will say when it's published in August or September. We hope it will be published. I think we are moving towards a period of openness and that will have to include, you know, the publication of key contracts. What is interesting is when I sometimes talk to the oil companies here, who are members of the EITI, when you ask the local guy for information, they say it is secret information and stuff. So there's a sort of difference between the situation on the ground and what globally these companies are committing to. But I think these are gonna be big discussions in the next couple of years.

Diamonds: We tend to not focus on diamonds enough because we don't have much access to data. Robin Sherborne in his publication on diamonds says that over the years, things have become more secretive and Namdeb has published less and less information. So I hope we don't find ourselves in the same situation.

### **Participant 3**

**Question 1: You have identified the following symptoms as the most significant for the green hydrogen project. Could you explain why you picked these three?**

**Expatriates dominating high-income/skilled jobs:** The green hydrogen industry, of course for Namibia and for most of our African countries is a new area that we are venturing into. The industry is very complicated and requires a lot of technical skills including technical infrastructure which we don't have here in Namibia so. What is going to probably happen is that the industry is most likely going to be dominated by expatriates. So I know that the Namibian government has started a scholarship to try to close the skills gap, but that is going to take many years before it will be realised. So that was basically my thinking that we don't have the expertise so far.

**Income inequality:** If you look at the percentage that has been proposed in terms of the ownership of the project, you can already see an imbalance. The presidency signed an agreement with Hyphen where they were offered about 22% (speaking under correction). It raises the question of how 22% equity shareholding is going to address the issue of inequalities? Because we know that the gap of inequality in this country is growing rapidly fast, but also the nature of this green hydrogen arrangement is

based on a neoliberal economic agenda, and we know from experience that when you have a neoliberal economic agenda, the likelihood of income inequality and inequality in general, is very high. This is the experience of other programmes and policies and economic agenda that were taken, including the land issue in this country, that has exacerbated the income inequality. But also because of the knowledge or the reality that a lot of Namibians don't have the means of production to be able to participate in the green hydrogen agenda. The only opportunities that might be presented to some people is them becoming ordinary workers or maybe cleaners and not strategic positions or being able to own the resources. So you can already see that this can lead to income inequality. Something else to consider is the size of the project and the amount of land it will be taking up. It raises questions of who the land belongs to and if people will be relocated and compensated for it.

The neoliberal economic agenda is the free market concept, where government must minimize the intervention and the market will equalize the resources and the market will distribute the resources. But in a country like Namibia, where we have a history of inequality, a history of colonialism, and oppression, then the neoliberal agenda itself is not really suitable. We need a lot of government intervention to put in resources to address the inequalities. But the free market of saying that government must play a minimal role or must only intervene when there is a market failure or there is a need does not change the structural inequalities that are there because the inequality in this country is due to the structures of our economy and the history of colonialism, plus the corruption. So the neoliberal approach is basically saying that if you have resources you can participate, if you don't have resources, you can only be assisted to that extent, but government should leave the market to function by itself because market free market is competitive and free market will distribute the resources. The invisible hand of the market that I think Adam Smith advocated, that's basically where the concept of neoliberalism is coming from.

**Weakening of institutions:** Local knowledge, local institutions and local systems are there in this country in terms of dealing with the resources. But because of the nature of the green hydrogen programme, raises the question of how we are going to ensure that local systems are strengthened. When you look at the programme that Namibia is entering, it is really based on technical knowledge. It is undermining the reality that the people that lived in those areas where the programmes are going to be introduced have well-functioning local systems, institutions and practices that need to be taken into account. So the perspective that I took it from is based on the bias in terms of the implementation of the project, that prefers technical and Western knowledge.

Compared to Botswana, here in Namibia and other countries, we thought that independence will strengthen our institution without really coming up with a conscious agenda to make sure that those institutions are revived because remember that what colonialism did is really to weaken indigenous knowledge and indigenous systems and institutions. Botswana made sure that those local institutions are part and parcel of their modern agenda.

**Question 2: Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three symptoms you picked?**

**Expatriates dominating high-income/skilled jobs:** I don't really know if there are policies pertaining to green hydrogen. Yeah, of course there are broader policies pertaining to industrialization that we tap into from the subject. I think the policy that we are relying on that I think would probably also address some of the issue is the climate change policy. It was developed before green hydrogen, so I don't know what current efforts are going into it to make sure that it is aligned with the green hydrogen industry, to make sure that it protects the communities.

Furthermore, the government is trying to develop policies and strategies as they go, and that in itself is a problem because the process could be manipulated to the extent that by the time they realise it is difficult to get up off the partnership that they are forming with companies from other countries. There is the likelihood that policies that will be implemented, might be biased or in favor of the people that have the know-how skills and and technology. It is very tricky because policies need to be developed on top of all the other challenges that the country has for the industry such as not having the knowledge, the expertise, the resources. So the government is trying to do all those things at the same time. So it could be a very daunting task and challenging task.

There are certain areas in the NDP, I think that can be used to make sure that the country benefits from this project. Access to resources, access to clean water, a safe environment, and opportunities and participation of local people, are featured permanently in the NDP. So I think those could be used as a foundation to try to shape the green hydrogen agenda. In this country, the issue of environmental and energy justice, you know, to make sure that the profit is not just going to go to the big companies and living the local people. I think we can rely on the NDP, in particular on the social agenda, to make sure that we build social infrastructures to protect the Community, the locals, and of course our resources, ensuring that they will not be exploited.

I think we should go back to the NDP and see what areas that we can use as a foundation so that we can develop a robust policy or policies to protect Namibia and the locals.

**Question 3: Is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development?**

The risk is there especially based on what we have seen happening in other industries, in particular extractive resources industry such as diamond mining and the discovery of oil and gas. Where the NDP was successful, was more in the social arena, in making sure access to education and healthcare is improved. In the social agenda, there's still a lot that needs to be done but we also see the NDP really stepping up through various institutions. But when it comes to aspects like mining, and fishery, we haven't really seen participation of the locals because those industries are largely dominated by big foreign companies. And if you really see where a lot of corruption is in this country, it is in those industries. So from that perspective, really that's where participation is very important. When it comes to green hydrogen, we must draw lessons from the mining and fisheries sectors, that although we are wealthy in those resources, we did not really use them to address the social inequalities and economic inequality that we face today. What we

have seen is really the plundering of those resources to benefit the elite. So it is not trickling down to the locals, to the majority of the Namibian people, but it has really benefited only a few Namibians, mostly politicians and the well-connected elites.

Transparency, openness and accountability are also key factors that are lacking in the mining and fishery industry. In the fishing industry, the power to allocate fishing quotas was given to one person, the minister, but we don't know how the people were selected. So I think for green hydrogen, the Harambee prosperity plan talks about transparency, openness and, accountability, but we have to be clear about how we will use our natural resources to build social infrastructures. I don't know how much the government has really learned from Botswana, on how they used their natural resources to build social infrastructures such as schools, hospitals, housing and so forth. I hope that there is space made to really draw lessons from how we implemented our other resources and also from our neighbouring country Botswana. It is also important that we are clear in definition when we say we have 50-50%. SO in terms of the government acquiring a 24% stake, what do we really mean and how are we going to use the ownership of such a big project for greater benefits for the country.

What I also recently found very surprising is a comment made by the Minister of Finance who mentioned that the government is not funding anything to the project, but it is externally being funded such as grants. However, the allocation of land, is a form of funding and a contribution to the project. So we need to be clear in terms of terms and definitions.

#### **Participant 4**

**Question 1: You have identified the following symptoms as the most significant for the green hydrogen project. Could you explain why you picked these three?**

**Diversion of talent from other sectors:** The first reason that I have for saying that I consider this a very important issue is that Namibia has a reasonably small talent base and we do also not have an industry where technical talent is bread and is acquainted with what is required. So that means that you know while the mining industry has been very effective in training up their technicians and engineers, etc, nothing of this sort has taken place or has started yet in the hydrogen sector and that is what I worry about that. We would very likely see very intense competition for qualified individuals who could rapidly then be integrated in the hydrogen industry. And so this is particularly so if you have these large- scale projects that would require many people in a short period of time without, allowing tertiary institutions to produce those graduates. You would quite likely then start to pull from other industries simply by way of offering new job opportunities that the mining industry or the manufacturing industry has not really been offering. This is a worry because we already have many young Namibians in particular, well-educated Namibians who are leaving Namibia for other pastures simply because there are no good opportunities. But you know to to lure them back to Namibia is a very arduous task because they would now find themselves in other places. So we are likely going to see a very intense competition for skilled individuals and it has happened before. For example, when the Husab uranium mine started here near Swakopmund, there was a very intense recruitment drive for specialised people, which then also lured away people from Langar Heinrich and other uranium mines. The advantage,

however, of that specific action for now, maybe is that there was already a talent pool in the uranium industry. None of that exists in hydrogen and therefore my worry would be that people with the requisite skills in engineering, particularly in finance, and in project development, would possibly find recruitment interesting to large scale or to these megaprojects and therefore my worry would be that this will destabilise and also put at risk other economic endeavours in Namibia.

**Environmental damage:** The departure point with the environmental damage is always. If we do not know what the environmental conditions are and what the biodiversity potential is of an area, then we would often be lured to think that, you know there is nothing there that could be lost. However, what we do know about the Tsau Khaeb park is of course that it has pockets of very high biodiversity. It is, in fact, one of Namibia's biodiversity hotspots in some areas. So I'm not suggesting that the entire Sperrgebiet is virgin area, which is now full of biodiversity that you do not find elsewhere, and that would be a claim that would simply not be credible. The Sperrgebiet has in parts been extensively mined, as you know, through the diamond mining operations of NamDeb, Elizabeth Bay, and all these various diamond mining operations in particular and so several parts have been disrupted. But because of the pronunciation as a National Park, as a Sperrgebiet first, in other words, a forbidden area, and then the National Park, access has been very controlled and limited, and that of course has contributed to a significant rehabilitation of that area in particular. And I think it would be very important to first understand what the potential biodiversity losses would be and how we could best minimise or mitigate them before we make huge announcements about megaprojects and before you know, we allocate thousands of square kilometres, like the Namibian government has done to a foreign party. You know who is doing the damage is not the issue here, but it is really the question of, whether we are credible, if we allocate huge areas without actually understanding what the biodiversity treasures are that this area holds. And my suggestion would be that we do not have a substantial knowledge base on what is going to be lost. And the environmental impact assessments are only being done now. So you know, how can we possibly proceed in taking the next steps before we do not know what we are potentially going to lose? So that that in my view is not credible, it is not a desirable way of doing policy and it also renders the Namibian government slightly naive about this. And I say this because foreign governments would not readily, you know, just hand out thousands of square kilometers of their territory, for investments by other parties. We are in the 21st century, and it is well known that our globe is the only one we have. So we should be very careful in allocating land.

And lastly, let me say a political argument. In the view of the history of the Sperrgebiet and the mining operations that took place, from 1908 onwards, where a previous Namibian had sold for a couple of rifles and a couple of pounds, large areas of Namibian soil to a German coloniser. And now you know more than 100 years later, we seem to be using the same logic, this is something that I find extremely worrying that we have not apparently progressed beyond valuing our own resource base, which is this fantastic Sperrgebiet that we have.

**Economic dependence:** You know, the question of economic dependence, of course, has many facets. So on the one hand, we could always argue, and I'm entirely in agreement with the government, that if we simply continue to do what we have always done, maybe we will not be creating this economic upliftment of the people and the further national development.

So we need to do something, different than before. So I'm entirely in agreement with that. However, my worry is that, there are different pathways in creating economic development and I believe that green hydrogen and you know power to x technologies, offer a fantastic pathway for Namibia. So I'm also in favour of what the Namibian government is thinking.

But what I am worried about is if we have, this reliance on a single project that has about the same size as the Namibian economy. This project is so enormous, it's like a tsunami that is coming toward you. And so that tsunami has about the same height as the entire economy in all its facets, you know, from agriculture, tourism, mining on all these others. And this is just a single project. And so what I'm worried about single project approaches is that when you do investments, everybody, even the layperson investor, would say, you would never, ever put all your eggs in one basket. You know it's common knowledge. So now we are having this one super egg in the basket and this super egg is so large that all other endeavours in green hydrogen and power to x and so forth are paling against it. Considering that we are having limited financial resources to do anything with that egg, so we are completely dependent on the breeding and nurturing of the egg and its products. One would be better served if you had structured the deal to include many many sub-projects that are not related to the same source of funding, simply because you would then also diversify their risk of funding and you would reduce the leverage that investors would have in terms of creating special rules for this gigantic investments. In other words, you know. There are the New York Stock Exchange sharks that we are suddenly dealing with and they are faced with a rather inexperienced lot of people who have heard about green hydrogen and PTX, you know, six months ago or a year ago. You saw all people who have no technical clue about it and suddenly they think they can negotiate 10 billion U.S. dollar deals. It is unheard of. And you know, it just strikes me as incredibly insensitive in how you manage economic risks. And how you would manage it would be by splitting it into manageable small parts. People would often say, but isn't economies of scale important? Green hydrogen and PTX is exactly one of the industries that you can build piecemeal in small steps. So instead you know we should use this in hedging our risks against this overwhelming single dependence on a single finance provider. Otherwise, we would suddenly be facing the harsh winds of the international financing fraternity and they will always and only fight for their own interest. And so my worry is that we are inviting as an independent country, we are inviting a new colonial process in a neocolonial way. And so, I would say we should be very careful when we climb into the shark bay when we have not yet learned to swim. I'm not in favor of a single-investor approach like the government is doing. So that's a primal fear that I have because I think at the end many Namibians will be rather disappointed and many Namibians will not grasp what this means if we are suddenly exposed to this full front of independent or international finance and their interest is to just earn a return on investment without taking into account the Namibian interest

That is exactly why I previously mentioned Captain Joseph Fredericks in 1883 when he basically sold off this entire area around Luderitz and you know, the the entire diamond-bearing sense of Namibia, not knowing or not realising the intrinsic value that this had. Now you know at the time of that negotiation when that first land sale was made nobody could have imagined that this would lead to the colonial grabbing of Namibia by Germany and all these type of things. But you know basically what he allowed to do is, he allowed a sort of invasive species into Namibia.

There is some asymmetry between, these individuals like Adolf Luderitz and Mr Vogelsang and all those who actually negotiated that deal with Fredericks. And so there was a great deal of naivety in hindsight, about how he went about it and so forth. You know, they were just basically a crooked, completely crooked out of very important possessions for Namibia. And unfortunately, in my humble opinion, we are seeing a repeat of exactly that, that there is a vast group of naive Namibians out there who would swallow anything that investors tell them and suggest to them in terms of the importance. And so we have all had it before. You know history is just repeating itself and I am as a Namibian extremely concerned that we do not take a more cautious and risk-focused approach here, but that we seem to be swallowing hook line and sinker.

Now it is for us to make sure that we cling to our interests and that we do not quickly just sell it off because we are just simply uneducated or do not know what we're talking about. So in those artworks.

**Expatriates dominating high income/skilled jobs:** In terms of these sort of mega projects, there are maybe less than five Namibians who would today be able to work in meaningful senior positions in the green hydrogen energy sector. There are lots of world trained engineers, particularly in the mining fraternity who could be upskilled very quickly to take positions in such a mega endeavour. However, the question is always what lead time do you have before you need real experience. What I'm suggesting is that we will probably struggle to train up skilled and experienced people in the sort of timeline to ensure that there is a significant number of Namibians participating in this. And so if we take the lesson of the Namibian mining sector, we see that the uranium mining sector, has a specialist character to it, of course, not every job. Namibia has been mining uranium since 1976, so there's a fairly well-established and solid basis of professionals that have been trained up and it has taken decades to establish those, but today, you know when you go out to the operating uranium mines, many of the people are in fact Namibians and I'm very happy to see that. So this is not just an area for external experts. So what I would be foreseeing is that we will see a similar development in the green hydrogen fraternity whereby it will take at least ten years or so before we can see significant number of Namibian experienced professionals simply because there are so few of them and what we should not forget is that green hydrogen is currently a sort of hybrid around the world with expertise being in extreme demand all around the world, all of them are currently in extreme demand. Well-qualified professionals can easily go overseas and earn very substantive salaries and so there's an international race for these specialists. And so I am concerned that the an investor, a mega investor would focus on recruiting international experts. The process of actually acquiring and basically breeding Namibian specialists will take a long time.

There are a couple of initiatives at the coast here in Swakop and in Walvis Bay that are much smaller in scale. The O&L initiative in terms of the 5MW, you know the HDF energy, the CMB tech initiatives with the locomotives etc. These initiatives are different in character because they would not require hundreds of professionals at once. So they would also be fishing also internationally, but the chances of them actually recruiting local people in the various areas and then rapidly upskilling those is much better. And then in the case of a megaproject, the implementation of this mega project is vast. If you are going to install gigawatts or photovoltaic and wind capacity and then electrolyzers of a few GW, etc, this is immense and maybe it has not seen a thing like that.

These companies just don't have the run-up time to actually educate and upskill people. And so to me, this is an outcome of a policy that is flawed in its very basics in the foundation in that, we think we are smart enough to grab this one huge opportunity rather than having plenty of smaller initiatives.

**Question 2: Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three symptoms you picked?**

**Diversion of talent from other sectors:** You know, there is an example of which I would call self-regulation (in the absence of policies there are often other structures or systems established by others). What the uranium industry has done in response to your question, what are measures in terms of ensuring that there is not the sort of poaching of human capital from amongst the companies? There is an umbrella body in the uranium sector called the Namibian Uranium Association, which basically is an umbrella organisation for most of these actors in the uranium sector, and they have a common charter which they say we will stick to the following principles and one of their principles is that they do not go out and actively poach highly qualified people. And this is possible because there are several larger uranium players in place. However, you know the asymmetry is very obvious when you have a super player such as hyphen who will need to have many many people in a short period of time. There are no rules or regulations in terms of not poaching individuals. So you know it will be an open game in recruiting people wherever they can get them from, which will be to the detriment of other industries. I consider the need of a policy intervention, because we should grow the base of employed people and not poach skilled people from one another. So what the uranium industry has shown and it works reasonably well, maybe not optimally, but there's this Charter that binds them to certain ethical behaviours in the sector and that works. However, the difficulties of this asymmetry is that you have this one giant company and then you have on the other hand these smaller hydrogen plants, and how we ought to bring about an equitable recruitment method, that is very challenging.

The Charter would probably require many parties, over and above those active in the hydrogen sector simply because the poaching of human capital will not just happen in amongst the ranks of those few hydrogen operators, but it will be across the industry, in manufacturing, the financial industry, the legal industry and also the technical industry. This is definitely calling for an approach that looks at the economy as a whole in perspective. I am worried that the government is not thinking about these sort of systemic effects, but they are seeing this vast carrot being dangled there. But the fallout for the industry as a whole is something that we also need to think about.

**Environmental damage:** So you know the Ministry of Environment, Forestry and tourism of course has the Environmental Management Act and the provisions for getting an environmental clearances and so forth. And they work quite well. There are often gaps in terms of policing these policies and ensuring that people or entities stick to it. And of course, the more gigantic an endeavour is, the more difficult it will be to really understand the cumulative impacts. And my worry is that what constitutes cumulative impacts is not well defined in the Environmental Management Act. Usually a mine has a footprint of 1000 hectares or maybe 2000 hectares or so. Suddenly we are upscaling an entire area of several 1000 square kilometres. This is many orders of magnitude larger. And making

this an industrial site with the production of first green hydrogen, then green ammonia. But ammonia is not really green other than its name.

So it emphasises that we should really do a strategic environmental assessment that looks at the overall cumulative effects, not just the effect on land and water but understanding how all these factors actually play together in becoming impacts. The uranium industry has done such a strategic environmental assessment, I believe it was 2011 and 2012 when we did it. This was an absolute eye-opener in terms of these interlinkages between many aspects that would appear rather unrelated to one another, and later we realised that they are highly related. If you do something here then something else will pop up here.

And lastly, one aspect that we must be very careful of is of course the fact that wind turbines and photovoltaic plants eventually come to an end of life. 30 years from now, all this material needs to be taken down and there is no thought of it at all. So I'm not suggesting that we must withhold progress until we know each and every solution to the detail, but what I'm suggesting is that we need to be a little bit more open-minded.

**Economic dependence:** Unfortunately, Namibia does not have a real industrial policy. We have Vision2030, but that of course is a sort of a framework, and you know that is outdated by now and is not really providing a lot of guidance other than the catchwords that our marketing ministers use frequently. So in terms of industrial development, I think that we must really have such a longer-term policy. Some useful thoughts are being raised in terms of having a sovereign wealth fund. Such an idea was already included in the 2017 energy policy for Namibia. So it is good to see that you know people have been picking up on that and it is being instituted. But in terms of the other management aspects in preventing over-exposure to one industry, my suggestion is that we need to understand what the origin of that potential over-exposure is and that is that we have simply followed a selection approach in terms of selecting the green hydrogen players. This sets us up for this single super-entity. That in itself is flawed and creates a super problem.

So the other thing is of course that in terms of the benefits from this super problem that we have already created, are not yet known. The benefits will only really be known once the definite feasibility study has been finalised which will take at least another 1 to 2 years or so. One of the weaknesses of the approach is that we now all wait and hold our breath hoping the definite feasibility study, will deliver the golden eggs to Namibia. While we could have used a smaller structured approach of inviting several parallel initiatives to drive this process so that if one fails, we still have a couple of others to go by. In my humble opinion, if you are an economic adviser and you choose such a single-horse strategy, I really wonder what people think about, how economic advisers would advise in terms of country investments, because that advice is clearly flawed. You do not advise on a single investment approach. We all know that investments need to be structured so as to be able to catch risks, when one doesn't do well, the other one may do better and that opportunity we have unfortunately failed and we have not in fact taken into account and that is a major worry to me. So how do we get out of that? I think it will be a very hard lesson for Namibia and mark my words, in a 1.5 years you will see, that the result of the definite feasibility study, which of course is done by that one super contestant, will be that they will say that these are the framework conditions under which we can

make it viable. And so, in terms of face-saving, the current political elite may have changed by then, so it will be different political leaders who will then have to face this music and they're very difficult trade-offs. And the difficult trade-offs are because we have been too naive and blue-eyed at the beginning point by suggesting that we can handle such an enormous investment rather than splitting it up in manageable pieces. And that to me is a significant failure and I worry about it because we have basically given away our leverage in terms of getting the best bank for bucks for Namibia. And so in my view, coming back to Joseph Frederick's and what he did in 1893, history repeats itself. It is blue-eyedness that leads to land sales or land giveaways or sell out, and we should not use that route.

**Question 3: Is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development?**

Without repeating myself on the uranium sector, but in my view, the most important is that we start with a policy that is particularly governed by independent persons. There must be a governance process that is followed. There must be an independent body that governs, that ensures that the governance is done correctly and that is completely missing. We have cases for example the diamond industry where very few people really know the insides of the arrangements till this very day. In the uranium industry, I would say that many of the practises in the late 70s, early 80s had mafia type approaches in terms of securing access to markets. And in the fishing industry, we have the case of the fishrot. This all shows that governance is often very weak. So we will need to set up proper governance structures and policies to have control over decision making.

#### **Participant 5**

**Question 1: You have identified the following symptoms as the most significant for the green hydrogen project. Could you explain why you picked these three?**

**Experts dominating high-income/skilled jobs:** The green hydrogen industry is a **capital-intensive**, high-technology sector that usually requires highly skilled personnel to run these plants. And we don't even have these expertise currently in Namibia. Namibia has sent quite a number of persons to Germany to get trained, in particular for wind power plants but also to run these green hydrogen plants or electrolyzers. And so we will certainly depend on foreign expertise in the beginning, that are also going to train Namibians. But as I said we need skilled personnel for the operations and the construction since it's a quite complex undertaking and you need highly specialized technicians, engineers and so on.

**Diversion of talent from other sectors:** Yes, there will certainly be increased competition for skilled personnel. And usually, these export sectors are able to pay higher wages than companies producing for the local or regional market. And so therefore there might be the risk that like in the mining industry, these companies can attract skilled personnel from other sectors because of higher salaries.

**Income inequality:** This is based on my analysis and if it's in particular highly skilled personnel and since it's capital intensive. So there's a higher return on capital certainly than on labour. So the beneficiaries are those in the higher income categories which could result in increased income inequality. Increased income inequality would be countrywide because the industry will attract skills from across the country.

**Question 2: Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three symptoms you picked?**

We certainly don't have policies that address the diversion of talent from other sectors. Companies are free to attract talent from other sectors however it is different when it comes to foreign experts where you need approval from the Ministry of Home Affairs.

In terms of addressing income inequality, both the NDP 5 as well as Harambee Prosperity Plan 2, there are chapters dealing with social progression and they also address the social safety net. So I think some of the potential mitigation efforts are captured in these development plans and the government has also approved the social protection policy in 2021 which outlines the objectives of social protection. Therefore, the social safety net can certainly play a role if the government receives high revenues from royalties and taxes from this new industry. This should then also place the government in a position to maybe also adjust the social grants. This can perhaps mitigate the adverse impacts on inequality. But then of course, we certainly need to review also our tax policies, income tax policies, that are currently also rather in favour of then better of low-income earners. And so, there are a couple of other measures government needs to introduce to mitigate any negative impacts, including investing much more into upskilling and so that we do have the experts in the country and even beyond just the, let's say the core industry that we further develop the supply capacity in the country that we source more of the content in the country and that could create additional jobs.

Furthermore, we could use the output of the new industry not to export energy but to attract processing and manufacturing companies that use green hydrogen or renewable energy to produce intermediate or final products here in the country and then export these products rather than exporting energy. And that again if we can inject more investments into manufacturing, processing and so on will again create jobs. And whenever you create jobs, it should have a positive impact on equality in the country. So we need to create a conducive environment for the private sector for foreign direct investment, but also domestic investment in the economy that will then lead to job creation and increased income for lower-income households or even poor households.

I'm not so sure whether we need an update on our growth at home strategy (provides a road map for the execution of the Industrial Policy) which was released in 2015. Following the growth at home strategy, the Ministry of Industrialization and Trade identified I think 10 sectoral growth strategies and they will reduce finally to I think 6 that are currently further pursued. There has been partial success with these strategies, so it's not so much an update that is required, but rather to ensure that these policies are being implemented and then monitored and evaluated, to get a better sense of what has worked and what has resulted in in the outcome that we expected and what has not worked and what needs to be changed. And then of course, if we realize that something has to be

changed, then these policies should be adapted or amended or whatever. I think these first steps are important, proper implementation and then monitoring evaluation and in particular the evaluation, so that we make informed decisions.

I think we are still working on the whole legal regulatory framework, not only for the green hydrogen industry but also for oil and gas industries which will be the appropriate act and the taxation schedule for these industries. These will certainly be different from the current taxation schedules, maybe similar to the taxation of diamond mining companies, I'm not sure, but I suspect it could. So that whole framework needs to be established. The green hydrogen strategy was developed last year but all the other regulatory frameworks are still being drafted which will still take time to be finalised because this is complex and entirely specialised. I think we are all aware that we have a lack of legal drafters in Namibia, so we certainly need again foreign expertise for these documents.

**Question 3: Is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development?**

First of all, if all these planned ideas with green hydrogen and the oil and gas projects materialise, they are of a different magnitude than our current export industries or current industries. So all the potential negative impacts would be quite different from what we have experienced so far. Also, when you refer to the resource curse, you often refer to the exchange rate risks where you have suddenly high inflow of foreign exchange that results in an appreciation of your currency and therefore you other industries like agriculture and manufacturing industries won't be competitive on regional or international markets anymore. We of course expect a very strong inflow of foreign currency. Whether it is strong enough to influence the exchange rate of basically the South African rand against the major currencies needs to be seen because the South African economy is at a different magnitude to the Namibian economy. Therefore I think we have so far been cushioned against any resource curse because even our diamonds have not had an impact on the exchange rate. So therefore I don't really expect a strong impact on the exchange rate if we still continue to be pegged to the South African rand.

So that is on the exchange rate side. Then of course there's the other resource curse which is the competition for scarce resources. Not only Labour but other resources as well. We need to invest into human resources so that there is a sufficient pool of human resources that with reasonable salaries that do not increase to such an extent that local Companies can no longer compete and have to resort to less experienced, less skillful and so on employees, which could have an impact on their productivity, competitiveness and so on. We talk about 5-6 years from now when these industries start operating. I believe there is still sufficient time to start with mitigating measures. I don't think that we have much time with policies and the legal framework because the implementation of these projects depends on the legal framework. Investors would be probably hesitant to start constructing let's say, green hydrogen plants if we have not even finalised the legal framework on on taxes and so forth, so therefore there is certainly pressure to work on and finalise the legal frameworks so that potential investors know what to expect and can base their investment decisions on not what is being said, but what is written.

Yes, definitely we we can learn from the diamond sector. Government receives tax revenue, dividends and royalties from from diamond mining companies. This could be done in GH2 and revenues could be used to address our main development challenges like inequality, poverty and so forth, but that depends on how effective government spends the money on projects that really address these issues.

That is similar also to the green hydrogen industry and and even more so oil and gas. In diamond mining, especially now that it has moved mainly offshore, this is high technology. The new diamond mining vessel cost 7 billion and created about 250 direct jobs. So it does not address our challenge of of high unemployment and this might be the case with GH2.

In diamond mining, about 20 years ago, we encouraged diamond cutting and polishing. So manufacturing activities in the country slowly took off. But there aren't more than I think 10 or more cutting and polishing plants operating here in the country. I'm not quite sure how many people they employ, so it really depends on whether we are able to capture more of the whole value chain and not only let's say forward linkages so further processing of the product but also backward linkages, that we produce more of the required inputs and goods and services that are being used in these industries and maybe even some of the tools, equipment and whatsoever. So then it will be beneficial to the whole economy. And I think that is what we need to pursue in particular with the green hydrogen project that, since it requires enormous investment into renewable energy, solar panels and with power plants, we try to produce some of these components here in the country and then build a further expertise and skills here.

Otherwise, of course, we risk it to be an enclave industry that sits on its own with relatively low levels of of linkages to the rest of the economy, and then it might benefit government coffers. And then it depends on how government allocates or spend some money with this whole country and and national benefits from it. But preferably of course it's not government that finally ends up improving the living conditions, but we create the necessary environment to capture more of the value chain and therefore create more jobs in the country, decent and well-paid. So therefore I think that's something we can learn from the diamond because the sector initially focused on producing the diamonds and then exporting the diamonds and then slowly, as I mentioned we we started adding value to the industry - let's learn from this experience and see how it can be applied to the green hydrogen project.

When it comes to government participation, I think that's a quite different story because when the government entered into the agreement with DBS. It was an existing industry and The risks, the opportunities whatsoever, were known. With the green hydrogen not only in Namibia but in other parts of the world it's a very new industry with certainly let's call it teasing problems, certainly with challenges too if we export green ammonia, which is also not the safest. So I would be rather cautious on the side of government to commit ourselves to a large equity portion on a project of this magnitude of almost 13 billion U.S. dollar. If you buy a stake of 24% it's 2.4 billion USD which is almost 50 billion Namibia dollar. Given our current financial situation, let's rather be on, on the safe side, even though there is a lot of pressure here in the country that we should reap more benefits and be more involved in these industries, but there are too many uncertainties still.

I mean if Epangelo has stakes in a number of mining companies among others the Husab mine, the arrangements are usually that these stakes are paid off by the dividends that are due to the shareholders. But what if these companies do not pay dividends, then you sit with liabilities and this is the case with at least one mining companies that has never paid dividends. So at one point in time Epangelo probably needs to fork out the money or that equivalent to the 10% stake. and then there imagine we have a similar arrangement with. This may be a risk in the green hydrogen industry too so we we need to be aware of all these risks that the different potential arrangements might carry.

50-50% arrangement? As I understand it, it's equity and then of course you share the risk and that is often ignored, I would say especially at these mining companies. When it comes to commodities, there are cycles where you can have good profits and cycles when due to whatever events, global events, geopolitical threats and and so on, suddenly these prices crash and you'll only not get any dividends, but you you might need to pump in funds to maintain the operations of these industries.

Last words. I think it is important to Explore and exploit opportunities and other sectors as well, so diversify the economy and not put all eggs in one basket or only focus on on these new industries and hope they can solve our existing problems and so on. So we should pursue it definitely but we also need to be open and transparent about the risks and how we can deal with and mitigate these risks. Also there hasn't been much talk about potential environmental risks and I think we need to be aware that the whole coastline is more or less a National Park. It's very unique because it has been isolated for about 100 years and a unique flora and fauna has developed. We need to acknowledge that all developments will have an impact on the environment and again, the matter is how can we mitigate these?

## **Participant 6**

**Question 1: You have identified the following symptoms as the most significant for the green hydrogen project. Could you explain why you picked these three?**

Diversion of talent from other sectors: Well, I guess in the diversion of talent from other sectors, Namibia is a large country in terms of size, but not large in terms of people. The country I think has done very well in terms of upskilling a certain group of people because the people in the age group of 50s sort, there is a whole range of people who had opportunities to go abroad through the mining industry, but also some from the anti-apartheid era who were supported. So I think there are people who have had that exposure people have we've been abroad who've come back. But then there's also this gap between those who could seize the opportunities and those who probably were left behind already in primary and secondary school, particularly in the rural areas, and haven't had that opportunity unless there was some sort of family connection or some sort of event, you know, some sort of circumstances that allowed them to come to the window of opportunity. So I could see a challenge with that group of people who has the skills, who has the exposure, who have done well, being sucked into the green hydrogen industry and out of let's say government positions, other industry and other sectors.

Environmental damage: There is tension between the environment being an attraction of the country, but at the same time not trying to undermine that with developments with high impacts that may interfere with the environment. It should be manageable as long as environmental regulations are adhered to. You should not be building things where a pristine area is valuable. But of course you will have a discourse among those on the conservation and environmental side, and those who see the need for industrial development and employment opportunities for the younger people.

**Income inequality:** This relates to the diversion of talent issue that I've sort of mentioned in the sense that an extractive industry brings opportunities but who seizes them can be very narrow. It's not a sector that generates a lot of employment during operations and it is very specialized in nature requiring people with high level of skills and experience. This will not help with the existing income inequality problem that already exists in Namibia. And of course, what's important, is the part about how the country plans to invest to close that gap.

The problem that we often find is of a political nature where investments go into tertiary education to those who are already more privileged. It is important to make sure that investments flow across all education levels. Examples can be seen in countries such as Angola and Equatorial Guinea where money has been spent at the front end, not at the other end. It is important to also note that other sectors need to remain relevant and funded to address those who are less advantaged because they need labor-intensive industries, and the extractive industries are not labor-intensive. So I think it is very easy for countries to focus their attention and this is particularly challenging, I guess if you're a country with a small population, to focus all your attention on policies and plans for the extractive sector and then forget all the other sectors or deemphasize the other sectors because in terms of revenue generation, they're not so important. But we should not forget that they remain important in terms of access to opportunities and addressing the income inequality problem. It however might not be attractive for people in the public service to work in those sectors if the opportunities are really in the extractive sector. This will require leadership on the political side to balance that, and not to forget that and only look for where the opportunities for certain elites lie.

So the balance between policies for the energy and the extractive sectors versus policy for other sectors that are more important for employment, really comes down to how the political leadership focuses attention not only on one but the broader spread. We need to ensure that a portion of the population is not ignored.

**Question 2: Do you know of policies or practices that are already in place in Namibia that try to tackle any of the three symptoms you picked?**

I would take it in two ways. In one way, because there has been mining and other industries, Namibia doesn't strike as a country with a lot of environmental challenges around mining. I think probably there is a good experience and there is some balancing that has happened there. I think with hydrogen, it is a new industry. I guess at the moment there is a lot of ideas and concepts, but to put those into practise, certain regulatory points need to be in place from an investor's perspective. But of course from a public policy perspective, it goes a bit beyond that. I think the challenge may well be that all this needs to take place for conceptual

projects to actually go forward and that requires actions on the side of the public authorities where the resources are maybe thinly spread. There may be a lack of human capacities to develop the regulatory framework required for Namibia's green hydrogen developments in a timely manner. This raises the question of how this will be prioritized and then it is also about who influences the policy making process and how much effort it requires to assess that in a balanced way. And I think that may well be a bottleneck.

Contractual issues are something very common when regulations don't exist yet for a particular industry. When a contract is signed now (with a developer for example) and then regulations come into place later, then these new regulations will not apply (to the developer). From experience in the mining sector where this has happened in the 90s, where in the absence of laws and regulations, one has put everything in contracts because the legislation will develop later. But then you end up with the problem that is like a regulatory freeze. This means that you are not able to develop the legislation well, meaning that the legislation doesn't retrospectively apply to those contracts that you've already signed. Unless there are clauses in the contract that allow for that adaptation later.

The regulatory freeze problem has been well described and written about for the mining industry, and sometimes I wonder whether that is a risk now in the hydrogen sector and in some of the renewable sectors, that in the absence of a well developed legal and regulatory framework, one ends up putting things in contracts with specific firms for specific projects. The attention should be focused on tailoring the industry to the concept of learning by doing an adapting. Yeah. So I think that its important to recognise and make sure that if things are put in contracts, that there are provisions in there that allow adjustments on the basis of a due process not to freeze it in a way that you can't change it as a government later on, because you then tie your hands through a contract.

And you find literature on this, how it happened in the mining industry. And I've had people say they see the same sort of thing happening with large solar plants and things like that, that is just putting the contract, it goes through Parliament and then it's frozen.

**Question 3: Is there anything significant that we can learn from the diamond industry in Namibia considering the role it plays in Namibia's GDP and its major export share and how the industry has affected Namibia's economic development?**

At some point, the mining industry was important but not too overly dominant. You could say that's an advantage because then other sectors actually contributed to GDP such as government, agriculture and the tourism industry.

Namibia perhaps never came across as an extractive country, even though mining is an important part of the economy. If like 90% of your revenue depends on mining or the extractive industries itself, it also means that the country is failed to diversify into any other sectors. This would mean that macroeconomically the sector overrides the other sectors if you don't carefully manage the exchange rates as other sectors would then become less competitive now etc (DD). On the Namibian side, the country has not picked up any signs of this sort.

Now there is, I think the topic that you hinted at, which is quite difficult - is the decision to hypothecate revenue from an extractive sector to particular expenditure, or to let it run via the national budget? I guess in theory it would be much better if everything goes through the national budget and parliament decides on the priorities that go beyond the extractive sector. But for that you need a certain political economic consensus that you're using the extractive or the energy sector to support other sectors and not to rent seek that sector for the benefit of certain groups. It needs that cost-conscious decision to use the national budget to support other sectors where employment is created or where you know and improve peoples livelihoods. That however doesn't happen very often because parliament has vested interests. And if parliament does decide to take certain parts of revenue generated in this sector hypothecated towards local economic development, the challenge is then you need the administrative capability to implement this at that level where you hypothecate revenue to. This may be a waste if this is not implemented properly because of local and regional interests overriding again what is important in the short term versus what is an investment in the long term. But the experiences are there, it has been done and so we cannot say it is never a good idea. It depends. And that's the difficult part. The Botswana case is a great example where revenue was reallocated according to developmental priorities, they had concerted policies on they wanted to achieve in terms of diversification or creating employment opportunities, but not at the subnational level, but actually at the national level. But in some countries like Peru or other countries that are more decentralised with large populations, there is a tendency to distribute revenue down to sub national tiers. It works in some regions, and it doesn't work in others, and that depends on the local political economic dynamics. In theory, in a well functioning parliamentary process, a parliament would need to debate accordingly, and political leadership would need to support that to have that wider perspective and not only a rent management and rent seeking sort of behaviour.

What I have observed at the recent Energy conference (2022), there were a lot of lessons and mistakes being shared on some of these industries, but those mistakes are vested with the political elites in those countries. And I don't think they would like to hear anybody telling them that they got things wrong. So I think there is a bit of a risk of influence from countries on policies that are not the ones that that you would really think are success cases. I think an interesting country to learn from is Ghana because Ghana when they got into the oil sector, they were quite alert on the sort of risks associated with these industries. And they also had the advantage on the administrative side since they have quite a lot of technocratic people however they recently ended up having to be bailed out by an IMF programme.

The recent oil and gas conference was quite dominated by the local content as the silver bullet to the industry. However, local content is not a silver bullet because local content focuses on the sector. It doesn't focus on diversification. They were portraying it by focusing on the sector to get opportunities for those who are already well placed to grab economic opportunities. And that's the problem then with the diversion of talent, but also the equality issue because it sees the opportunities for those who can and leaves nothing and no attention for the rest. Local content is a very particular aspect of industrial policy, and local content doesn't live out diversification.

In conclusion, I think an important part would be that Namibia doesn't just become a deliverer of green hydrogen to countries in the north who want it because of their security of supply part, but that Namibia also benefits for its own access to energy for its own industries that need energy, you know, and that part is part and parcel of the package of supporting a hydrogen industry where local industry also benefits from the availability of that resource as well as addressing the energy access issue. We also need to ensure that things don't go too fast. So I guess it's that part where you need to be able to move ahead but at the same time leave enough flexibility to correct if one has made mistakes or one sees that things could be optimised. So like to leave it open as a process now.