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Development of a Downstream Beneficiation Strategy in an underdeveloped Country: Case Study of the Lualaba Province in the Democratic Republic of Congo

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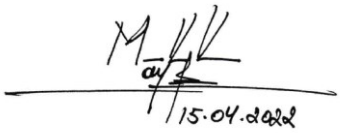
A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Engineering.

25 April 2022

DECLARATION

I, Mukonki May Patrick, declare that this research report is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Science in engineering at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in another university. I further declare that I obtained the necessary authorisation and consent to carry out this study.

Mukonki May Patrick

Signature	Date
	25 April 2022

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With great deference, I thank God who gave me the inspiration and strength to get through the difficult times while writing this report.

ABSTRACT

Since ancient times, civilization has had a close relationship with mineral resources in their various forms and their economic well-being. Overall, the Democratic Republic of Congo (DRC) is ranked as the world's leading producer of cobalt resources and reserves, which are largely exploited in Lualaba province. However, preliminary analysis and reports have shown that the DRC has failed to promote resource-based sustainable development, despite the policies implemented to date. Currently, the DRC's extractive industry faces challenges in terms of stakeholder's engagement and participation and lack of practicality of existing mining policies, with a focus on its cobalt industry to develop a linkage-based strategy for Lualaba province. Developed countries have been able to use mineral resources to stimulate economic growth, and downstream mineral development has been touted as one of the main drivers for promoting economic growth.

Aiming to examine a resource-based development approach, the objective of this study is to contribute to the design and recommendation of an appropriate policy strategy that can be translated into a set of operational actions with a tangible impact on human development.

Extensive studies have been conducted to identify the real issues in Lualaba province to address the implementation of a downstream beneficiation strategy. An approach using comparative case studies of different successful countries proved necessary to situate the DRC with regard to its enormous mineral resources in order to stimulate the development of its economy. Open-ended (quantitative approach) and close-ended questionnaires (qualitative approach) to collect primary data (level of satisfaction of the industry participants) were made possible by addressing different categories of people deemed capable of providing reliable data (purposive sampling) which were processed using the Exploratory Factor Analysis (EFA) using SPSS software from IBM and a qualitative method (determination of themes and sub-themes) using NVIVO 11 software. The EFA was used in this study in order to be able to manipulate responses from open-ended questionnaires as recommended by Watkins (2018) or moving from an empirical state of dataset to an analytical state of measurable dataset.

Preliminary results of the EFA were submitted to correlation coefficients and Cronbach's coefficient calculations to determine how the variables are interrelated and to assess the validity and reliability of EFA results.

Based on the case studies from different countries, the DRC needs to improve its upstream beneficiation in Lualaba Province by promoting a strong fiscal linkage, overcoming infrastructure challenges, eradicating corruption, and developing a global vision based on resources.

The compilation results from respondents based on EFA and themes and sub-themes analysis revealed that the main challenges in formulating successful downstream beneficiation of the cobalt mining value chain in the Lualaba Province are also tributary to the improvement of the upstream (local content) linkages of which the main challenges were: lack of effectiveness of legal texts, weak compliance with the existing legal framework, corruption, lack of a participative and collaborative approach among stakeholders, lack or obsolete infrastructure, lack of willingness to fund the local content development, rent-seeking behaviour, opacity of the tax system, child and pregnant women labour, artisanal mining, and lack of value sharing of the cobalt mineral rent.

Thus, it is recommended that the DRC improve the upstream value chain in the Lualaba province by implementing appropriate infrastructure and technologies that address the classic challenges related to quality standards that are supposed to facilitate downstream beneficiation.

Keywords: mineral resources; beneficiation; value chain; economic growth; Lualaba Province; upstream; downstream; linkages.

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LIST OF ABREVIATIONS

AIA: Association of Antofagasta Industries

AMV: African Mining Vision

ANAPI: Agency for Promoting Investments

ANC: African Nation Congress

APEC: Argentine, Asia-Pacific Economic cooperation

AU : African Union

BCK : Chemin de Fer du Bas Congo

BED: Beneficiation Economic Directorate

CAMI: Mining Cadastre

CCS: Comparative Case Study

CCSI: Columbia Centre on Sustainable Investment

CCSI: Contact Center Satisfaction Index

CORFO: Chilean Economic Development Agency

CVR: Content Validity Ratio

DMR: Department of Mineral Resources and Energy

ECOFIN : Commission Economique et finances

EFA : Exploratory Factor Analysis

EGC : Entreprise General du Cobalt

EH: Economie History

EIS: Environment Impact Statement

ERP: Economic Recovery Plan

FAO: Food and Agriculture Organization

FDI: Foreign Direct Investment

FLPMA: Federal Land Policy and Management

FNI : Front des Nationalistes Integrationistes

FORMIERE : Société Internationale Forestière et Minière du Congo

FPI : Fond de Promotion de l'Industrie

GATT: General Agreement on Tariff and Trade

GECAMINES: Générale des Mines et des carrières

GDP: Gross domestic product

GML: General Mining Law

GNI: Gross National Income

HDI: Human Development Index

ICMM: International Council on Mining and Metals

IDA: International Development Agency

IFIs: International Financial Institutions

IMF: International Monetary Funds

INGEMMET: Geological Mining and Metallurgical

KEQs: Key Evaluation Question

KPMG: Peat Marwick International and Klynveld Main Goerdeler

MILP: Mining Investment Promotion Law

MINEM: Ministry of Energy and Mines

MMC : Marcona Mining Company

MONUC : Mission des Nations Unies en République Démocratique du Congo

MPRDA: Mineral and Petroleum Resources Development Act

MPSP: Mining Program of Solidarity with people

MSRP: Manufacturer Suggested Retail Price

NDP: National Development Plan

NEPA: National Environmental Policy Act

NRGI: National Resource Governance Institute

NTA: Native Title

NYSE: New York Stock Exchange

OECD: Organization for Economic Co-operation and Development

OHADA: Organisation for the Harmonisation of Business Law in Africa

PAM : Principal Axis Method

PAP : Programme d'Actions Prioritaires

PNDC : Provisional National Defense Council

PNSD : Programme National Stratégique pour le Développement

R&D: Research and Development

SADC: Southern African Development Community

SAG: Semi-Autogenous

SEC: Security Exchange Commission

SERCOTEC: Technical Co-operation Service

SMEs: Small and Medium Enterprises

SNCC : Société Nationale de Chemin de Fer au Congo

SPCC : Southern Peru Copper Corporation

STP : Societé des transports et des ports

UMHK : Union Miniere du Haut-Katanga

UNDP: United Nations Development Programme

UNECE: United Nations Economic Commission for Europe

UNICEF: United Nations Children's Fund

UNSDG: United Nations Sustainable Development Cooperation Framework

USA: United States of America

USGS: United States Geological Survey

WTO: World Trade Organisation

WW: World War

WWI: First World War

ZEAs: Zones d'Exploitation Artisanales

CHAPTER 1: INTRODUTION

1.1 Introduction and Background

Since ancient times, civilization has maintained a close relationship between mineral resources in their various forms and their economic wellbeing. Since then, mineral resources have been and still are one of the key factors in the modern economy. The scarcity and exhaustibility (non-renewability) of mineral resources, associated with the geographical location of mineral deposits and environmental regulations, community pressures, socioeconomic role of the extractive sector, have highlighted the resources-based concept, the promotion of economic linkages and related mineral policies as known today.

1.1.1 Colonialism and its legacy in Africa

According to Fofack, in an African Export-Import report (2019), almost no change has been made in terms of patterns of growth and trade. Africa's economy is still driven by primary commodities and natural resources. Fofack (2019) emphasized by saying that now, Africa still serves as a feedstock for advanced economies. The consequences for the economy of Africa are obvious, the continent's economy is fragile and exposed to global price volatility and risks with great exposure to transfer pricing along its continental mining value chain.

Fofack (2019) mentioned that the Gross Domestic Product (GDP) of the continent reached US$ 2.0 trillion in 2011, US$ 2.4 trillion in 2014 and declined to US$ 1.9 trillion in 2017 due to the reliance of most the African countries on mineral resources, with devastating effect on sustainable development at the continental level (Adu & Dramani, 2018).

Mineral resources and development have been hotly debated over the past two decades. There is this conceptual understanding that countries rich in minerals experienced slow economic growth compared to countries less endowed with minerals. Authors like Sachs and Warner (1995; 1997) as cited by Stijns (2005) in their concluding remarks mentioned that countries with a high mineral potential had a slow pace in terms of economic growth compared to rich countries with less mineral wealth and addressed the resource curse theory.

Sachs and Warner (1999) as cited by Stijns (2005), formulated the question of whether this paradox is the result of a resource curse or whether it is policies that were not adequately formulated. Auty (1998) as cited by Wright and Czelusta (2002) argued that countries endowed with mineral resources have underperformed in terms of economic growth since the 1960s compared to rich countries with less mineral.

While authors like Prebisch (1950) and Singer (1950) as cited by Ville and Wicken (2013) argued that there are limited opportunities for innovation in the extractive industry and predicted a long-term decline in terms of trade. Hirschman (1958) as cited by Ville and Wicken (2013) predicted that manufacturing along the extractive industry value chain will provide a wide range of opportunities for greater economic growth if correct economic linkages are promoted between the extractive industry and other sectors of the economy.

As a counter-argument to Sachs and Warner (1999) and Auty (1998), successful examples of resource-based development can be found between the mid-nineteenth century and the mid-twentieth century. Wright and Czelusta (2002) described the United States of America's mineral endowment as "an endogenous historical phenomenon". The authors mentioned the quality of the design of the strategy and the links that were created between collective learning (research and development), the increase in tax declarations and the promotion of the legal environment. The authors argued that if resource-based development was possible back into history, it was still feasible in the modern economic era. Wright and Czelusta (2002) highlighted more recent successful examples of Australia, Chile and Norway by emphasising that if mineral resources are wasting assets, these countries were able to extend the life of the wasting asset by conducting intensive exploration programs and by promoting linkages such as technological progress by investing in research and development as well as local skills creation (promoting the local content) supported by well-designed policies.

1.1.2 The African Mining Vision context

The Africa Mining Vision (AMV) was formulated as a continental framework in 2008 and adopted in 2009 by the African Union (AU). The aim of this continental vision was to determine strategies and policies that should optimize exploitation of mineral resources (Hutton, 2015) in order to promote economic sustainability and socio-economic development articulated by the following scope and strategies:

- Technology and product development by creating a lateral migration of technological skills to other non-resources-based markets;
- To create an upstream value addition by developing the resource supply and inputs sector with emphasis at promoting the local content supported by adequate policies;
- To create the downstream value addition (beneficiation) to provide inputs for the manufacturing and industrialisation sector;
- To promote the collateral use of infrastructure in order to promote the resource potential

of other low return sectors; and

- To improve physical and knowledge infrastructure.

A decade later, the AU is forced to recognise that so far, Africa with its 30% of the world reserves of extractive resources failed to harness its mineral resources potential in order to sustainably boost its economy (Ofori, 2017). There is a consensus opinion that Africa should focus on the continent's specific economic determinants such as the African socio-economic climate. When designing the strategy and policy development for Africa, experts should have considered key factors specific to Africa by using a holistic approach to understand the African policy environment and analyse applicability context at regional and national levels across the African continent (Grynspan, 2021).

Observers also determined that the AMV did not meet expectations because of the lack of coordination between members who have different priorities related to their environments. The lack of coordination between members led to different strategies planning at country levels that were not linking to each other in order to create a single strategy at the continental level. Although the AMV strategy is well written and designed, it still needs the involvement of different stakeholders in order to promote a single effective strategy at the continental level, and this can only be possible if there is a strong political will at the national and regional level first.

Namely, that a well-designed policy that can promote resource-based development can be effective if the policy is designed around the following three keys questions:

- How can extractive activities on the African continent contribute to economic growth and development?

In an attempt to answer the question, every country must engage in the core vision of the strategies of the AMV by determining the strategy for promoting economic linkages and partnership for growth and development (economic interest and formulation of the economic theory), by addressing the environmental issues, and the implementation of the main channels of the human development at national and regional level first before adhering to the continental strategy.

- What roles and responsibilities are assigned to governments, investors, and citizens?

This question was answered by determining and assigning the roles of each country (identified stakeholders) on the African continent, with regard to its potential contribution to the economic growth of its own economy first and the economy of Africa.

- How can the first two questions be converted into operational and functional rules?

These adequate political choices must be made at the national and regional level, before making the AMV fully functional by emphasizing the guidelines that each country and/or region should follow along with potential sanctions that result if the member (country) is not committed to fulfilling its mandate role.

The AMV is a visionary approach that must be translated to reality only after answering the three questions. A strong collaborative effort must be agreed upon by each African country, coupled with a strong political determination in order to achieve continental economic growth.

1.1.3 The Southern African Development Community context

This section in Chapter one described the issue of resource-based development and how different countries have been able to harness their mineral potential to boost their economies. In addition, the section was able to confront pessimistic to optimistic theories about an economy's ability, to create and promote economic linkages at the global, continental, regional, and national levels using the extractive sector as a trigger, using a much more collaborative and consensual approach. Resource-based development has been shown to be context-specific and the correct identification of stakeholders is a key component of the process of designing a strategy and formulating a policy.

At the regional level in Africa, for instance, in the Southern African Development Community (SADC) region, there is a much more fascinating approach that has been formulated by Mtegha et al. (2006) in terms of designing national minerals policies that emphasise stakeholders' participation. Mtegha et al. (2006) had a visionary approach that could have helped to solve the issue of the practicality of implementing AMV. The authors seemed to grasp at the earlier stage the issue of conflicts of interests at the country level in terms of priorities in the implementation (lack of a policy implementation plan) of relevant strategies that could promote resources-based development at the continental level. Likewise, Mtegha et al. (2006) formulated the concept of improved stakeholder participation in the development of mineral policy (strong collaborative approach) to accommodate divergent views and interests in order to bring everyone together to promote the development of policy that can promote effective implementation of policies in the regional level.

The AMV was well designed, formulated, and encompassed all relevant issues on resource-based development at the continental level, but seemed to lack practicality and a collaborative approach (sanctions were not correctly mentioned in the policy formulation), which resulted in

the issue of having too many targets and lacking in coordination (Jourdan, 2017). The SADC vision, as described by Mtegha et al. (2006) seems to have captured the issue of the required fieldwork that should be undertaken at the national level (socio-economic and specific regional problems) in order to formulate highly effective policies with successful implementation in the national mineral policies of Namibia and Malawi.

The SADC policy implementation approach or vision is based on a much more proactive approach. The vision is articulated on the concept of ensuring that everyone (stakeholders), once identified, will agree on the policy and commit to it once formulated rather than expecting stakeholders to stick to the policy (consultative and participatory process) after its formulation.

Mtegha et al. (2006) formulated a consultative and participatory approach by suggesting that all issues and concerns relevant to the country consider the needs of the other stakeholders, and at the same time, they recommended that the policy include clear operational details in terms of implementation in order to make the formulated policy effective. In other words, they have formulated an alternative strategy, which stems from the traditional strategy of formulating a policy primarily focused on taxation (tax returns to governments) and of making states, heads of governments, and foreign investors the main stakeholders benefiting from the same policy in the traditional approach inherited from the World War II (WWII). The proposed alternative strategy is more focused on a consensual, consultative, and collaborative approach in a democratic environment (political will) in order to include and motivate stakeholders to take ownership of the policy implementation.

Fessehaie and Rustomjee (2018) have discussed the strategies and policy formulation and implementation to develop industrial linkages with the mineral sector, using examples from Botswana, Zambia, and Zimbabwe. In the case of Zambia, Fessehaie and Rustomjee (2018) concluded that policy implementation had failed to promote the local content (domestic manufacturing) because of conflicting views and approaches in terms of policy formulation, and implementation around legislation and regulation. The lack of a consensual and collaborative approach between stakeholders (Mines Ministry, Ministry of Commerce and other regulatory agencies) has been a key component in the failure to formulate a common strategy in order to promote local content in the Zambian economy.

Similarly, for the Zimbabwean economy, Fessehaie and Rustomjee (2018) concluded that Zimbabwe had also failed to promote economic linkages due to a conflict of interest between key stakeholders of the Zimbabwean industry. The policy has arisen between extractive mining

policy institutions and the industrial and trade institutions, which has resulted in the marginalisation of the local content issues. It is important to highlight that in the case of Zimbabwe, the political conflict arose between institutions supporting the traditional approach and neglecting the consensual approach.

Botswana is certainly a successful example of the formulation and implementation of policies that have helped to create and promote economic linkages between the mineral sector and the manufacturing industry. Essentially, Botswana's economy is based on diamond mining and despite the fact that its GDP declined from 56% in 1990 to 33% in 2014 (Fessehaie and Rustomjee, 2018) the country has adopted the long-term vision 2016, in which the government decided to diversify its economy. After conducting an in-depth analysis of the current state of its own economy, Botswana has developed a strategy based on the three keys principles that should be used to develop a strategy and an adequate mineral policy. Botswana was able to identify the key sectors and the role of relevant stakeholders who will participate in the strategy. In doing so, the government of Botswana was able to determine the need to create six economic hubs as diamond, health, education, agriculture, innovation, and transport.

Most importantly, Botswana differs from Zambia and Zimbabwe in that its government has established and understood (detailed operational plan) the concepts of promoting linkages between the extractive sector (diamond sector) and the rest of their economy. Basically, Botswana understood its dominant position in the diamond industry sector and adopted a strategic approach with a multinational company from Botswana, by renegotiating its shares and creating a 50:50 Joint Venture was able to force its partner to locally outsource part of the value chain, thus creating opportunity for the local content to develop, with immediate positive consequences on the transfer of skills supported by a balanced fiscal policy oriented on fiscal incentives (Fox & Murray, 2004).

The successful implementation of the economic linkages between the mineral sector and the rest of the industry in Botswana has been specifically articulated with a clear understanding of its challenges, a thorough economic analysis of its economy, the correct and inclusive identification of the stakeholders using a collaborative and consensual approach, and then formulating a well-balanced fiscal strategy in which, political will and good governance played a major role.

The Democratic Republic of the Congo (DRC) is one of the richest countries in the world in terms of mineral endowment, with around US$ 24 trillion in mineral value (Wiese, 2021).

According to the National Agency for Promoting Investments (ANAPI, 2020) and the United States Department Office of Investment Affairs (Saulys & Kaozi, 2018) the country has more than 1,000 minerals (Geenen and Marysse, 2016). Table 1.1 shows some relevant minerals from the DRC.

Table1. 1: Relevant geological reserves of minerals of the DRC (ANAPI, 2020)

Rank	Mineral substances	Quantity tons
1	Copper	75,000,000
2	Lithium	31,000,000
3	Niobium	30,000,000
4	Manganese	7,000,000
5	Zinc	7,000,000
6	Cobalt	4,500,000
7	Iron (over 60%)	1,000,000
8	Cassiterite	450,000
9	Gold	600
10	Diamonds (Carats)	206,000,000 (41.2 tons)

After being heavily impacted by the so-called "two Congo wars" (Verbruggen, 2006; and Diemel and Hilhorst, 2018), the country's mining sector became risky and unattractive until the DRC government enacted a much more incentive-driven mining code in 2002 when the political situation improved. The idea behind the 2002 mining code was to harness the mineral potential of the country in order to boost its economic growth and development as it was done in many other countries. Table 1.2 shows the increasing trend in the production of copper and cobalt metal in the DRC since the implementation of the mining code in 2022 which was incentive-driven.

Table1. 2: Metals production trend (in Kt) under the new 2002 Mining code (ANAPI, 2020)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Copper	98,6	96,4	335	309	498	499	620	920	1,100	1,021	1,048	1,095	1,239	1,430
Cobalt	15,4	17,9	42,5	56,3	97,7	99,5	86,4	76,5	72,6	63,0	66,0	73,0	104	100

Most of the DRC's minerals were and still are exported as raw or semi-finished materials, creating employment opportunities elsewhere. Worldwide, the DRC was ranked, in 2012, as the world's largest cobalt producer, the third-largest tantalum producer, the seventh-largest tin producer, the eightieth largest copper producer, and hosting the highest gold reserves potential

(KPMG International, 2014). Yet the country's economy is experiencing a decline in gross national income (GNI) with a poverty index or Human Development Index (HDI) of 0.46 in 2018, as shown in Table 1.3.

Table1. 3: Declining of the Democratic Republic of Congo GNI and HDI (UNDP, 2019)

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011 PPP$)	HDI value
1990	49.0	6.8	2.3	2,054	0.377
1995	49.1	6.6	2.9	696	0.333
2000	50.0	7.0	3.3	565	0.333
2005	53.7	7.5	4.3	572	0.364
2010	56.9	9.2	5.9	634	0.416
2015	59.3	9.6	6.4	749	0.445
2016	59.7	9.6	6.6	794	0.453
2017	60.0	9.7	6.8	787	0.456
2018	60.4	9.7	6.8	800	0.459

Paradoxically with the increase in the Human Development Index (HDI) of the DRC, the Gross National Income (GNI) has drastically decreased during the same period and in addition to this, the HDI is still lower than the average of the HDI for the sub-Saharan region (UNDP, 2019). Table 1.4 and Figure 1.3 illustrate that paradox.

Globally, it has been agreed upon and demonstrated that there are opportunities for countries with mineral reserves to harness their potential in order to develop their economies and promote sustainable development. Countries like Chile, Peru, South Africa, Botswana, and China succeeded in doing this by promoting appropriate economic linkages and adopting contextual mining policies (IFC, 2014 & OECD, 2020). Based on preliminary analysis and reports, it is clear that the DRC, however, has failed to promote sustainable resources-based development despite policies that have been implemented so far.

Table1. 4: DRC's HDI & component indicators for 2018 for selected countries and groups (UNDP, 2019)

	HDI value	HDI rank	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011 PPP US$)
Democratic Republic of Congo	0.459	179	60.4	9.7	6.8	800
Ethiopia	0.47	173	66.2	8.7	2.8	1,782
Nigeria	0.534	158	54.3	9.7	6.5	5,086
Sub-Saharan Africa	0.541	-	61.2	10	5.7	3,443
Low HDI	0.507	-	61.3	9.3	4.8	2,581

In an attempt to use its mineral potential to develop the economy of the country, the DRC government concluded a deal with Chinese partners in 2007, under the "Chinese minerals for infrastructure plan. The deal has been unofficially referred to as the "deal of the century". The agreement was concluded by "Sino Congolaise des Mines" (Sicomines), which granted mining rights on the copper and cobalt reserves of the Lualaba Province (Dikuluwe and Mashamba West deposits) to China in exchange for the construction of infrastructure such as bridges, railways, and highways in the province. Operating in this way was to revive the country's economy. Analysts such as the Carter Centre, in a report released in 2017, concluded that the deal fell short of expectations due to tax exemptions until infrastructure and mining loans were fully repaid. The DRC government did not receive any tax revenue from the deal.

This is the core problem of the study that the researcher intends to conduct. Considerable mineral deposits are available in the country, but due to the lack of promotion of economic linkage, the mineral potential does not contribute to human development.

1.2 Problem statement

African countries endowed with huge mineral resources fail to revive their economies which, on the other hand, suffer the opposite effect, sometimes referred to as the "resource curse" (Siakwah, 2017). Likewise, the DRC faces an economy with low levels of mineral beneficiation due to the fact that most mineral resources are exported in the form of ores or

only semi-processed minerals (Matthysen & Montejano, 2013). Moreover, the DRC suffers from certain constraints in terms of mining policy, infrastructure and technology to reach the qualitative and quantitative threshold of its endowment in mineral resources. A number of key constraints to the effective implementation of the beneficiation strategy are identified, including, but not limited to, access to raw materials at development prices, infrastructure (access, costs and logistics), limited innovation and more broadly R&D and shortage of required critical skills. Conversely, the interventions aimed at alleviating these constraints come up against local and international political measures. An example for this would be a good long-term plan might outline an approach to reviving the economy with sustainable development through mineral beneficiation. However, the political instability that the DRC has been experiencing for decades has always been an obstacle to chart safe and certain routes that can help the country emerge from the impasse. Moreover, the strong influence of international actors in the management of the DRC's resources does not leave the government free to implement policy likely to extend mineral beneficiation to a large mineral value chain (Vircoulon, 2011). Attempting to improving economic policy, the government has made some progress, but there has been a mismatch between explicit political will and implementation capacity (KPMG, 2014).

It is essential to trace the historical context in order to understand the system in force which weakened the mineral resources to be the driving force that revives the DRC economy. The mineral resources of the DRC were articulated in three main periods (colonial, post-independence, and independence) linked to "the congolisation of mineral resources"[1] (Hutton, 2015) as developed by Kabemba (2011). The first period is characterized by the colonization of the DRC by Belgium as the Belgian Minister of finance in a speech described the intention to use the mineral resources of the DRC as market value to develop its economy, hindering the growth of the DRC economy.

The post-independence period in the DRC was characterized by the impact of the distortion of the international economic and trading system (after World War II) which became more speculative, leaving countries endowed with minerals with few options to bring substantial returns in their countries (forced to borrow money from international institutions). Kabemba

[1] The term "congolisation" was first used by an academic professor Ernest Wamba dia Wamba in order to describe how foreign countries have been taking control over DRC mineral resources for their own interests.

(2011) described the later period as the independent period, during which Western powers and the local elite developed a corrupt system to plunder the DRC's mineral resources. Kabemba (2011), at the same time, addressed the issue of lack of progressive leadership in DRC, while the civil society seemed not to be adequately involved in the process of designing mining codes and regulations.

Previous DRC mining codes and regulations as described by Geenen and Marysse (2016), such as Law 081-013 (April 2, 1981), Law 007/2002 (July 11, 2002), and Decree 0038/2003 (March 26, 2003), had failed to revive the DRC's economy, mainly due to gaps in policies that should ensure linkages among stakeholders. The new mining code adopted by the DRC Parliament on January 27, 2018, and promulgated by the DRC President in June 2018 (de Shoutheete et al. 2021), categorized "strategic" has strengthened DRC membership in the World Trade Organization (WTO), the World Bank, the Extractive Industries Transparency Initiative (EITI), and the Organisation for the Harmonisation of Business Law in Africa (OHADA). The Act requires, foreign companies should seek commercial and legal advice in the UK Bribery Act and the US Foreign Corrupt Practices Act for business safety when investing in DRC in the mining sector (de Shoutheete et al. 2021).

Lassourd (2018), in a report from the Natural Resource Governance Institute (NRGI), addressed in the concluding remarks, the concern that the tax regime is above the international standard which may result in a limited development opportunity for the extractive sector in the DRC. Indeed, the tax system can eradicate medium-producers in the mining sector, and therefore, limit the development of the sector. Lassourd (2018) also discussed the parallelism of fiscal institutions associated with the interventionism (Regime Cash Machine, 2017) of State-owned companies that are in a joint venture with foreign companies. In his concluding remarks, Lassourd (2018) stated that the DRC's new mining code was not a consultative process and that this new mining code would trigger conflicts between the state (DRC) and its extractive industry.

1.3 Research Motivation

Garrett and Lintzer (2010) conducted research on resource-based development in the DRC at the provincial level (Africa Report N°239, 2016). In their concluding remarks, after focusing on two major indicators such as the fiscal linkage and the development of economic linkages between the Katanga mining sector and the rest of the DRC economy, they identified the need

for political reforms that prevent or complicate opportunities for the mining sector to contribute to the growth and development of the DRC economy.

This being said, the study envisaged the opportunity to contribute to the design and recommendation of an appropriate policy strategy that can be translated into a set of operational actions and later, into a linkage resource-based development strategy between stakeholders operating in the Lualaba Province with a tangible impact on human development.

1.4 Research objectives

The aim of this study is therefore to examine a resource-based development approach that considers the current challenges of the DRC's extractive industry in terms of stakeholders and existing mining policies, with an emphasis on its cobalt industry, in order to develop a linkage-based strategy for the Lualaba Province.

The aim was fulfilled in the objective viz.

i. To provide an overview of the contribution of the mining sector to the economic growth of the country;
ii. To unpack the concept of global economic linkages and related policies;
iii. To identify the roles of stakeholders and bring them together to commit to a vision of sustainable development related to minerals;
iv. To identify specific case studies on "what to do" and "how to do" in order to implement a successful beneficiation strategy based on economic linkages promotion;
v. To examine the current mineral situation in the DRC mining sector and uncover the gap between the DRC economy and the mining sector that reinforces poverty and low human development;
vi. To explore key challenges as a target for DRC to fully understand the system and derive findings from successful case studies;
vii. To determine the potential benefits of developing beneficiation strategies for the DRC economy.

1.5 Research question

The following key research questions are addressed to this study:

1. What is the appropriate resource-based policy to be designed in order to create an appropriate linkages-based strategy that can enable the DRC to develop its economy using the cobalt mineral potential of the Lualaba Province?
2. How do cobalt extractive activities contribute to the economic growth and development

of the Lualaba Province?

3. What roles and responsibilities of the industry stakeholders in the Lualaba Province?
4. How can these be translated into operational rules, guidelines, and sanctions?

1.6 Research propositions

Proposition 1: The DRC government, as the main stakeholder still has a weak operational engagement and participation.

Proposition 2: There is very little understanding of the positive impact of local downstream beneficiation.

Proposition 3: Promoting local content is weak and there is a need to develop this sector, which can potentially support local minerals beneficiation.

Proposition 4: There is no operational National Development Plan to outline a clear resources-based strategy around the cobalt mineral potential (no existing short-term, mid-term or long-term manufacturing strategy using cobalt as the main component).

1.7 Importance of the study

The relevance of this study is based on the importance of the key role that the cobalt mineral plays in the modern world and on the non-renewable resources, associated with the fact that most of its resources and reserves are located in the Lualaba Province. The DRC government needs to understand that the economic opportunity is limited in time and must implement urgent and adequate strategies in order to harness this mineral potential to diversify its economy. Most of the resources-based studies in DRC are conflicts-related studies with an emphasis on the Eastern part of the country, while this study aims to look at the DRC's mineral potential from another perspective by addressing not only the lack of appropriate strategy for economic linkages and contextual policies that could enable the DRC government to harness its cobalt mineral potential from the Lualaba Province but also to formulate a set of policies that will translate into a linkage-based development strategy.

1.8 Structure of the report

Chapter 1 Introductory sentences set the scene of the study by providing an overview of the research in describing its background. The core concepts of the study are covered as well as the research problem, aims, and objectives are outlined along with the research question. Propositions are formulated and accompanied by an outline of the structure of the study.

Chapter 2 provides a literature review on the relationship between economic linkages and the mining sector in a global approach with emphasis on the positive impact on a country's

economy. The chapter covers the literature review on the core concepts that support an effective resource-based strategy. In this chapter, core definitions of downstream beneficiation, economic linkages, policy formulation, strategy design, and implementation, as well as promotion of economic linkages, are covered. The historical and political contexts of resource-based development are also discussed. The national development plan concept and development strategy layout are discussed with an emphasis on the DRC mining context.

Chapter 3 discusses the research methodology and design employed in this study. The chapter set the scene for a comparative and interpretive case study-type research approach and explains the necessity of dividing data collection into qualitative and quantitative analysis parts. The Chapter discusses the uses of a comparative case-study methodology approach in order to ground prevailing theories in mineral resource-based development economies and explains the reason why techniques such as Exploratory Factor Analysis and Principal Components Analysis (PCA) method are used on the quantitative side.

The study design induced the collection of primary data and addressed the challenges encountered during their collection. Open and closed questionnaires addressed to participants (identified actors) of the cobalt mining sector in Lualaba province were formulated and distributed. This chapter also indicated why a purposive sampling method was applied in order to collect primary data more efficiently due to the limited sample size. Validation and reliability criteria have been explained and applied with the aim of providing reliable results. Emphasis was placed on Cronbach's alpha to further validate constructs that were identified after EFA. Qualitative analysis focused on identifying themes and sub-themes using NVIVO 11 software for text-based qualitative analysis of participants' responses.

The chapter also cover secondary data collection using peer-reviewed articles and reports such as United Nations, International Monetary Fund and World Bank reports in order to purposely select successful case studies.

Chapter 4 about resource-based development case studies, focuses on the successful resource-development case studies that were purposely selected by the researcher. The chapter explains intense detail how other countries endowed with minerals have been able to improve human development by harnessing the mineral potential of their respective countries. This chapter is presented as a standalone chapter with a substantial contribution to the findings from secondary data. The chapter illustrates the practical implementation of the theory and concepts covered in chapter 2 with a view to discussing and confronting the findings in chapter 5. Critical

challenges and implications have been identified and addressed, in terms of strategies and policies to be implemented.

Chapter 5 relates to the political economy of the DRC and linkages issues with a focus on the political economy of the Lualaba Province. In addition, the chapter highlighted some policy formulations in the DRC mining regulatory framework with respect to the socio-economic context of the country.

Chapter 6, depicting research findings and discussion, formulated constructs and aggregates themes that constitute key drivers and challenges at implementing a downstream development strategy for the Lualaba Province.

Chapter 7, in the form of conclusions and recommendations, oriented towards the aims and objectives of the research, summarizes the key points of the results and the discussion. The chapter equally discusses the limitation of the research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Resource-based development has long been considered difficult, not impossible, to achieve in countries endowed with mineral resources. In the previous chapter, we have discussed the prevailing theories formulated by authors like Sachs and Warner (1995a) and (1997) and Prebisch (1950) and Singer (1950) while at the same time counter-arguments were also formulated by another group of authors like Wright and Czelusta (2002). They were convinced that resource-based development was possible, insisted that it was a matter of organization and strategic planning despite the exhaustibility of mineral resources. This Chapter will focus on successful case studies which were able to harness their mineral potential to improve human wellbeing. At this stage, it is relevant to explain what minerals are, why nations depend on them, and how minerals bring development or human development.

In mineral economics, minerals are defined as a stock of materials present in the natural environment that are both scarce and economically useful in production and consumption, either in their raw state or after a minimal amount of processing (World Trade Report, 2010). In addition to this, the economics of minerals highlights the fact that minerals have specific features such as uneven distribution across countries, exhaustibility, price volatility, substitution, and scarcity (World Trade Report, 2010).

Because of the specific features that minerals carry with them and also because nations use their minerals wealth to increase their level of the economy, trade organizations such as the World Trade Organization (WTO) which are basically responsible for regulating how minerals are to be traded and how nations can mutually benefit from them in order to develop their respective economies. In general, the extractive industry uses two main channels (public

spending by the government and the extractive sector through employment and corporate social responsibility) to bring wealth and development as illustrated in Figure 2.1[2]

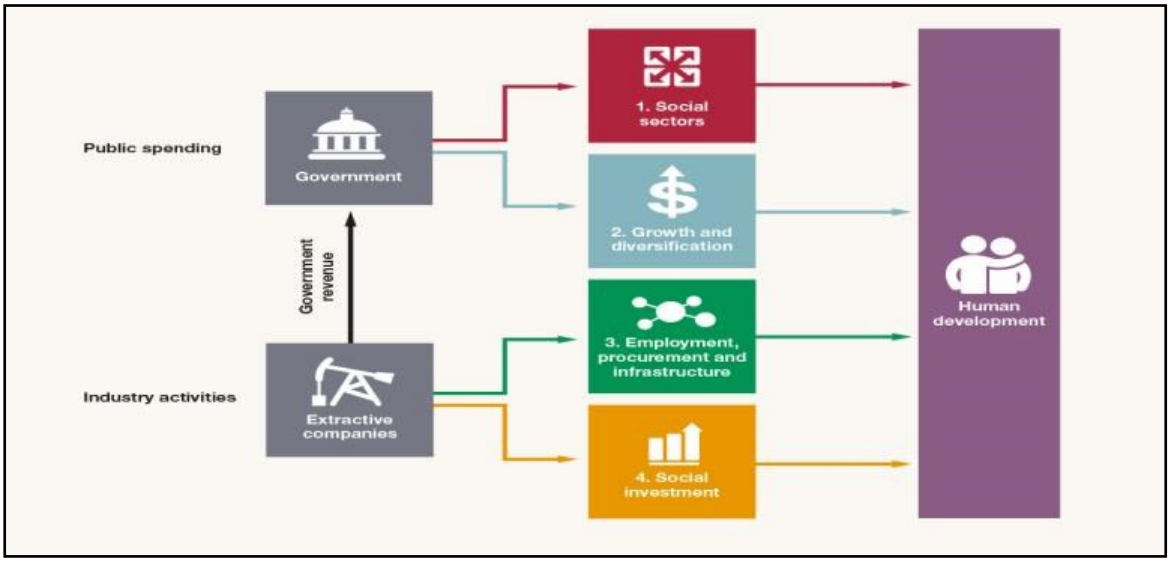

Figure 2. 1: Link between the mineral sector and the human development (Source: Bill and Melinda Gates Foundation, 2015)

Economically developed countries such as the United States of America (USA), China, Canada, Australia, Norway, Chile, and Sweden, were able to use their mineral resources from their respective countries, and thanks to the returns provided by the minerals trade, created wealth for their nations by applying value sharing and promoting manufacturing. On the contrary, on the African continent, very few countries have been able to use their minerals to promote their economic growth such as Botswana, South Africa, and Ghana. When analysing those facts, it is important to understand why developed countries were able to harness their mineral potential when Africa, in general, could not.

Mining in the DRC began during the 'Congo Free State' which ran from 1885 to 1908, and the extractive industry was initially located in the Katanga region (Phillips, 1889) in which raw materials such as copper, cobalt, and uranium were mined and processed in the copper ingot. During the colonial times, the mining production was primarily exported to Belgium, where the downstream beneficiation was conducted. The mining industry in the DRC has recently expanded to the production and exports of gold (northern part of the country) and diamonds

[2] Figure 2.1, is the illustration of the main channels and interactions between the mining sector and the economy of a country. This diagram basically describes how the mineral sector interacts with the human development in a given country.

(central part of the country in the Kasai region) in the form of gold ingots and raw diamonds which were beneficiated abroad.

The mining sector of the DRC has been dominated by the production and exports of copper and cobalt since colonial times (1908-1960), under the regime of President Mobutu (1965-1997), until the present day (the 2000s), periods during which the production of copper and cobalt remains upstream-oriented, with a very low impact on the local economy in terms of education, employment, health, and social development.

2.2 Development

Development is a process that creates growth, progress, positive change, or the addition of physical, economic, environmental, social, and demographic components (Todaro and Smith, 2009). Seers (1972) asserted that "development" means the conditions for the realisation of the human personality. The evaluation of development must therefore consider three linked criteria: where there was a reduction in (1) poverty, (2) unemployment, and (3) inequality" (Seers, 1972, pp 115).

In the simplest terms, development can be defined as social change that enables people to grow to the point of realizing their human potential (Adams, 2009). Another important point is that development is a process rather than an outcome: it is dynamic in the sense that it involves moving from one state or condition to another (van Geert, 2019). Development is not limited to interactions between human groups; it also involves the natural environment (Adams, 2009). Development requires the release of potential to enable the conversion of natural resources into cultural resources.

2.2.1. Resources-based development and sustainability

Developing countries, especially countries in Sub-Saharan Africa (SSA), are highly dependent on resources. Many countries are focusing more on resource extraction and exports, despite their desire to promote industrial development as well as export and production diversification. A crucial factor is the high volatility of commodity prices which makes macroeconomic management of resource-based economies difficult.

Economic development based on mineral resources is included in the broad definition of what is called "sustainable development". The definition of sustainable development is applied in various fields related to the existence of mankind. Authors like Dubinski (2013), indicated that it was in the second half of the 20th century and in response to the dynamism of economic growth, world opinion began to question the intensity of use (use excessive) raw materials.

Theories of resource depletion (hotel rule), the wealth of nations (Adam Smith), including Hartwick's rule (concepts of intergenerational equity) have begun to arise again and question the viability of the sustainability concept.

Dubinski (2013) indicated in his introductory part of his article that the overexploitation of resources and environmental concerns led to the publication of a document (the Brundtland report) in 1987 under the title "Our common future" by the Commission on Environment and Development (WCED) under the direction of Mr. Gro Harlem Brundtland at the United Nations (UN). The core of the Brundtland Report was that the same quality of life of present generations should be transferred to future generations in a sustainable way. This is the basic concept of intergenerational equity (Dubinski, 2013). This is also the driving concept of true savings indicators that is commonly used by the UN. Sustainability is subdivided into weak and strong sustainability which are hotly debated in the scientific world of sustainability.

For the purposes of this study, sustainability will not be widely discussed in terms of intergenerational equity, but rather its components in terms of mineral resources and how mineral resources can be used to bring about sustainable human development are those analyzed in this research. Dubinsky (2013), indicated that 27 principles of sustainable development are compiled in a document following the help of the Earth Summit in 1992 in Rio de Janeiro. The summit focused on the future of the world and also identified "new indispensable ways to invest in the future in order to achieve sustainable development" and the key elements were identified as follows:

- The need for cooperation in creating a sustainable economy in the mineral resource acquisition industry;
- The need to seek to promote research and development to create new technologies that will increase the use of these minerals (especially the most critical);
- Have an integrative or holistic approach to unite technical and economic, ecological and social activities.

Acquiring mineral resources is not a straightforward process and mining or mineral policies (legal framework) fall under a country-specific mineral framework regarding how a mineral is first discovered (mineral exploration rights), classified (critical, strategic or basic), mine life of the deposit must be recognized and subsequently valued (upstream or downstream).

Research and Development (R&D) is a component that arises from how a mineral is acquired, discovered and classified, it is an essential component to analyse in an integrative way whether

the specific mining industry is ready to make the most of the economic opportunities that are offered by the mineral. This is where local content needs to be contextually promoted with strong supportive mineral policies. It is important that to have resource-based sustainable development, strong policies must be in place and must also follow an operational approach in order to be functional and effective on the ground.

Mtegha (2020) indicated that in order to develop a resource-based development strategy, there are 3 key questions to be addressed and they are formulated as follow:

- How do extractive activities contribute to economic growth and development? At this step, the government of a country must be prepared to conduct a candid self-assessment on the state of the political economy. This is where the tools and theory of economic and empirical analysis must be integrated;
- What are the roles and responsibilities of relevant stakeholders such as governments, investors, and citizens? Especially in terms of the domain of responsibility of the state in a matter of protection of citizens, preservation of private-decision-making and the responsibilities of the individual; and
- Policy formulation and related investment law from answers given on the first and second statements.

2.2.2. Development versus environment

Development is not limited to interactions between human groups alone; it also involves other aspects, including the natural environment (Kington, et al, 2013). Thus, in the process of development, it is a question of better knowing the conversion of the natural resources into cultural resources. With regard to the economy, it will be important to understand development through a fundamental function of the economy which is the conversion of natural resources (in the form of raw materials and energy) into products and services used (Gyau-Boakye, 2011).

The environment suffers from pollution as the conversion processes are never fully efficient, some wastes are produced which are usually discharged into the environment in various forms of pollution. Consequently, the environment is both a source and a sink in relation to economic processes: it is a source of raw materials and energy and a sink of pollution.

With regard to conversion, we will speak of crude oil which is converted into gasoline or diesel after its fractionation and distillation in oil refineries. Through the combustion process, gasoline and diesel are converted into useful work (such as transportation) while waste products

are released into the atmosphere as greenhouse gases (such as carbon dioxide) Deevingue, et al 2020). Widespread decarbonisation efforts across all industries could create major shifts in the demand for mining commodities (de Pee, et al, 2018). And the mining sector, responsible for 4-7% of greenhouse gas (GHG) emissions globally, will also face pressure from governments, investors and society to reduce emissions (Sakhau, 2022).

2.2.3. National Development Plan

Chimhowu et al (2019), described the National Development Plan (NDP) as a catalyst for achieving a sustainable development agenda over a given period. The Food and Agriculture Organization (FAO) website, defined an NDP as a plan that includes all sectors that generate wealth in a given economy. The NDP is structured based on core objectives (eradicate poverty, implement downstream beneficiation of its cobalt industry, create a solid educational system, etc.) that a country has decided to achieve in a given period (generally five years). The NDP has core characteristics as follows:

- The NDP is based on a country objective (vision of development);
- The NDP is country-specific (related to the context and well-identified national needs);
- The NDP is based on priorities;
- The NDP defines the role and the contribution of every sector of the economy;
- The NDP must be able to formulate policies and incentives to link the private and public sectors (enabling factors) and also promote economic linkages between all sectors of the economy (sectors should operate as a whole and not remain as silos);
- The NDP must determine a clear operational development strategy; and
- The NDP must identify and define the roles of stakeholders that interact in every sector of an economy.

It is important to note that the level of stakeholder inclusion determines the likelihood that a plan or a strategy will be successful. Mtegha et al (2006) asserted that classic mineral policy was FDI-oriented and had a high risk of remaining a desk study exercise. He went on to mention that based on research, the findings showed that policy-making required special skills (Mtegha et al, 2006). Several NDP has remained unachieved such as the African Mining Vision (AMV), certainly because of lack of better stakeholder participation during the mineral policy development, as indicated by Mtegha et al (2006) in their abstract. Despite this, the case studies of the USA, Australia, Chile, Ghana, and South Africa are well-known examples of successful implementation of a resource-based development strategy.

2.2.4 Local content

The wealth of the soil should benefit the people who live on it first. For this cause, it is critical for extractive projects to develop and include a local content policy. Local content is the value that a local, regional or national economy derives from extractive projects. Mining companies have to create jobs for the communities/ countries where they operate. Mining activity should benefit the communities/countries where they take place, including through the procurement of local goods and services. The local content concept originated in the United Kingdom in the 1970s. Following heavy dependency on US investments to exploit its oil fields, the UK developed a network of oil companies (Tordo et al., 2013). The latter grew to the point of manufacturing all the equipment necessary for oil exploration and production, thus ending that dependency.

Today, most countries with significant mining, oil and gas industries employ this concept that urges multinationals to promote 'industrial diversity, ensure sustainable growth, and tackle poverty'. The concept could be based on 'tax incentives', 'contract clauses' or a 'mining code'. The concept details all 'national preference' requirements. It is an obligation imposed on multinationals to mainstream local components into the production process, which can be measured in percentages or quotas, and which can include subcontracting, the use of local labour, the training of local staff, the transfer of technology and skills, funding for the local production of goods and services (promotion of local entrepreneurship), and the possibility for citizens to own shares in the company (Féviliyé, 2021).

Local content could be applied in three ways: first, through the construction of plants, energy and transport infrastructure in a country where the industrial sector is so underdeveloped that it cannot absorb the output of multinationals operating on its territory; second, through hiring local labour and vocational training for the locals; and third, by promoting local entrepreneurship via private direct investment by the multinationals. Copper, cobalt, diamond, gold, manganese, tin, coltan and tinstone are some of the most famous amongst the plethora of mineral resources found in the DRC. Their exploitation is yet to yield tangible benefits for the national economy, including jobs for the locals (Mukuli & Hengelela, 2021). As a country overflowing with natural resources, the DRC would benefit from mainstreaming the local content concept in its legislation to drive socio-economic development.

2.2.4.1 Local content policy

What qualifies as local content often varies from country to country. For example, some countries refer to *national content* to emphasize that the inputs can be from anywhere in the country, while others seek to promote inputs from the resource rich region specifically (Natural Resource Governance Institute, 2015). There are often additional questions about what qualifies as a local business—is it enough to have a certain percentage owned by nationals? Must it be registered in the country? What percentage of the workforce must be local? Some countries are very explicit about these mandates; others are not.

To encourage local content, countries often create requirements for extraction companies to include local labour, products or companies. Governments use a variety of tools to reach their goal of benefiting the local economy through the extraction project, including (Natural Resource Governance Institute, 2015):

- **Quotas**, embedded in laws, regulations or contracts, are provisions to require companies to award a certain percentage of hires, contracts or equity ownership to local companies or professionals.
- **Training program requirements** or incentives are aimed at requiring or encouraging foreign companies to build the skills of the domestic workforce.
- **Public education initiatives,** wherein the state opens training centres, establishes programs or organizes overseas scholarships to build a cadre of expertise in sectors with strategic links to oil and minerals.
- **Incentives for small business development**, including fostering better access to credit for small business owners or opening business incubation centres.
- **Processing and production of derivative products**, such as refining crude oil or smelting minerals, which can capture significant economic benefits if done domestically but also can be expensive and complicated to construct.

Local content requirements in a country can be implemented on a project-by-project basis through contracts or universally through national legislation. Countries vary on the level of specificity of local content requirements and whether they include provisions for employment, training or ownership.

2.2.4.2 Local content in the mining law

a) Local Content Innovations in the Mining Law

The first innovation is the legal definition of subcontracting given in the Mining Code (Mukuli & Hengelela, 2021). It defines subcontracting as "any legal person under Congolese law with

Congolese capital that provides equipment or performs work and/or services required on behalf of the holder as part of its mining activities under its mining title and including the construction of industrial, administrative, socio-cultural and other infrastructure necessary for the project, as well as all other services directly related to the mining project" (Mining Code: Article 1.48).

The second innovation is that the government must define and implement the employment and training policy for Congolese nationals in the mining sector (article 16 bis). There are quotas in place to regulate the employment of foreign nationals, there is a list of prohibited jobs for foreign nationals, and there are regulations that determine the terms of their employment. Priority must be given to Congolese nationals with the same skills as their competitors (Decree No. 038/2003 of March 26, 2003 on mining regulations: article 405). The DRC government has set the minimum quota of Congolese nationals by job category at different stages of mining projects (Mukuli & Hengelela, 2021).

The Mining Code requires mining operators to set up advanced training programs for their Congolese personnel, covering all qualifications, and allowing them to occupy management positions within the time limits indicated in the table above (Article 405). Mining operators are required to establish and submit their training and staff development plans to the Technical Unit for Coordination and Mining Planning (CTCPM) of the Ministry of Mines for information and follow-up. In addition, the training and development plan of mining companies must include training courses for students in mining-related science and technology (Article 405).

The third innovation is the opening of the mining sector to local shareholders through the compulsory participation of Congolese nationals in at least 10% of the share capital of mining companies (article 71). This condition is also extended to designated places of purchase, sale and processing of precious materials. These shares can be released when the Exploration Permit (EP) is transformed into an Exploitation Permit (OP) or when a new mining company is created. Congolese nationals must be associated with the setting up of counters. It should be noted that the legal provision of the Mining Code which enshrines the opening of shareholding to Congolese nationals in the mining sector has not been implemented, the execution measures in terms of ministerial orders still being lacking. It is up to the Minister of SMEs and SMIs to draw up this decree and submit it to the Council of Ministers for approval. In the meantime, we can affirm that the Minister in charge of SMEs and SMIs, in consultation with the Minister of Mines, should ensure that the 10% of shares reserved for Congolese nationals are the subject of a transparent and competitive call for tenders (Mukuli & Hengelela, 2021). This would allow

interested citizens with the financial means to compete. This tender will likely contribute to the fight against money laundering and prevent ineligible persons from carrying out mining activities.

The fourth innovation concerns the industrialization of the mining sector. It consists of three types of obligations that have a strong impact on the promotion of local content in the mining sector. Firstly, any holder of a mining title or a permanent quarrying authorization is required to transform or have transformed the mineral substances into marketable products in their own facilities or in approved processing entities established in the national territory (Mukuli & Hengelela, 2021). To this end, the permit holder must submit to the Department of Mines his industrialization plan comprising a program for processing the ores extracted from his site in his own facilities or with approved processing entities established on national territory (article 108). To date, no enforcement action has been identified to support this provision. The fifth innovation is the consecration of the authorization to create processing entities and processing plants. Indeed, any person who does not hold a mining exploitation title and who intends to engage solely in the processing of minerals must obtain a processing authorization from the Minister in charge of Mines. A company that does not have a mining title but intends to engage solely in the processing of minerals must reserve at least 50% of its share capital for Congolese nationals (article 108 quarter).

b) Critical Assessment of Local Content in the Mining Legislation

Regarding subcontracting or supply in the mining sector, Article 108 quinquies of the Mining Code stipulates that mining operators must follow the provisions of Law No. 17/001 of February 8, 2017 which sets the rules applicable to the subcontracting in the private sector. As indicated above, this law has shortcomings that are detrimental to the development of subcontracting insofar as it does not set measurable objectives for the main companies. The Minister in charge of Mines should issue an order to determine the equipment, consumables, products and services that must come from Congolese Small and medium-sized enterprises (SMEs). The Minister of Planning should issue a decree recognizing the right of the Extractive Industries Transparency Initiative (EITI) to require companies to declare their expenditure on local purchases. Mining legislation lacks clarity on training. It is hoped that the training of Congolese cadres will be quantified and determined in time given that the expected life of a mine varies between 25 and 30 years. Concerning the industrialization of the mining sector, the derogation to process raw minerals outside the national territory (article 108 ter) runs risks of becoming a general rule in violation of the obligation to process minerals locally. The

Congolese government should provide sufficient electricity to mining operators to process and process minerals locally. The only provision relating to the transfer of technology is that which recognizes the competence of the Minister in charge of Mines to rule on the industrialization plan presented by the holder and comprising a program for the transformation of the mining products extracted from its perimeter in its own facilities or with approved processing entities established on national territory (Article 7). The Mining Regulations do not specify the content of the industrialization plan nor the procedures for submitting, examining, approving and monitoring it. There are no industrialization guidelines in Congolese mining legislation.

2.3 Beneficiation

According to Robinson and Von Below (1990), beneficiation is defined as any additional processing of a mineral to improve its economic value. Beneficiation is generally divided into two main parts: the upstream beneficiation or extraction stage and the downstream or manufacturing stage. Baxter (2005) defines beneficiation as a series of steps in adding value from the extraction stage to the branded product. The term beneficiation draws attention to the fact that most of Africa's minerals are exported to the former colonial countries where beneficiation is carried out to its final stage and fabricated products are imported back to the originating countries (Baxter, 2005). According to Baxter (2005), the term beneficiation implies the development of commodities from extraction to manufacturing with a change in the employment system associated with each stage in accordance with the recipient country of the respective beneficiation stage.

Hausmann et al. (2008) argue that beneficiation, downstream movement and promotion of greater value addition in natural resources are common policy initiatives to stimulate new export sectors in developing countries, largely on the premise that it is a natural and logical path to structural transformation. In the mining industry or extractive metallurgy, beneficiation is any process that improves (benefits) the economic value of the ore by removing the gangue minerals, which results in a higher-grade product (concentrate) and a waste stream (tailings) (Hausmann, 2007).

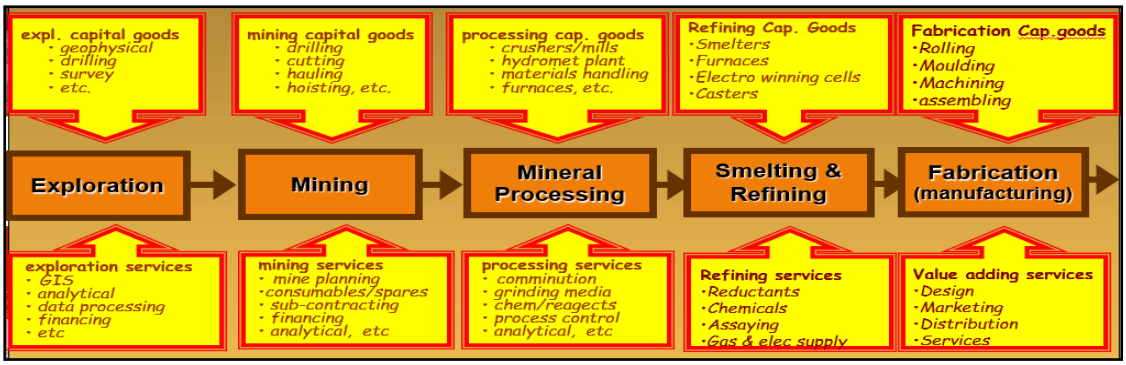

Figure 2. 2: Upstream and Downstream beneficiation concept (Jourdan, 2013)

2.3.1 Downstream beneficiation

Downstream is defined as located in or moving in the direction in which a stream or river flows and in the mining industry, downstream refers to a resulting product that does not require any additional processes. Downstream beneficiation is converting the mineral resources into the fuels and finished products. Robinson and Von Below (1990) defined beneficiation as any further processing of a mineral to improve its economic value. Baxter (2005) defined beneficiation as a series of steps of adding value from the mining stage to the branded product.

2.3.2 The case against and for beneficiation

The International Panel on Growth (Hausmann, 2006) addressed the case against beneficiation by saying that the use of beneficiation as a means of industrial promotion is unnecessary because the subsequent minerals processing (downstream beneficiation) is not easy and is not a mandatory next step in the process of a country's economic growth. Krugman (2008) as cited in a report by the Department of Mineral Resources of South Africa (2011), formulated a positive approach to beneficiation by supporting the theory of the comparative advantage and furthermore the competitive advantage in countries' minerals producers. Sala-i-Martin and Subramanian (2003) argued, in their concluding remarks that the resource curse is not deterministic. Countries like Chile, Brazil, Ghana, China and, South Africa have been able to use their mineral resources to develop their respective economies through successful linkages-based downstream beneficiation and diversification. Authors like Mtegha (2009) as cited by Zonwabele (2015) indicated that beneficiation along the mining value chain creates more employment opportunities when new companies are created along the value chain and provide products and services to the mineral sector.

The International Panel on Growth has visibly underestimated the political will of underdeveloped countries in terms of policy formulation and stakeholder participation around a single vision for the development of their respective countries. Successful economies such as

the USA, Australia, Peru, Chile, Ghana, and South Africa have been able to promote downstream beneficiation and linkages which have greatly benefited their growing economic wealth.

This study will explore how a vision around the cobalt mineral, can benefit the economy of the DRC by developing a downstream beneficiation strategy.

2.4 Strategy

Strategy is a word with many meanings and all of them are relevant and useful to those who are charged with setting strategy for their corporations, businesses, or organizations. Some definitions of strategy as offered by various authors, for instance, Chandler (1962), author of Strategy and Structure, the classic study of the relationship between an organization's structure and its strategy, defined strategy as "the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources for carrying out these goals." (Chandler, 1962).

A method or plan was chosen to create a desired future, such as the achievement of a goal or a solution to a problem. In this study, the strategy consists in compounding all the elements such as the geological potential of cobalt, the prevailing level of development of the DRC, assess the roles and levels of stakeholder participation, existing policies and vision, and the type of economic linkages to be promoted together in order to boost the development of the Lualaba Province.

The word "strategy" applied to the context of this research led to the formulation of the definition comprising the following elements:

- Search for answers that can lead to escaping an unacceptable past;
- Conceptualise that exports of beneficiated minerals are means or tools to support economic development; and
- Awareness that minerals waste assets, which offer a unique opportunity to improve social well-being (HDI).

2.5 Economic linkages

Economic linkages are, by definition, a long-term collaboration between stakeholders such as local communities, governments and investors. Haussmann et al (2008), defined economic linkages as vertical relationships in the mining value chain. They underline the strong impact

of the linkages on the policies formulated in the extractive sector in general and the mining sector in particular.

Economic linkages occur in the input and output process as they interact and overlap along a mining value chain. Along the extractive industry value chain, economic linkages are created and depending on the country context, some linkages may not exist for the same value chain in another country. The general structure of economic linkages related to the mining value chain, including upstream and downstream beneficiation is shown in Figure 2.2.

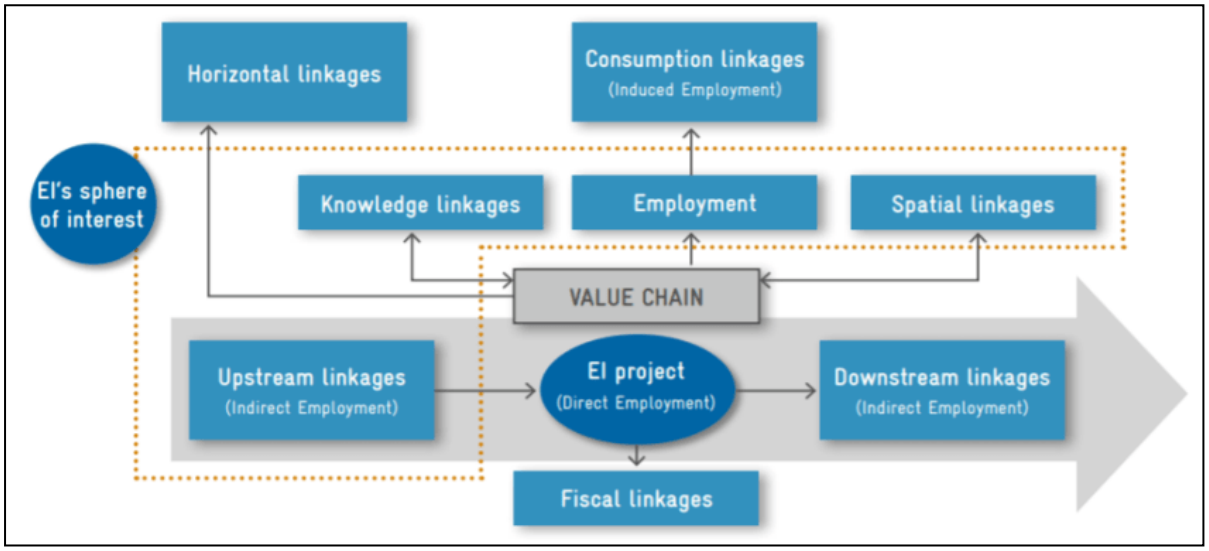

Figure 2. 3: Economic linkages along the mining value chain (Columbia Centre on Sustainable Economic Investment, 2016)

2.5.1 Upstream or backward linkages

Upstream or backward linkages are, by definition, production linkages that are related to the goods and services that a mining value chain requires to maintain production. Backward linkages are directly related to the so-called operating costs and include goods such as organic reagents and lime, as well as services such as the regular replacement of SAG mill liners and worn-out rotate bearings. The upstream linkages relate to procurement, whether it is a local or a foreign supply chain. The upstream part of the production process does nothing with the material itself, such as processing the material. Hirschman (1976) defines backward linkage as an "input-provision derived demand that will induce attempts by domestic production to supply the inputs needed for this activity". Thus, to produce cobalt, a supply of external goods and services will be necessary. The derivative demand or upstream linkages generates indirect employment.

2.5.2 Forward linkages

Hirschman (1976) in his introduction defines the forward linkage as an "output-utilization" linkage type. The author says that any activity that does not fully support final demand will attempt to utilize its final output product as an input for another activity. For example, the final product at the end of the cobalt value chain in the DRC is generally in the form of hydroxide. In order to construct cobalt-based components for electric vehicle batteries, the cobalt would have to be refined for further use, creating a forward linkage. Output-utilization linkage is a generator of indirect employment and the opportunity to promote such a linkage will be explored in this study. This type of linkage does not exist in the DRC and will have to be created and promoted using an appropriate strategy.

2.5.3 Horizontal or lateral linkages

Horizontal linkages, as opposed to upstream and downstream linkages, which are considered "vertical linkages", are production linkages commonly named lateral linkages. They generate the creation of industries all along the supply chain. They also provide opportunities to supply local content to the mining industry, reducing reliance on foreign materials.

Rupert and Hodder (1990) argue in their introduction that the implementation of horizontal linkages in China in 1978 was difficult due to challenges that presented the need to reform the Chinese industrial system by implementing a commercially integrated economy on one hand, and on the other hand, the tension caused by the ideological context of preserving existing state structures, bureaucracy, and the industry's ownership. Horizontal economic linkages are not created instantly; these are policy-related linkages. The externalities that constitute challenges for the implementation of such linkages are contextual and may vary from country to country.

According to the World Bank Report No.112733-ZR (2018), horizontal linkages are difficult to implement in the DRC because of challenges faced by local entrepreneurs in terms of starting and opening up small to medium enterprises (SMEs).

2.5.4 Consumption linkages and the economic multiplier effect

Consumption linkages are the result of the exchange of goods and services. These linkages are perceived as consequences of the creation and promotion of production and horizontal linkages. Hirschman (1992) as cited by Leeuw and Mtegha (2016) defines consumption linkages as a demand for goods and services induced by earned income. The demand may increase or decrease in proportion to income. Consumption linkages create employment that is not directly linked to the mining value chain.

According to Domanski and Gwosdz (2010), the term "multiplier effects" refers to the emergence of a new type of economic activity as a result of an increase or decrease in income or employment in a local or regional economy.

2.5.5 Spatial and technological linkages

Leeuw and Mtegha (2016), define spatial linkages as linkages resulting from the construction of infrastructure such as roads, bridges, and power grids as consequences of the exploitation of resources in a region. Spatial linkages, as defined by the CCSI (2016), are considered to be enabling factors. Technological linkages relate to the required knowledge and expertise that needs to be transferred. Spatial and technological linkages are grouped in the category of side-stream linkages.

2.5.6 Fiscal linkages

The term "fiscal linkages" refers to taxes that are owed to the government by extractive companies, such as export taxes and royalties. Hirschman (1981), as cited by Leeuw and Mtegha (2016) describes fiscal linkages as the impact of export and import tariffs on the creation or enhancement of existing public goods in the economy of a region.

Garrett and Lintzer (2010), explore the development potential of fiscal linkages in the Katanga Province of the DRC. The authors question the real impact of tax revenues and the tax collection system due to the informalisation and lack of historical sub-national redistribution of wealth. Lamer et al (2013) as cited by Haider (2015), argue that the tax system in the DRC is barely functional and most fee collection by state officers occurs informally and illegally.

According to a report by the World Bank as cited by Garrett and Lintzer (2010), prior to the 2008 financial crisis, the DRC's mining sector could have earned 200 to 400 million US dollars in tax revenues from the mining sector. They suggest that to promote fiscal linkages in the DRC mining sector, policies must be well carried out.

2.6 Resource Curse

The concept of "resource curse" as introduced by Richard Auty in 1993 to insinuate the inability of countries rich in natural resources to use this wealth to improve their economies. On the other hand, these countries had an inferior economy compared to countries that did not have abundant natural resources. The resource curse shows that countries rich in mineral resources encounter inadequate beneficiation of their mineral resources because they mainly focus on the extraction and commitment of natural resource rents in situations contrary to the

competitive diversification of the economy. Various reasons are given for this resource curse, such as corruption, exchange rate appreciation, foreign ownership and conflict.

The general belief for centuries has been that, large mineral resources endowment was beneficial for country's development but it was only during the 1950's when different line of thinking arose based on the work done by Prebisch and Singer (In class material, wits 2018).

Numerical studies were carried out from the period ranging from 1988 to 1997 by authors such as Gleb, Auty, Sachs & Warner in which, the resource curse theory was somehow validated. There was a general agreement based on all these studies and evidences, that Rent-seeking behaviour, Dutch disease and commodities prices volatility, were key components.

2.6.1 Dutch disease

Ebrahimzadeh, in her article published in the International Monetary Funds (2020) , citing W.Max & Neary (1982) , indicated that the Dutch disease is the result of wealth managed unwisely. Dutch disease is the causal relationship between the increase in the economic development of a specific sector such as the cobalt sector of the Lualaba Province and a decline of other sectors such as manufacturing and agriculture.

2.6.2 Arguments against resource curse

Arguments against resource curse theory is back to early 200s when authors like Wright and Czelusta (2002), after reviewing successful cases studies, indicated that resource curse is avoidable, it was just a matter of organization and strategic planning. There were countries such as Botswana, South Africa, Ghana, USA, and many other that were able to harness their mineral potential, in order to grow economically. And based on the review of various case-studies it appeared that every single case-study had its particular features.

The particularity of the Lualaba -province was picked up by the researcher as a matter of interest for this study.

2.7 Mining Value Chain

A mining value chain is a linear value - increasing chain of beneficiation steps through which raw materials (a mineral, are transformed from raw material into its branded product). The mining value chain includes everything from extracting raw materials to delivering products to customers, is the backbone of the industry. Good value chain management fosters an important source of competitive advantage and value creation. In contrast, those who neglect their value chain are likely to encounter bottlenecks and constraints that will limit the throughput shipped

and the return on risk (Görner et al., 2020). Depending on the size of the operation, the key stages of a mining value chain can be divided into an upstream mining value chain and a downstream mining value chain.

2.7.1 Upstream- oriented mining Value Chain

An upstream mining value chain is generally inclusive of the following steps:

(i) Exploration, and reserves valuation;
(ii) Mining operations (Drilling & blasting; Loading and hauling);
(iii) Processing (concentration & leaching, metallurgy, SX and EW)
(iv)Marketing

Step (i) can be cyclical up to step (ii) while step (i) to step (iii) are considered to be upstream operations because they don't lead to the fabrication of the final saleable product.

This type of mining value chains is very common in Africa, and constitutes the core of discussions around the African Mining Vision (AMV). The key of the debate about whether to go downstream is directly related to this type of mining value chain, as this is where lost opportunity appears the most when it comes to activating local content.

2.7.2 Downstream – oriented mining Value Chain

A downstream mining value chain includes two additional steps: the manufacturing of the final product and a recycling leg in which the branded product is recycled. It is by definition of the context of this study, the ideal mining value chain in the sense that more jobs are created, the recycling industry is present, local content is more involved and exposed in the value chain, and multiplier effects take place. This is the next stage in the development of an economy, and this is where the key investigation of this study takes place; is it doable? How do you develop a strategy to get there? What will be the policies?

2.8 Mining Policy

A more comprehensive definition of a mining policy is provided by the Intergovernmental Forum (IGF) on Mines, Minerals, Metals and Sustainable Development. According to the IGF, a mining policy represents the sum of the best practices necessary for good environmental, social and economic governance of the mining sector. The definition is also extended to the objective for the sector, to generate an equitable sharing of benefits in a way that will contribute to sustainable development.

2.9 Summary

Mineral beneficiation presents an essential approach to promote the development of countries endowed with mineral resources. Improving mineral beneficiation requires the establishment of an effective operational system in the mineral value chain to circumvent the challenges that could lead the country to the resource curse. Thus, an effective policy will holistically strengthen economic linkages in upstream beneficiation and downstream beneficiation to enable equitable sharing that will revive the economy.

CHAPTER 3: RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

This chapter outline the approach that has been utilized in this research. On a design point of view, this study is based on assessing a certain level of satisfaction of the mining industry stakeholders with regards to the lack of tangible benefits of exploiting cobalt mineral resources of the Lualaba Province and potential benefits associated with extending the cobalt value chain to the downstream.

This research is designed around development case studies based on existing successful resources which are discussed in more detail. Successful case studies have been deliberately chosen based on their ability to promote specific economic linkages to illustrate theoretical facts about mineral resource-based development and various contexts in which these linkages have led to economic developments. Cases studies that have been utilized in the theoretical development aimed at setting the scene of applicability of such approach using the Lualaba Province as area of research.

A method or plan was chosen to create a desired future, such as the achievement of a goal or a solution to a problem. The strategy consists in compounding all the elements such as the geological potential of cobalt, the prevailing level of development of the DRC, assess the roles and levels of stakeholder participation, existing policies and vision, and the type of economic linkages to be promoted together in order to boost the development of the Lualaba Province.

The researcher identified the comparative case study (CCS) as a way to provide a clear description and analysis of a matter (in this case, a comprehensive resource-based development which would be inclusive of a downstream beneficiation branch), in order to identify variables, structures, form and hierarchy of interaction between the stakeholders of the cobalt sector of the Lualaba Province. Although case-studies were found to be relevant and theoretically supportive, they are considered secondary data. The case study of the Lualaba Province has

never been studied to date and in order to contribute effectively to the body of Knowledge (BOK), the researcher had to develop a strategy for collecting primary, on quantitative and qualitative aspects. Data were collected using a purposive sampling approach. This sampling method had the merit of targeting only the population of the Lualaba Province, subject to providing the most accurate information regarding the aim of the research.

The researcher used two questionnaires close-ended (23 questions over 51 participants) and open-ended (18 questions over 51 participants). The close-ended questionnaire was used in reference to a Likert-type questionnaire with the idea of collecting responses on a satisfaction scale ranging from 1 to 5. While the open-ended questionnaire was used with the idea of constituting themes and sub-themes around which, the participants most insisted on their vision of a possibility of implementing real and tangible resource-based development.

The data collected from the close-ended and open-ended questionnaires were empirical; they were mainly based on the personal perception of the situation and could not provide sufficient insights to the researcher in order for him to draw conclusions. The Exploratory Factor Analysis method or EFA on the quantitative side, was used in order to reveal latent variables or factors directly related to questions asked (collected from the close-ended questionnaire), and, in addition to this, EFA was able to help the researcher to use the factors in order to assess Cronbach's alpha coefficient between them in order to develop constructs.

On the qualitative side, a word frequency-based approach was used to analyze how often a word was cited in a sentence (answer from respondents), and based on that frequency, themes and sub-themes were elaborated.

3.2 The research Design

The CCS design-type of research, especially one of its five variants, the so-called "interpretive" as described by Eckstein (1975) and Lijphart 1971), as cited by Kaarbo and Beasley (1999) have been used for this research. The philosophy behind this research is based on the fact that there are supporting theories that were proven effective in terms of resources-based development. The fact that these theories worked elsewhere sparked interest in testing them and applying them in our research.

The authors define the interpretive CCS as a case study research that uses grounded theories in a relevant scientific field to investigate a case study, in this case the researcher has illustrated knowledge of mechanisms of promoting economic linkages and contextual application through

successful examples and thinks that, there is an opportunity for Lualaba province, similarly, to achieve resource-based development if the theory is applied.

Goodrick (2014) provided insights on the iterative process of the applying the CCS methodology as described below:

1. The study focused on clarifying the Key Evaluation Questions (KEQs)[3] to determine whether the use of the CCS is applicable;
2. Identification of the proposals and theories initially formulated to focus on CCS;
3. Definition of successful case studies included in the study with emphasis on their relevance to the study;
4. Specification on how primary and secondary data were collected, analysed, and summarized within and between successful cases studies, and how the study implementation was conducted;
5. Provide and test explanatory scenarios for the expected results; and
6. Report findings.

Figure 3.1 illustrates the iterative process as indicated by Goodrick.

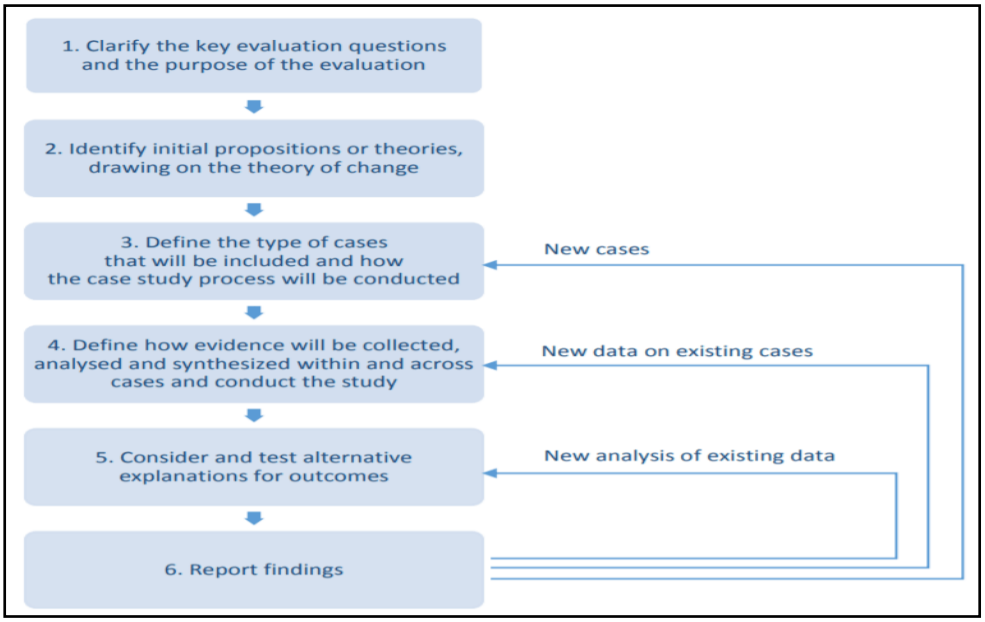

Figure 3. 1: Case study methodology design (Goodrick, 2014)

3.3 Population of Interest

[3] Key Evaluation Questions (KEQs) are the high-level questions that an evaluation is designed to answer - not specific questions that are asked in an interview or a questionnaire.

The population of interest in this study targeted seven groups of what the researcher identified as active stakeholders of the cobalt extractive sector of Lualaba Province, and these groups consisted primarily of mining companies, the local ministry of mines, the civil society from Lualaba Province, academic group, local community, subcontractor and non-governmental organizations (NGOs), the total population of interest consisted of a total of 51 participants in the close-ended questionnaire and 51 participants in the open-ended questionnaire.

The table 3.1 illustrates the distribution of participants.

Table3. 1: *illustration of the population of interest*

Sector	Industry	Frequency	Percentage
1	Mining Companies	9	18%
2	Ministry of Mines	5	10%
3	Civil society	8	16%
4	Academic	10	20%
5	Local community	6	12%
6	Subcontractor	7	14%
7	NGOs	6	12%
Total	7	51	100%

3.3.1 Sampling method and sampling size

Moser and Korstjens (2018) defined a sampling method as a formal plan that must include aspects such as sample size, sampling procedure for recruiting participants. They also highlighted that the sampling method or protocol must be segregated into a qualitative sampling plan and a quantitative plan as advised by Polit and Beck (2017) in the citation from Moser and Korstjens (2018). Table 3.2 shows existing sampling strategies for qualitative analysis.

The research involved the use of a purposive sampling method (based on researcher's judgement of the level and value of information that can be collected) on both the qualitative and the quantitative part of this research. Reasons being the limited access to mining companies, and limited willingness of local government representatives to share information on mineral sector but, on the civil society and NGOs part, it was mainly due to barrier language (from local dialect to French, and from French to English). Those limitations were the shortfall

of this research in terms of primary data collection and resulted in a reduced number of participants, especially on the qualitative part of the data collection.

Table3. 2: Sampling strategy for qualitative analysis (Polit and Beck, 2017)

	Sampling method	Definition
1	Purposive sampling	Selection of participants based on researcher's judgement of potential participants will be more informative.
2	Criterion sampling	Selection of participants who meet pre-determined importance criteria.
3	Theoretical Sampling	Selection of participants based on the emerging findings to ensure adequate representation of theoretical concepts.
4	Convenience sampling	Selection of participants readily available.
5	Snowball sampling	Selection of participants through referrals by previously selected participants or people with access to potential participants.
6	Maximum variation sampling	Selection of participants based on a wide range of varying backgrounds.
7	Extreme case sampling	Purposeful selection of the most unusual cases.
8	Typical case sampling	Selection of the most typical or average participants.
9	Confirming and disconfirming sampling	Confirming and disconfirming cases sampling supports checking or challenging emerging trends or patterns in the data.

3.4 Data collection

Apparently, it may seem confusing to be able to exactly demarcate the qualitative and quantitative aspect of data collection when conducting this type of research, because at first look at the type of data collected in the two cases, they seem unrelated to mathematics. The following section focused on why the close-ended and open -ended questionnaires have been respectively used for data collection in this research.

3.4.1 Close -Ended questionnaire (Likert-type questionnaire)

According to the Survey Legend Website (www.surveylegend.com), the Likert scale inherited its name from the social scientist "Rensis Likert, who developed a specific psychometric

research approach in the early 1930s. According to the website, Rensis Likert was focused on using his approach to conduct social and educational research.

To this day, the Likert scale is considered a powerful popular opinion research tool. The scale is regularly used for customer satisfaction type of surveys. (www.surveylegend.com) website indicated that the Likert scale has the advantage of converting qualitative elements into quantitative ones and allowing their analysis using quantitative methods such as EFA. Harlacher (2016), indicated in his article entitled "A Technique for the Measurement of Attitudes" formulates a technique of measurement based on five steps ranging from 1 to 5 as for "Strongly agree =1", "Agree=2", "Neutral =3", "disagree=4", and "Strongly disagree=5".

The research consisted of 51 participants and 23 questions on a close-ended questionnaire. Each participant had to answer 23 questions regarding their level of satisfaction with each question. The data were compiled in a form of a spreadsheet. The questions were referenced on the x-axis of the spreadsheet and the number of participants was referenced on the y-axis. Data collected using close-ended questionnaires are essentially attitudes that have been put on satisfaction scale based on individual's level of satisfaction with a specific question. Table 3.3 illustrates an example that was applied to each group out of the seven constituting stakeholders in the cobalt mining sector of Lualaba province, as identified by the researcher.

Table 3.3 illustrates an example of data collection on the close-ended questionnaire.

Table 3. 3: Close-ended questionnaire data collection spreadsheet

	Q1	Q2	Q3	Q4	Q5	Q6
1						
2						
3						
4						
5						
6						

3.4.2 Open -Ended questionnaire

Open -ended questionnaire have been used to collect qualitative primary data regarding respondent's attitudes in terms of implementing a resource-based development strategy of Lualaba province inclusive of a downstream section of the cobalt value chain. This part of data collection consisted of collecting written statements from participants in order to further assess

what their personal perception is regarding a provided topic. This study used 18 open-ended questions regarding various aspects of the implementation of the downstream beneficiation in the cobalt value chain of Lualaba Province.

3.5 Data analysis (Quantitative)

The introductory part of this chapter indicated that this research was articulated into two components of data collection and analysis of primary data (quantitative and qualitative). In this section, it was explained how open -ended and close-ended questionnaires results are analyzed with respect to the research design.

3.5.1 Exploratory Factor Analysis

Costello and Osborne (2005) published an article entitled "*Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most from Your Analysis"*. The authors indicated the complexity and the multi-step aspect of the statistical analysis that is associated with an EFA.

But what is a factor analysis? Reyment and Joreskog (1993), as cited by Connie (1997) stated "*Factor analysis is a generic term that is used to describe a number of methods designed to analyses interrelationships within a set of variables.*" And as a result of such analysis, there is a construction of a few hypothetical variables or factors, meant to reduce the overall complexity of the dataset. Cureton and D'Agostino (1983), as cited by Connie (1997), defined factor analysis as a collection of procedures for analyzing relationship between a dataset of observed random variables.

This research used the factor analysis in one of its widely utilized and widely applied forms: the EFA. Costello and Osborne (2005), indicated that the EFA was applied in a variety of applications such as social sciences, development of an assessment tool for school principals (Lovett, Zeiss, & Heinemann, 2002) and assessment of the motivation level of students from Puerto Rican high school students (Morris ,2001).

In this research the EFA was used in order to assess the reliability and the validity not only of the questionnaire, but also to determine the key variables that should have been taken into consideration when implementing a downstream beneficiation.

3.5.2 Principal Components Analysis (The debate)

Costello and Osborne (2005), indicated that the Principal Components Analysis (PCA) is incorporated into popular statistical software such as SPSS from IBM and SAS. Costello and Osborne (2005) indicated that beside the popularity of the PCA method, they asserted that it was not a true factor analysis method.

Costello and Osborne indicated that the debate in the statistical literature is based on facts that the use of PCA should be "*severely restricted"* and instead favor the use of a "*true factor analysis method*" as argued by Ford et al. (1986); Snook & Gorsuch (1989); Bentler & Kano (1990); Widaman (1990, 1993); Floyd & Widaman (1995); Gorsuch (1990); Loehlin (1990); MacCallum & Tucker (1991); Mulaik (1990). The counter-argument on the use of true factor analysis method came from authors cited by Costello and Osborne (2005) such as Arrindell & Van der Ende (1985); Guadagnoli & Velicer (1988); Schoenmann (1990); Steiger (1990); Velicer & Jackson (1990). The counter-argument consisted at regarding the PCA and the true factor analysis method as "*identical*".

Costello and Osborne (2005), considered the true factor analysis method or the "preferable" factor analysis method because, according to them, PCA only serves to reduce the amount of data (the lack of speed of computation over time made PCA popular because it provided a faster and cheaper computational alternative) that should be involved in EFA while, at the same time, factor analysis was seen as a method to reveal the latent variables likely to covary with the manifest variables.

3.5.3 Choice of a factor extraction method

According to IBM, its famous SPSS software package has six factor analysis extraction methods which are: Principal Components Analysis; Unweighted Least-Squares Method; Generalized least squares, Maximum-Likelihood Method; Principal Axis Factoring and Alpha method. Costello and Osborne (2005) indicated that the relative strengths and weakness associated with these techniques are scarce and obscure in terms of references.

Costello and Osborne (2005) stated the following "*To complicate matters further, there doesn't even seem to be an exact name for several of these methods; it is often hard to determine which method a textbook or journal article author is describing, and whether or not it is actually available in the software package*". Costello and Osborne (2005) indicated that because of this confusion, the PCA is more popular in terms of use.

Fabrigar et *al*. (1999) as cited by Costello and Osborne (2005) indicated that in case of a normal distribution of collected data, the maximum likelihood method will be preferred. The authors stipulated that in general, the Principal Axis Factoring (PAF) and the Maximum Likelihood are the most used. For the purpose of this research the Principal Axis Method (PAM) method was preferred to be used for the analysis of the results from the close-ended questionnaire.

3.5.4 Factors or items loaded (Components)

After conducting the PAF method using IBM SPSS software statistical package, 8 factors with a great Eigenvalue were identified, from which a preliminary variable correlation table could be determined. Figure 3.2 illustrates the factor distribution.



Figure 3. 2: Diagram illustrating factors loaded

Loaded factors (unrotated factors) are also represented in Table 3.4

Table3. 4: *Example of table showing unrotated factors distribution*

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Question1		0.578	0.534				
Question2							
Question3	0.817						
Question4	0.675	0.683					
Question5							

The factor1, factor2 and factor3 column were purposely populated in order to mimic what happened when the analysis were carried out. At this stage it is difficult to determine the constructs that can lead the researcher to methodically conduct analysis and conclude on findings, reason why the next section discusses the rotation method that was employed in this research.

3.5.5 The Rotation Method

Costello and Osborne (2005) have indicated in their article that applying rotation is aiming to simplify and to bring clarity into data structure. Costello and Osborne (2005), have indicated that applying rotation doesn't mean to improve core aspects of the factor analysis such as the number of factors. Costello and Osborne (2005) have highlighted the existence of rotation methods such as the Varimax, Equamax, Quartimax (orthogonal methods) and oblique methods such as direct oblimin, quartimin and promax. Costello and Osborne have mentioned that "*Conventional wisdom advises researchers to use orthogonal rotation because it produces more easily interpretable results*."

Reason for the advice is that, although factors resulting from oblique method tend to bring more correlation in data structure, in social sciences this also lead to bring in more complexity which is considered as "*unnecessary*" in this research, the varimax orthogonal method was used. The rotation method applied in this study confirmed 8 factors that were furtherly used to determine constructs.

3.5.6 Determination of constructs

This section of the methodology chapter is a result of the EFA that was conducted up to the rotation step. A construct is a theory inclusive of conceptual elements, generally considered to be subjective and not based on empirical evidence.

Britannica (2021), have indicated that a construct or psychological construct in social sciences, is a tool employed to facilitate understanding of human behavior. In the domain of exact sciences, a construct can be assimilated to gravity, temperature or tectonic pressure. In the domain of behavioral sciences, a construct can be related to intelligence, political power or self-esteem. In the case of this research, constructs are related to challenges that are affecting the implementation of a downstream beneficiation on the copper-cobalt value chain of Lualaba Province and have. Table 3.5 summarizes the six constructs that have been generated based on the EFA.

Table3. 5: *Table showing constructs that have been determined based on the EFA*

Factor	construct	Variables
F1	C1	Q3, Q4, Q10, Q11
F2	C2	Q17, Q18, Q22
F3	C3	Q9, Q13, Q14, Q15
F4	C4	Q1, Q2, Q7, Q8
F5	C5	Q5, Q6, Q23
F6	C6	Q12, Q18
F7	N/A	Q21
F8	N/A	Q16

3.5.7 Data validity, consistency and reliability

Gliem and Gliem (2003), indicated in their concluding remarks that when a Likert-type scale is used, in the configuration as elaborated in this research, it is important to calculate and to report the Cronbach's alpha coefficient. There is no evidence in the literature on the cutoff value of the Cronbach's alpha coefficient, but for the purpose of this study, anything equal or above 0.6 was considered valid.

3.5.8 Internal consistency and reliability of a dataset

Cronbach's alpha coefficient is recommended for internal consistency evaluation of a dataset. Gliem and Gliem (2003) have indicated that the alpha coefficient must serve primarily to evaluate internal consistency reliability. Their analysis is significant in that they indicated that when an EFA loads items or factors, single load factors such as F7 and F8 as illustrated in Table 3.6, should be considered to have low and at worst zero reliability or consistency at all. Gliem and Gliem (2003) have indicated that the Cronbach's alpha coefficient must be calculated and reported for summed scales (constructs) or subscales and not for individual items. Table 3.6 summarizes valid constructs based on the Cronbach's alpha coefficient cut-off of 0.6 as performed in this study.

Table3. 6: *Table showing constructs and their reliability coefficients*

Factor	Construct	Variables	Cronbach
F1	C1	Q3, Q4, Q10, Q11	0.841
F2	C2	Q17, Q18, Q22	0.731
F3	C3	Q9, Q13, Q14, Q15	0.735
F4	C4	Q1, Q2, Q7, Q8	0.708
F5	C5	Q5, Q6, Q23	0.637
F6	C6	Q12, Q18	0.613
F7		Q21	
F8		Q16	

Based on the values of the Cronbach's alpha coefficient, it was possible to know how strong constructs are elaborated and how reliable, results and conclusions that will be cascaded down from those observations can be trustworthy. Likewise, it was determined how elaborate the solid constructions are and how reliable the results and conclusions that will come from these observations can be.

3.6 Data analysis (Qualitative)

The qualitative part of data analysis has consisted at gathering results from an open-ended questionnaire and conducted a classic thematic analysis, based on 18 questions asked and 51 participants. The use of NVIVO 11, thematic analysis software was found to be helpful in terms

of coding and segregating relevant respondent details. The use of NVIVO 11 generated 44 themes and sub-themes as summarized in Tables 6.16a, 6.16b, 6.16c and 6.16d.

3.7 Summary

With the aim to provide a clear description and analysis of matter, the comparative case study has been identified and rendered possible through grounded theories in a relevant scientific field that illustrated knowledge of mechanisms of promoting economic linkages and contextual application. The method of two close-ended and open-ended questionnaires respectively with the idea of collecting the answers (Likert type questionnaire), and of constituting themes and sub-themes was essential to provide data. The data collected was refined by different relevant methods including sampling method, EFA, Cronbach's alpha coefficient, PAM, IBM SPSS statistical package and rotation method to assess validity, consistency and reliability.

CHAPTER 4: RESOURCE-BASED DEVELOPMENT CASES-STUDIES

4.1 Introduction

This study set out to develop a strategy for beneficiating the downstream value chain of cobalt mining in the Lualaba Province, with the aim to determine its positive impact on the economy of the province. In other words, the study aims at linking the economic development of the Lualaba Province to its mining sector.

The core idea behind this study was based on the following facts:

- Mineral resources are exhaustible (limited in time);
- Cobalt is playing a major role in the high-tech industry (high economic opportunity for direct and indirect employment); and
- The high cobalt mineral potential available in the province (offering the opportunity of a long-lasting resource-based development if well managed).

Despite the theories formulated by authors such as Sachs and Warner (1995a), Prebisch (1950) and Singer (1950) on the resource curse, successful case studies covered in Chapter 2 have clearly demonstrated that resource-based development is not only possible but must also be supported by a well-formulated contextual resource-based development strategy.

Mtegha et al. (2006), advised that in order to develop a good resource-based development strategy, the government of a country, as the primary actor, must develop a strong mineral policy supported by a holistic, comprehensive, participatory, and inclusive vision focused on promoting ownership of the vision among all stakeholders.

The case studies covered in the literature review illustrated how the concepts that underpin the formulation of a good mineral policy as indicated by Mtegha (2020), have been answered in order to promote resource-based development. This chapter has illustrated different case studies that helped understand the context of resource-based development in Lualaba province, which is fundamental to answering the key questions in Section 1.5.

4.2 Case studies selection criteria

The case studies that the researcher deliberately chose as the basis of comparison for this research were intended to illuminate some key points, including:

1. Illustrate how the extractive sector has historically contributed to the economic growth and development of nations. What strategies were in place and how were they implemented with regards to the existing theory on research-based development;
2. Demonstrate the importance of having a well-identified group of stakeholders with specific roles and responsibilities in order to promote the development of economic linkages between the mining sector and the rest of the economy of a country;
3. Mineral policy formulation process to what extent successful countries have been able to formulate mineral policies that support their economic growth and development? How were they able to implement it?

The selection of case studies is based on the exploration of the Lualaba Province case study using existing mining policy formulation and mineral resource-based theories as discussed in Chapter 2. In this regard, the case studies were segregated into three main components as follows:

1. Historical and political context of the selected case study;
2. Regulatory framework and mining law evolution; and
3. Economic linkages creation, promotion, and development in a form of resource-based strategy.

The case study summary also revealed the "context-specific" aspect of each selected case study and how the focus was on developing one specific economic linkage rather than another and how policies were formulated according to the context.

4.3 Case study of the USA

The USA resource-based development that occurred in the early 1900s was often the exception to the rule for economies endowed with mineral resources that were unable to harness their mineral potential to grow economically. Not only was the USA the world's leading mineral economy in the very historical period during which the country became the world leader in manufacturing (roughly from 1890 and 1910); but linkages and complementarities to the resource sector were vital elements in the broader story of American economic success. (Wright, 2002)

4.3.1 Mineral resource-based development of the USA (History)

Historically, the USA was a colony of the United Kingdom (UK) until 1776, when it became independent. According to Fessehaie and Rustomjee (2018), the USA has succeeded in

harnessing the opportunities of the mineral sector around the extraction of iron, coal, lead, nickel, zinc, copper, and oil in order to shift to the infrastructure creation and manufacturing in addition to research and development in the metallurgy sector, all supported by an evolving legal environment. (Council, 2008)

4.3.2 Mineral policy and legal framework development of the USA

Lacy (1999) mentioned that in the early stage of the mining sector in the USA, mining companies were only authorized to mine an outcrop of the deposits because at that time no attention was paid to the exploration and systematic development of ore deposits and during that time, the miners were convicts or slaves. Lacy (1995) asserted that 1849 was the birth date of the Mining District Regulations. The US congress realized that miners of the time (gold rush) in America used mining laws imported from Germany, Mexico, and England. These mining laws were somewhat consensual among smaller groups of miners but not with the government.

However, the US legal framework continued to evolve and adapt to environmental, social, and political changes until 1872, when the General Mining Law (GML) was promulgated. Kahalley and Nannini (2020) mentioned how valuable the mining industry is to the US government for its production of domestic raw materials, strategic minerals, and high-wage job creation. The US mining law was designed in general, to attract international investment, including financial investment and direct investment in mining operations (Kahalley and Nannimi, 2020). However, weak restrictions have been found in US mining legislation, except for national security implications (uranium or export of rare earth). For instance, determining which level of Government has jurisdiction over mining activities largely depends on surface and mineral ownership (Kahalley, 2021). The US government, as a stakeholder in the mining industry, has also promoted a safe environment in terms of expropriation of mining operations, seizure of property, or political unrest (Kahalley and Nannini, 2020).

Wright and Czelusta (2007) as cited by Fessaie and Rustomjee (2018) mentioned that throughout their history, the US government, through returns from its mining sector, has promoted investments in the public knowledge infrastructure such as the US Geological Survey, education in mining, minerals, and metallurgy (research and development linkages). Essentially, the legal framework of the US mining industry is the GML of 1872, which is the principal law governing traceable minerals on federal lands, as asserted by Kahalley and

Nannini (2020). In addition, the GML allows "US citizens" to explore, discover and purchase certain valuable metallic and non-metallic mineral deposits which are open to mineral entry.

In addition to the GML, the legal framework in the US, there is the Federal Land Policy and Management Act of 1976 (FLPMA) which recognises "the Nation's need" for domestic mineral resources (A law that recognises peoples as stakeholders in the mining industry), the National Environmental Policy Act (NEPA) responsible for preparing and issuing an Environmental Impact Statement (EIS) on federal land. The US government has equally placed emphasis on the mineral resources regulation by creating a commission known as the Securities and Exchange Commission (SEC) in 1997[4] that must manage reports on reserves (proven and probable). The US legal framework also includes surface mining rights, additional permits and licenses, closure and remediation of mining projects laws, environmental, health, and safety regulations and compliance, and third-party rights.

Drastic changes and resource-based development in the USA have occurred due to a comprehensive vision (Hart, 1995). In 1942, Home Secretary, Fred W. Johnson, as cited by Lacy (1995), stated that "minerals deposits are the property of all the American people and the US government is the appropriate administrative authority to prevent wasteful exploitation". This statement translated into a vision that led to formulating minerals policies and linkages-based strategies to harness the mineral potential of the US extractive sector. The main stakeholder (government) understood the role to play in formulating policies and developing strategies for his peoples.

In the case of America, although the concept of resource-based development was well understood at the beginning, the challenge of scarcity and technological advance paved the way for the search for "strategic minerals" (National Research Council, 2008). Bradfish (1987) mentioned that the US imports more than thirty-three minerals that are strategic and essential to the national economy from abroad. Those minerals, of which the first tier of the imported amount was critical for the American defence system. US economists determined the future need of the US (as earlier as 1939) for strategic minerals before entering the twenty-first century and targeted at the time, South Africa and the DRC (ex-Zaire) because of the weak

[4] In 1997, the U.S. government created a Securities and Exchange Commission (SEC) regulates the reporting of Exploration Information, Mineral Resources, and Mineral Reserves by companies' subject to the filing and disclosure requirements of the U.S. SEC as promulgated in its Regulation S-K, Industry Guide 7, and staff communications. (U.S. Securities and Exchange Commission, 2018)

human rights situation that prevailed at the time in both countries. Bradfish (1987) asserted that President Reagan's administration adopted a policy of gentle persuasion under the so-called "constructive engagement" in which, the US engagement to promote human rights remained very weak, but offered the guarantee of no disruption of strategic minerals to the US government. The rationale for this policy is that the US administration, because it correctly formulated its mining regulations and linkages strategies, clearly understood its future in terms of resources -based development and, as such, was able to foresee the future of its economy and had decided to adopt a national strategic mineral stockpile (Bradfish, 1987). This type of policy will not be advocated in the context of this study but has the advantage of illustrating the extent to which the legal framework and the coordination strategies of the American government have been formulated. If the policy and strategy are well formulated, they can become a very useful tool that a government of a country can use to promote economic growth and the human wellbeing of its citizens.

4.3.3 Linkages-based strategy of the USA and concept of resource-based development

Mineral resources are limited; the United States understood the concept at an earlier stage of its development by formulating the GML of 1872 which included exploration in order to be able to balance the mineral potential exploited and that which was to be discovered as support for the development of their economy. The Columbia Centre of Sustainable Industry illustrates the concept resource-based development in Figure 4.1.

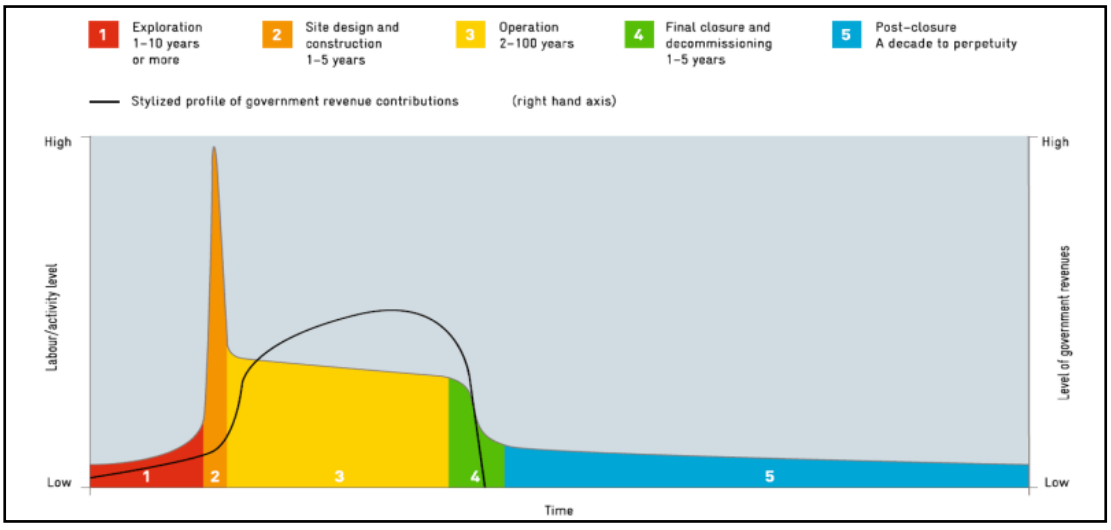

Figure 4. 1: Impact of mining life cycles on the "profitable" time frame of a resource-based development strategy (Source: Columbia Centre of Sustainable Investment CCSI, 2016)

Figure 4.1 explains the windows in which, during the lifecycle of a mineral resource (operations), the resource-based development can occur in mine life and it is at this point that the policy formulation that will lead to a development strategy must be in place.

Walker and Jourdan (2003) asserted that the first resource-based development in the USA took place because they used their mineral wealth as a platform to achieve economic diversification. Porter (1990), as cited by Walker and Jourdan (2003) mentioned that the further processing of natural resources (downstream beneficiation), as well as with the development of the manufacturing sector (backward and forward linkages) in America, was a key element in promoting a prosperous economy. In addition, the US mining sector has shifted from a low-technology and low-cost labour-based industry to a highly skilled (research and development linkages) and knowledge-intensive industry coupled with an increase in exports industry. In their concluding remarks, Walker and Jourdan (2003) have pointed out that the economic success of the USA comes from very large and sustained investments in education, research and development, and infrastructure (spatial linkages).

4.3.4 Stakeholders engagement and participation in USA

The vision of developing the “West” as formulated by the initiators of the US Revolution of 1776 was clear, they wanted to create a superpower that will dominate the western civilization, and on this basis, the vision led to stakeholder identification and inclusiveness in terms of roles allocation. The contribution of the mining sector to the development of the American economy must be seen as a component of a "whole" which includes various interdependent sectors and not as a key determinant as is the case with the mining sectors of underdeveloped countries such as the DRC.

The US economy was primarily oriented toward agriculture with a very low level of infrastructure but lacked the means to acquire industrial size. The formalization of a well-controlled mining sector through the creation of policy instruments such as the US Geological Survey (USGS) in 1879 and the Manufacturer Suggested Retail Price (MSRP) in 1994 led to better knowledge of wasted assets (quantity minerals) and provided other sectors with the raw minerals needed to support their economy. The case study example from the United States showed how government, a major actor, led to the formulation of policies that created economic linkages and fostered economic growth. Table 4.1 and Table 4.2 summarises the US case study linkages strategy and roles of stakeholders.

Table 4. 1: US case study linkages strategy (Roles of stakeholders)

Stakeholder	Role	Comments
US Government US congress US Ministry of Trade US Ministry of Industry US extractive sector	Strengthened institutions (1776) Promulgated the GML in 1872, created the USGS in 1879, and 1994, the MRSP Promoted fiscal linkages (Alexander Hamilton's Bank) under a Special Charter from US Congress in 1791. Promoted high wages in the mining industry, larger and expensive industrial investments in machinery, organizational strategies were put in place to promote the "outwork system" creation of an expanded credit system to support entrepreneurs. Promoted access to international market and created stock exchange Promoted regional and international trade policy Promoted spatial linkages (railway network), upstream and backward linkages (raw materials and finished goods to reach consumers) this was called "market revolution" USGS (1879) implemented a systematic exploration campaign in order to assess the entire American mineral potential according to the Nation needs of raw materials to promote economic development. USGS (1994) formulated a five-year plan including environmental constrains for a strategic use of minerals in the short, medium and long-term. GML promulgation defined the role of private sector and public sector interactions. Defined the necessity of having a strategic mineral stockpile with regards to scarcity of certain minerals such as cobalt and uranium that influenced the US foreign policy with countries such as DRC and South Africa	• Granting special privileges to certain individuals was a controversial idea regarding the prevailing concept of equality before the US law. • State Charter concept (policy formulated according to the context) led to rapid expansion of the US banking system and, as an immediate consequence, • promoted the development of spatial linkages in terms of infrastructure creation that also in turn, • supported entrepreneurs' initiatives regarding massive production organizations (the outwork system) • The linkage between the mining sector led to the interaction between the manufacturing sector and the rapid development of other sector of the US economy • Government implication and engagement is in this case-study emphasized in term of flexibility regarding nation needs context. • Also, this case study highlights the fact that the mineral sector cannot work as a standalone sector, different sectors of an economy must interact and must be complementary

Table 4.1 (continued)

Stakeholder	Role	Comments
US Academic Institutions and R&D entrepreneurs	Promote research and development as a support for the industrial sector in terms of productivity and foster technological and spatial linkages. Provided support to horizontal linkages development in economic diversification. Provided training, skills development and job opportunities.	
US Financial Institutions	Provided early access to loans and long-term credit to entrepreneurs, R&D and SMEs. Promoted development of stock exchange, formulated regional and international trade policies in collaborative approach with the Ministry of trade.	

4.3.5 Economic linkages development of the USA

The US development is affected by its economic linkages with the rest of the world. Global economic developments play an important role in driving activity and financial markets in the US *(Shatz, 2016)*. Although the US faces many choices regarding the global economy, a solid strategy has been implemented for an effective linkage system based on policy formulation and linkage development, as shown in Table 4.2.

Table 4. 2: US case study linkages strategy (policy formulation & linkages development)

Type of Linkage	*Policy*	*Strategy*
Upstream	The General Mining Law (GML) of 1872. The equal Pay Act of 1963. The Age Discrimination in Employment Act of 1967. The Federal Land Policy and Management Act (FLPMA) of 1976.	Promote production linkages between the mining sector and the manufacturing industry.
Forward	The General Mining Law (GML) of 1872. The Federal land policy and management Act (FLPMA) of 1976.	Promote development of the heavy machinery and mass production that should interconnect with the large-scale mining sector

Table 4.2 (continued)

Type of Linkage	Findings	Policy	Strategy
Horizontal	Nationwide needs in terms of quality of life and growing demand boosted the development of Economic Diversification Raw Materials were processed locally and enabled the manufacturing of big machinery that allowed massive production of diversified goods and services.	The General Mining Law (GML) of 1872. The Federal Trade Act of 1915. The Federal Land Policy and Management Act (FLPMA) of 1976.	Promoting manufacturing and economic diversification Supporting downstream beneficiation.
Consumption	As a result of the development of upstream, forward and horizontal linkages.	The Federal Trade Act of 1915.	Protect consumers and promote competition.
Spatial & technological	Infrastructure became a priority for the USA as a result of the booming industrial revolution. The steel and oil industry required that railway infrastructure and bridges to be constructed at a rapid pace in order to promote goods and raw materials consumption and supply.	American Association for the Advancement of Science (AAAS) R&D Tax Credit in 1981	Combine infrastructure and skills development by improving technology and economic diversification. Promoting value addition as a contribution to downstream beneficiation.
Fiscal	Access to credit for entrepreneurs at National and State level. Access to international market by promoting regional trade. Stock exchange creation.	The General Agreement on Tariffs and Trade (GATT) The World Trade Organization (WTO) New York Stock Exchange (NYSE) R&D Tax Credit in 1981 Monetary policy (Central Bank)	Promote US global economic presence. Focus on US economic growth. Export / Import tariffs.

4.3.6 Economic growth of the USA (GDP trend)

Regardless of the fluctuation observed between 1930 and 1945, the US experienced the increase in real GDP per capita from 1900 to 2017, as shown in Figure 4.2.

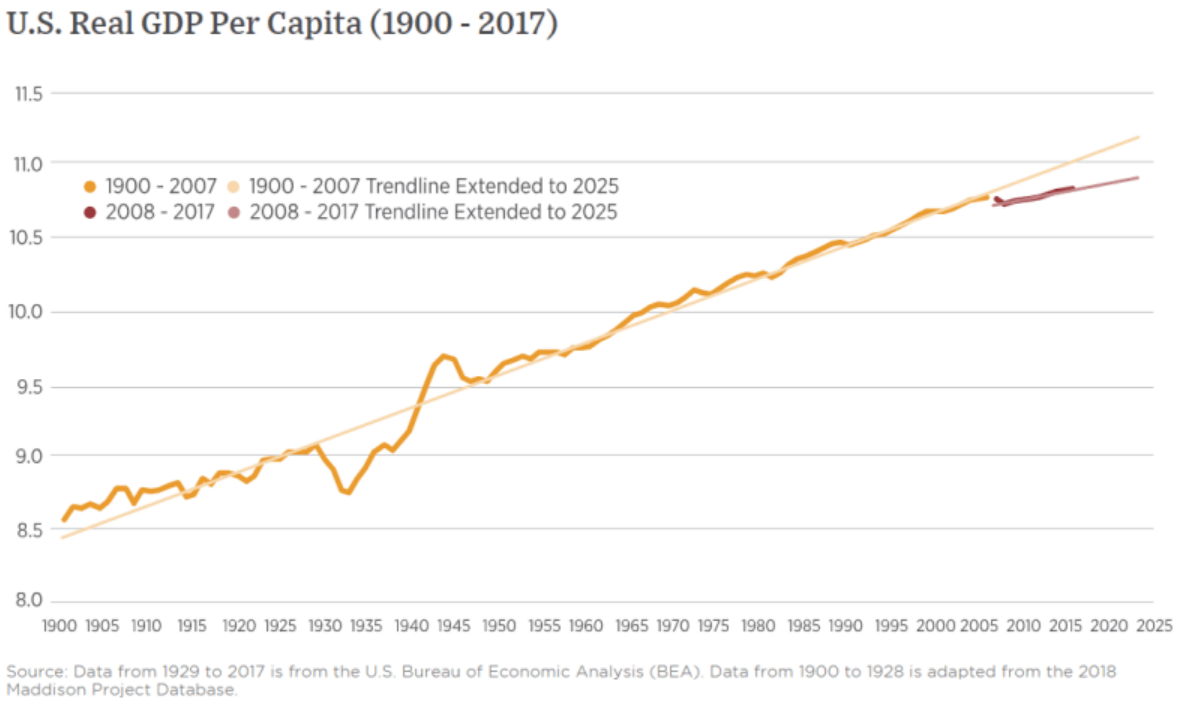

Figure 4. 2: US real GDP trend from 1900-2017

4.3.7 Downfalls of the USA case study

The aggressive capitalism characterised by approach to the economy of the USA has led to uneven wealth distribution and structural issues in the agriculture sector. The problems faced by the US economy in the farming sector in the early 1900s were mainly created by the overproduction of food that depended on the end of WW1 when food was a necessity. Food prices dropped because of high surpluses, which had an impact on employment. The tariffs applied by the US Department of Trade (protectionism) have seriously affected the free flow of trade with other nations. The easy access to credit of the US citizens without proper controls led to debt because people borrowed money to buy shares and they paid more for them than they were actually worth.

4.3.8 Summary of USA case study

The success of resource-based development in the USA is an example of a commitment and management of a broad vision of development (National Development Plan). American citizens do not sit and act like rentiers because of the wealth of their land; they understood the vision of their economy, the scarcity, the finite aspect of their resources. The USA was able to

integrate the three key aspects of the resource-based development policies that should be implemented. The GML of 1872 and its resulting existing legal framework is an example of how the government was involved. The USA government, by implementing such a liberal system, has encouraged both the private and the public sectors to develop in terms of infrastructure, education, promoting high skills development, research and development, and manufacturing. The resource-based development in the USA has clearly formulated policies, determined roles of stakeholders, and created an operational plan sustained by adequate rules to follow. David and Wright (1997) as cited by Ville and Wicken (2013) declared that "the American mineral expansion embodied many of the features that typify modern knowledge-based economies"

4.4 Case study of Australia

Attard (2007) described Australia as a former British colony in 1778, which was effectively colonised in the 1890s.

4.4.1 Historical resource-based development of Australia

The resource-based economy of Australia heavily relied on agriculture and mineral wealth that initially belonged to the indigenous population. Attard (2008), described four major periods in the economic history of Australia:

- The Bridgehead economy, 1788-1820

During this period, Australia, as a colony, was essentially a penal institution of Great Britain, with little effective institutional implementation. Australia was essentially neglected at the time with very little infrastructure such as Port Jackson in 1788, today known as Sidney, New South Wales and Hobart (1804) (Bernard, 2008). The legal framework of this period favoured a kind of private economy to support the penal regime in force. The land was granted to senior officials and emancipated convicts.

- Australia as a natural resource-based economy, 1820-1930

The country became an official colonial economy, with an economy essentially based on fine wool and other rural commodities. As with the African colony, Australia was then used as a market feedstock for the British Kingdom. Mineral resources such as gold and other minerals attracted infrastructure. Due to the growing opportunities offered by the mineral resources, Australian institutions have developed a legal framework that secured property rights, established stable and democratic political systems and created free colonial societies. At the

same time (1820-1930), skilled manpower (research and development linkage) was imported from Britain to come to Australia in order to contribute to the economic growth.

- Economic protectionism in Australia, 1891-1973 (Legal framework implementation)

Attard (2007) described this period as a considerable overlap with the previous period. The reason for this is the creation of the Commonwealth of Australia in January 1901 which was established in order to broaden and strengthen the public sector in private markets. Labour unions were given more power in the manufacturing sector, including arrangements for compulsory arbitration of industrial disputes by government tribunals and against discriminatory immigration policies to exclude non-Europeans from the labour market. Attard (2007) asserted that after 1901 the involvement of Australian government regulation in the economic growth increased drastically. Attard (2007) described this period as a period of the Australian settlement. It was during this period that critical structural changes at social, political and industrial levels took place in the country. It was during this period that most of the enabling factors were created and implemented that allowed Australia to start growing economically. Attard (2007) described the period from 1891 to 1973 as "defensive and retrospective" and a call for fundamental reform was required.

- Structural change 1973-2005

The protectionism implemented in Australia encountered serious difficulties in coping with global economic instability from the 1970s, because of the end of the post-World War II economic boom. The fiscal linkage was becoming a serious bottleneck for the Australian economy.

4.4.2 Mineral investment policy and legal framework of Australia

The Australian mineral policy has to be linked to its government investment policy as noted in a report by Chambers & Company (2013). The Australian constitution provides for shared jurisdiction at two levels over mineral resources of the Commonwealth and the State[5]. The primary focus of State Government jurisdiction encompasses onshore mining, although certain Commonwealth laws are required for the development of a mining project to take place. The Commonwealth institution has the power over ancillary issues such as indigenous affairs, trade,

[5] Chambers & Company (2013) asserted that Australia (also known as the Commonwealth of Australia) is a federation formed in 1901 with six states (New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania), two territories (Northern Territory and Australian Capital Territory) and a number of small external territories.

and finance, while the scope of the legal framework of the State covers most mining legislation. According to Chambers & Company (2013), the Commonwealth powers prevail in jurisdictions where the States and Commonwealth legislate on the same matter.

The legal framework of each State is organised by the following systems in order to secure an investor for a granted mineral deposit (Chambers & Company, 2013):

- The Mining Acts[6] which are specific to every State and allow them to grant mining licenses and leases; and
- A State Agreement, which is usually issued for large-scale mining projects and is generally negotiated between the State Governments concerned in Australia, provides a legal basement to facilitate the development of mining projects.

Under Mining Acts and State Agreements, the Government adopts a common licensing system to administrate mineral deposits adopting a common governmental policy and regulation. Chambers & Company (2013) asserted that the type of State licensing in Australia is linked to the three essential stages of mining development in the country:

- The initial exploration stage;
- The further detailed exploration stage and assessment stage includes reserves categorisation into proven and probable, in which reserves and resources must be declared in the public domain; and
- The mining stage or operational stage.

The Australian government sees the three stages as a whole and an interconnected process in order to protect mining operations which will move from the exploration stage to the mine development phase (Chambers & Company).

The benefits of the Australian mining licensing and leasing regime are that the system provides a clear way to transfer ownership from the licensing state, to a private investor who would like to engage in mining operations (Chamber & Company). The benefit of this system is that it provides clarity and a high level of certainty (incentive) to the investor who is willing to engage

[6] In a published presentation, Chambers & Company (2013) referenced Australian Mining Act as follow: New South Wales: *Mining Act* 1992 and the *Petroleum (Onshore) Act* 1991; Victoria: *Mineral Resources Development Act* 1990; South Australia: *Mining Act* 1971; Queensland: *Mineral Resources Act* 1989; Western Australia: *Mining Act* 1978; Tasmania: *Mineral Resources Development Act* 1995.

in mining operations, in that it enables sustainable investment in a given mining project (safe mining environment). Private investment in the mining sector paves the way for the mobilization of private capital and the development of the infrastructure that makes the country important because the economy can grow competitively. Moreover, "private investment brings not only the capital needed by companies, but also the skills needed to support the functioning of their operations" (Mashile-Nkosi, 2014). This is essential because the lack of such skills can jeopardize their development prospects. Another essential element brought about by private investment is technology diffusion and innovation that would ensure that mining operations are efficient, dynamic, profitable and sustainable. Technology and innovation are providing new ways to extract minerals, in a way that ensures both efficiency and safety.

Another aspect of the enabling environment that supports the Australian legal framework is the ratification of the State Agreement by the Parliament. The Australian Parliament ratifies the State Agreement ensuring that any potentially inconsistent provision in any other law is overridden (Chambers & Company, 2013). The advantage of this legal process is that a single mining project can be managed under a single enactment with the provision of the infrastructure requirements such as towns, ports, roads, and any other infrastructure.

Chambers & Company (2013) also indicated the benefit and flexibility of the Australian legal framework and policies in terms of environmental and native issues. From an environmental point of view, the investor or developer has the opportunity to address environmental requirements at an early stage of the project, allowing them to take into account concerns raised by local communities directly affected by the project development and to make the necessary adjustments to the development proposals during the planning and design phase. On the side of the native issues, the project developer, under the Commonwealth Native Title Act promulgated in 1993 (NTA) that recognises and protects the right of native people against any future dealing on the land, especially mining operations, is requested to provide a clearance certificate which must include a compensation plan to local communities by the project developer.

Chambers & Company, in its closing remarks, asserted that Australia's legal and policy framework is a well coherent system based on the openness, transparency of its mining investment regime and legal framework. The system provides incentives and certainty to industry participants with comprehensive inclusion of stakeholders (Native community) established in order to broaden and strengthen the public sector in private markets.

4.4.3 Linkage-based strategy of Australia, challenges and definition of the role of government as principal stakeholder

Likewise, as in the USA, Australia has experienced a mineral resource-based development mainly due to the extensive goldfields discovered in 1892 near Coolgardie (Tonts et al. 2013) in Western Australia. Mineral resources in Australia, like many other resource-rich countries, have been seen as the main trigger for economic growth, but at the same time, the concept of resource-based development evolved along the time. According to Willett (2002), the Australian mineral sector, as an engine of economic development, has experienced evolutionary stages as follows:

1. The pressure of the environmental context increased in the 1970s when public opinion began to question the potential negative impacts of the mineral sector as a trigger for economic growth on the environment (considering gas emissions and ecology);
2. During the same period (the 1970s), questions were raised about the finite and non-renewable aspects of the mineral resources, considering the Australian mineral sector as a threat to the economic diversification of the Australian economy;
3. Australian economic experts addressed the question of the fear of the "Dutch Disease" and the "Resource Curse" in the late 1970s, 1980s, and 1990s. In this question academic and government representatives examined the ability of the mineral sector of the country to be an economic trigger;
4. The question of the local content was raised at the same period by questioning the ability of the Australian mineral sector to promote local communities' development (focus on Aboriginal communities);
5. Externalities such as the global oil crisis and low-cost supplies to Asian economies were subject of serious research in the Australian mineral sector; and
6. Exploration regimes and incentives, interactions between State Governments and Commonwealth were also subject to heated debates until the late 1990s.

Willett (2002) asserted that because of all these issues, the Corporate & Economic Strategies Pty Ltd became the commission that was purposely created by the Australian Minerals and Energy Environment Foundation to investigate and encapsulate the relevant issues of the mineral sector in Australia and to determine the management strategies for the mineral sector. The commission's mission was to analyse and determine a strategy based on a "holistic" view of the mineral sector as an economic trigger.

According to a report by the Columbia Center on Sustainable Investment (CCSI) published in 2016, the Australian government's resource-based linkage strategy was developed as a first step to focus on strengthening upstream linkages with local and regional suppliers. However, soon after, this strategy faced challenges when relocating low-cost supplies to Asian economies and local suppliers of manufacturing and services. This forced the Australian government and the Commonwealth to implement so-called "soft approach" measures to preserve local content from international competitiveness. CCSI (2016) mentioned that the Australian government initiative was primarily aimed at ensuring that SMEs are guaranteed to operate and participate in all major onshore and offshore investment projects. In other terms, Australia was able to formulate a strong policy that promotes local content and at the same time, was able to promote research and development framework in order to maintain an acceptable level of competitiveness of its local content during the lifetime of all its major large-scale mining projects.

4.4.4 Stakeholders engagement and participation in Australia

Australia's history as depicted in Table 4.3 reveals government involvement in the operation of the mining sector through various regulations implemented as a strategy to stimulate economic growth, which is the foundation of sustainable development.

Table 4. 3 : Stakeholders engagement and participation in Australia

Stakeholder	Role	Comments
Government	Increased regulation implication in 1901 in economic growth Commonwealth creation in 1901 Mining Act 1971 in South Australia Mining Act 1978 in Western Australia Mineral Resources Act 1989 in Queensland Australian institutions settlement and implementation of a protectionist economy Structural changes from 1973-2005 Mineral Resources Development Act 1990 in Victoria	Australian government implication in three stages in the mineral sector: initial exploration stage, detailed exploration and mineral reserves assessment and mining or operational stage

Table 4.3 (continued)

Stakeholder	Role	Comments
Government	Australian Mining Act 1992 in South Wales Petroleum (offshore) Act 1991 Mineral Resources Development Act 1995 in Tasmania Protectionism in order to promote local content (mining sector's suppliers) Ensured of local SMEs participation in onshore and offshore mining projects Promoted research and development to ensure competitiveness	

4.4.5 Economic linkages development of Australia

Australia's history shows that governments have long been encouraged to be ambitious in developing their economic development strategies and activities within their local constraints and opportunities (Economic Development Framework, 2019). As shown in Table 4.4, Australian governments have tried different approaches to their economic development activities, which are often influenced by their organizational capacity and local economic conditions.

Table 4. 4: Development strategy and economic linkages of Australia

Type of Linkage	Findings	Policy	Strategy
Upstream	Promoted local content Encouraged European skills related immigration especially from Great Britain	Regional and National Mining Acts. Creation of the Commonwealth Federation in 1901. Promoting subcontractors' interests onshore and offshore. Mineral Council of Australia.	Promote production linkages between the mining sector and the manufacturing industry
Forward	Rise in services sector share of GDP after the middle of 1900s	Regional and National Mining Acts. Creation of the Commonwealth Federation in 1901. Mineral Council of Australia	Promote development of the heavy machinery and mass production that should interconnect with the large-scale mining sector

Table 4.4 (continued)

Type of Linkage	Findings	Policy	Strategy
Horizontal	Peak in manufacturing after WWII. Less reliance on the land (less share of the agriculture sector in the Australian GDP).	Mineral Council of Australia	Promoting manufacturing and economic diversification Supporting downstream beneficiation.
Consumption	As a result of the development of upstream, forward and horizontal linkages.	Increase in trade intensity (the Australian economy has been exposed to international stock markets)	Protect consumers and promote competition.
Spatial & technological	Infrastructure drives economic growth by facilitating trade and investment, stimulating enterprise opportunities, generating employment and providing poor people with access to basic services. The poor also benefit indirectly from the contributions that infrastructure makes to economic growth through reliable energy supply, better roads, improved water supply, access to sanitation, rehabilitated railways and ports and modern telecommunications.	Australian Mining and Mining Equipment, Technology and Services (METS)	Australia is committed to tackling infrastructure bottlenecks to help create the right conditions for sustainable economic growth and to enhance trade and investment opportunities across the region.
Fiscal	Liberalisation of trade. Stock exchange creation 77% of government revenues on iron ore contribute to payments to suppliers or taxes and royalties to governments of the federation.	Bilateral, regional and plurilateral? free trade agreements associated with global trade liberalisation and economic integration policy. Trans Pacific Partnership (TPP-11)	Boost GDP and leaving standards of Australian citizens

4.4.6 Summary of Australian case study

The success behind resource-based Australian economic development was similar to the American case study, contextual and opportunity-based development. The Australian government understood the need to have a thorough knowledge of the available mineral

resources and formulated a “holistic” approach to developing policies that encompassed the need for a sustainable minerals exploration programme supported by adequate and protective policies. Although contextual, Australia's resource-based development may have evolved with externalities such as historical context, immigration restrictions, geographic location, aboriginal and environmental challenges, in order to develop an appropriate evolution strategy. This strategy has promoted and continues to promote the human well-being of the peoples of Australia. Thus, the Australian economy continues to face threats that represent automation and globalisation along the mining value chain.

4.5 Case study of Chile

Latin America has missed opportunities for rapid resource-based growth that countries with the same wealth – Australia, Canada, Scandinavia – have been able to take advantage of. The root cause for this poor performance was the deficient adoption of the technology due to two factors (Maloney, Missed opportunities - innovation and resource-based growth in Latin America, 2002). First, a deficient national “learning” or “innovative” capacity, resulting from low investment in human capital and scientific infrastructure, has led to a low capacity to innovate or even to take advantage of technological advances abroad (Maloney, 2002). Second, the period of inward-looking industrialization discouraged innovation and created a sector whose growth depended on artificial monopoly rents rather than quasi-rents from technology adoption and at the same time undermined resource-intensive sectors that had the potential for dynamic growth (Maloney, 2002). The Chile case study illustrated the counter-argument to this point of view on resource-based development in Latin America. The cases of Chile may shed new light on the debate on the middle-income trap and economic growth in lagging economies (Lebdioui, 2020). Chile has been a symbol of so-called neo-liberalism in Latin America as it followed for many years the Washington Consensus focused on the free market (Williamson, 1990), which was widely seen as a failure (Rodrik, 2006). In fact, several scholars have praised Chile for its success with its free market approach (Barro, 2000); (Valenzuela, 2006)Valenzuela and Dammert 2006), and even Stiglitz (2002) considered Chile to be exceptionally successful despite the unregulated political regime focused on the free market. So the question is whether Chile's growth is due to its liberal policies or something else.

4.5.1 Historical resource-based development

Larrain et al. (2000), described the Chilean economy as an economy based on agriculture but predominantly oriented on the exports of nitrates and wheat in the late 1880s and World War I. Larrain et al. (2000), asserted that due to the discovery in Europe of the manufacturing

process of synthetic fertilizers associated with the fact that Chile's neighbouring countries started to produce and export wheat, the economy of Chile switched from wheat exporter to the importer. In the 1970s the Chilean's copper production alone accounted for 80 percent of the government exports and 40 percent in the 1990s (Larrain et al. 2000).

According to World Development Report (1998), quoted by Larrain et al. (2000), the Chilean economy was ranked 27th out of 133 countries in terms of gross national product per person (GNP), which, at US$12,080, placed Chile 34th out of 174 countries in terms of the Human Development Index (HDI) (UNDP, 1997) and a constant growth rate of 5.4%.

The Chilean economy is strong with a high rate of economic growth but below the top rank of countries (Larrain et al. 2000). This is due to the core structural characteristics that shape the country, and they are as follows:

- Structural advantages such as the temperate climate which allows value-added agriculture (developed wine industry, fisheries, fruits, and forestry) and the copper deposits.
- Structural disadvantages such as the high distance from world markets allowing a restricted range of exports and the persistence of a small domestic market.

The Chilean economy's dependence on mineral resources has raised questions about its ability to meet the challenges of the global market. Standard & Poor (1998), cited by Larrain et al. (2000), in a report published in October 1998, highlighted the fragility of the Chilean economy by describing it as an economy with a high account deficit and an economy consisting of a narrow and concentrated export base compared to the small size of its economy. The analysis focused on risk and the need for a more diversified economy.

4.5.2 Chilean legal mineral framework and government engagement as stakeholder

The mining legal framework of Chile (Claro and Cia, 2019) is basically organized as follows:

- The Political Constitution of the Republic of Chile was promulgated in 1980 and reviewed in 2012 constitutes the legal basis for the various legal regulations and codes governing minerals extraction in the country;
- The Organic Constitutional Law on Mining Concessions of Chile, which describes the scope of the general terms for mining concessions was officially published in Official Gazette in 1982;

- The Chilean Mining Code promulgated under the Law N0 18,248, provides details on the procedures for granting rights to exploration and exploitation concessions;
- The Mining Code Regulations, that entered into force by decree N01/1989 as an operational regulation reinforcing the Mining Code; and
- The Mining Safety Regulation in which the State of Chile has exclusive ownership and control of all mineral deposits. However, any natural or legal person (whether Chilean or foreign) may acquire the rights to explore or exploit these mineral deposits if they comply with the applicable procedures.

There are no specific restrictions in the Chilean Mining Code and Regulations that prevent foreign ownership of exploration and exploitation concessions. With regard to the regulatory authorities of the mining industry, the Ministry of Mines and the National Service of Geology and Mines (Sernageomin) of Chile are the main stakeholders of the government. Nieto and Medina (2020) described the role of the Chilean government as absolute, exclusive, and permanent in terms of mining deposit ownership, playing the specific role of a regulator that grants exploration and mining permits. The courts of justice in Chile are the institutions that grant mining rights under the authority of the Ministry of Mines (Nieto and Medina, 2020). Figure 4.3 illustrates how the mining sector in Chile is organized and how institutions interact with each other.

According to a KPMG report (2014), Chile is ranked 14th out of 82 countries in terms of business environment attractiveness between 2007 and 2011, with a well-functioning market economy. Nieto and Medina (2020) mentioned that Chile has opened up its economy to the world and has an international treaty with Argentina, Asia-Pacific Economic Cooperation (APEC), and double-taxation agreements with countries such as the South Africa.

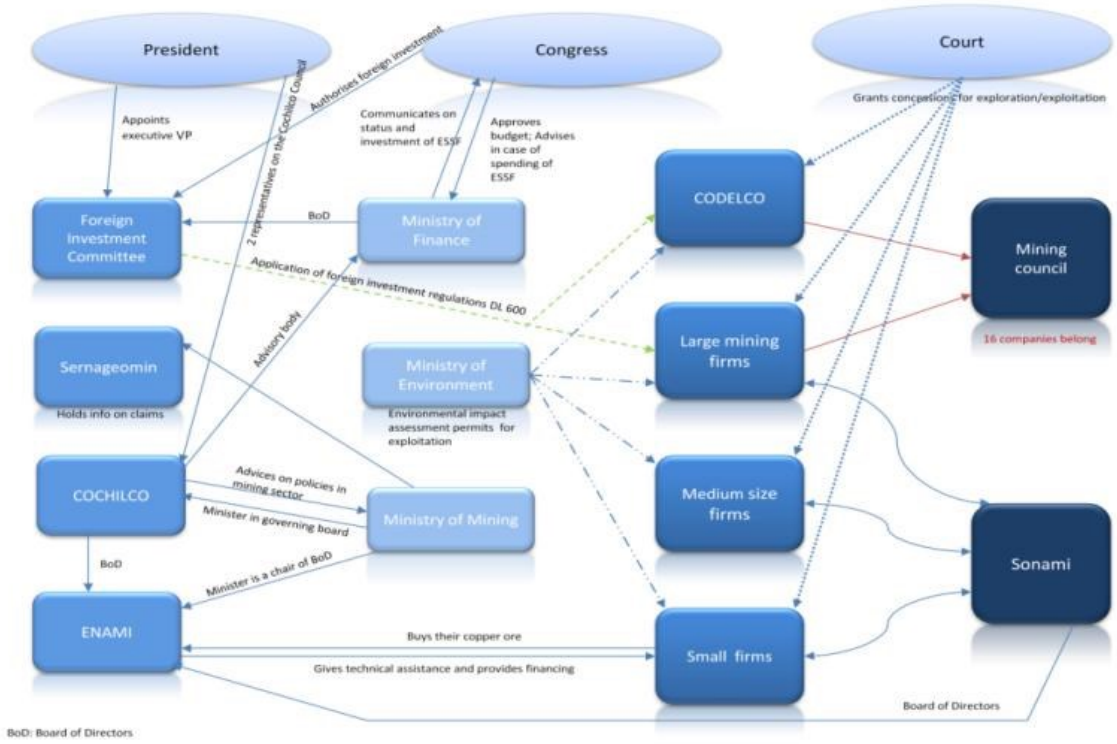

Figure 4. 3: Structure of the Chilean mining industry (interaction between relevant structures) source: (OECD, 2013)

4.5.3 Linkage-based strategy and related development challenges

Due to the heavy reliance on copper ore exports and the fragility of the copper demand, the Chilean economy began to realise the importance of promoting the local content of its mining industry as early as 1992 according to McMahon and Moreira (2014). In 1992, the Chilean government initiated the creation of a Corporation for Productive Development which was made up of a consortium of ten large mining companies and two universities in order to provide an environment focused on the development of support services for the benefit of small and medium enterprises (SMEs) in Antofagasta (McMahon and Moreira, 2014). This was necessary to promote resource-based development in Region II. In return, the government of Chile used the fiscal linkage as an incentive creator for mining companies to collaborate on the project (McMahon and Moreira, 2014). The fiscal linkage that was created was basically aiming at providing long-term credits to mining companies and financially assisting the Chilean Economic Development Agency (CORFO) to promote economic growth in Chile.

In order to strengthen the fiscal linkage and to create an incentive for mining companies in Region II of Chile, in 1995, CORFO and the European Union-funded a new initiative to promote local content of the region's mining sector, by creating a program to develop local

suppliers (SMEs) and make them competitive enough to integrate the supply chain of large companies.

Linkages development of the Antofagasta region, in 1997, integrated stakeholders such as trade unions under the so-called Association of Antofagasta Industries (AIA), as well as a government institution, the Technical Co-operation Service (SERCOTEC) with a scope similar to that of CORFO. The purpose was to improve the State's contribution to the development of the local content by meeting the specific needs for SMEs in terms of qualifications required to integrate the supply chain of large companies (competitiveness aspect) as mentioned by Culverwell (2000), as cited by McMahon and Moreira (2014).

In Chile, like in many other successful resource-based economic developments, stakeholder participation and dynamic policy creation and improvement were the key issues to be addressed. Figure 4.4 illustrates the linkages-based strategy implemented in Chile and stakeholder's participation.

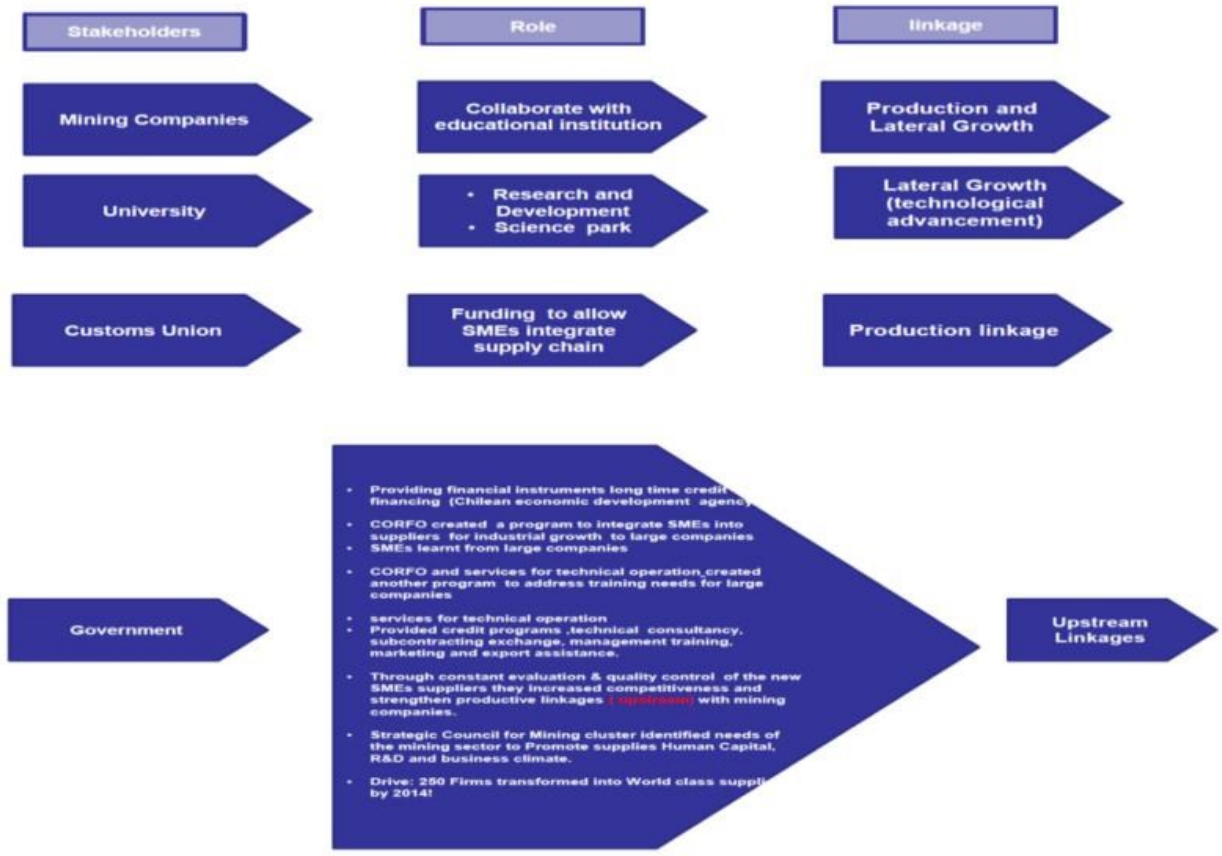

Figure 4. 4: Linkage-based development strategy of Chile (Diagram compiled based on the analysis conducted by McMahon & Moreira, 2014)

4.5.4 Stakeholders' engagement and participation in Chile

Chilean regulations are opening up to provide respective relevant activities to specific stakeholders for mining to function as a driving force in reviving the economy, as shown in Table 4.5.

Table 4. 5: stakeholders' engagement and participation in Chile

Stakeholder	Role	Comments
Government	Provided financial instruments (Chilean economic development agency). Integrated SMEs into the industrial supply chain of multinational mining companies operating locally. Provided training of SMEs to meet multinationals mining companies' standards. Created a program to identify and address the training needs of SMEs for large companies. Provided services for technical operations. Provided credit programmes, technical consultancy, subcontracting exchange, management training, and marketing export assistance.	As a result, for the role played by the government of Chile, 250 firms were transformed into world-class suppliers in 2014, and with an immediate consequence, promoting job creation through local content enablement. CORFCO was the main institution created in Chile that was directing training and development of local SMEs
Government	SMEs were constantly evaluated in terms of quality control in order to improve their competitiveness and reinforced production linkages with mining companies. Created a Strategic Council for Mining Cluster in order to identify the needs of the mining sector to promote supplies Human Capital, R&D, and business climate.	Financing and loan was a primary incentive to develop the integration of SMEs into the supply chain.
Mining companies	Provided collaboration with educational institutions.	Created in 1992, the Corporation for Productive Development. The organization was inclusive of 10 large mining companies and 2 universities
Universities	Developed research & development approaches. Created science park.	Aim at moving laterally the Chilean economy in a longer term.
Customs Union	Funded SMEs integration process into the supply chain.	Supporting investment in human capital.

4.5.5 Economic linkages development of Chile

The Chilean government recognizes that the private sector is the engine of growth and that the role of the state is to act as a facilitator, setting the rules and creating an enabling environment that favours the linkages development and strategy, as shown in Table 4.6.

Table 4. 6: linkages development and strategy in Chile

Type of Linkage	Findings	Policy	Strategy
Upstream	Integration of SMEs into the main supply chain of the Chilean's mining sector.	Creation of a specific program under CORFO and a strategic Council for mining cluster.	Create employment by promoting local content to support upstream linkage in relevant aspects of the mining industry.
Forward	Promoted indirect employment.	SMEs training and regular quality control evaluation	Additional jobs creation
Horizontal	Technological advancement. Lateral growth.	Creation of a development hub in research and development	Move laterally the economy by diversification using skills acquired in the mining industry to other sectors.
Spatial & technological	Intensified knowledge exchange between mining sector and universities.	Creation of the Corporation for Productive Development.	Investing in local skills creation to be sourced locally by large mining companies.
Fiscal	Implication of government for funding SMEs integration.	Credit and loans facilitation to enable the SMEs integration process.	Incentivizing the integration process.

4.5.6 Summary of Chile Case Study

Despite the resource-based development in the Chilean economy, Nieto and Moran (2020) identified some challenges in unlocking the mining sector's potential for the country's future economic growth. The Chilean Mining Code and its regulations are developed without any specific restrictions to allow foreign ownership to explore and exploit the concessions. This

paved the way for the good organization of the mining sector in Chile and good interaction between institutions. Thus, linkages development and strategy depend on sound management practices developed within a framework of good environment legislation. A mature modern legislative regime is one that establishes clear lines of responsibility and accountability.

4.6 Case study of Peru

According to a KPMG (2013), Peru is the second-largest producer of copper after Chile, and the country is endowed with many other minerals such as silver and gold. The value of in-country mining investment was estimated at US $10 billion (KPMG, 2013). The country has been viewed as a private sector-driven economy in recent years.

4.6.1 Historical mineral resource-based development of Peru and its political context

Bebbington et al. (2018) divided the political history of Peru into three major stages: oligarchical, nationalism, and the neoliberal stage.

The Oligarchical rule and foreign capital domination settlement, as described by Bebbington et al. (2018) is a period ranging from 1895 to 1968 characterized by weakness of central state associated with the lack of institutional capacity over land and sustainable economic development, marked by poverty and political unrest. Revenues from oil, copper, and silver exports only benefited a group of people of the dominant oligarchy from 1895 to 1919 under an aristocratic regime followed by an authoritarian era from 1919 to 1930 under President Augusto Leguia, which appeared to grant legal recognition to indigenous communities in 1920 by creating a central governmental agency for indigenous affairs.

The mining sector of Peru was predominantly silver and gold oriented and most deposits were in the hands of national owners, with the mining sector at the time helping the country recover from the Pacific War. Miller (2011), as cited by Bebbington et al. (2018) mentioned that the Peruvian governmental policies in force at the time and the national elites encouraged the denationalisation of the silver industry in order to help attract foreign investment, because of the limited financial capacity of local entrepreneurs and the State, and also due to the rapid growth of the copper industry. Becker (1983), as cited by Bebbington et al. (2018), asserted that the promulgation of a new liberal mining code in 1901 evenly distributed the conditions for foreign and domestic investors to obtain mineral rights to mineral deposits in Peru. It also enshrined a tax freeze for all export-oriented activities. As a result of this measure, significant investments were made in the country, such as the US-owned Cerro de Pasco.

Dore (1986), as cited by Bebbington et al. (2018), discussed the positive impact of the role of the Peruvian government in 1950 under General Manuel Odria, who revoked protectionist measures in place since the 1900s and 1940s, allowing more competitive foreign investment and technology in open pit mining in the copper industry. Dore (1986) asserted that in 1950, a new mining code was promulgated which allowed the signing of two major open pit mining contracts with US-owned companies such as the iron ore with Marcona Mining Company (MMC) in 1952 and the Southern Peru Copper Corporation (SPCC), in 1954. At the same time, certain medium-size Peruvian mining companies (Becker, 1983) experienced emergence, as cited by Bebbington et al. (2018). In 1960, SPCC and MMC accounted for 73% of the total mineral production of Peru.

Nationalism and accelerated social change in Peru is the period from 1968 to 1990; it is an era of distinct political settlement as described by Beddington et al. (2018). The country moved away from oligarchical, aristocratic, and military regimes to adopt a more democratic approach. In the 1970s, Peru experienced a growing debt due to the global oil crisis associated with the corruption that prevailed within institutions; in 1975 President Velasco was overthrown by General Francisco Morales. From 1985, the country entered a spiral of political violence and hyperinflation, with a higher level of isolation from the global financial system.

According to Beddington et al. (2018), two major US mining projects such as the CPMC in 1974 and the MMC in 1975 were nationalised with shares transferred to nationals for fear of being expropriated (Torres, 2013), as cited by Beddington et al. (2018). The nationalized mines of CPMC and MMC have been converted to Centromin and Hierro Peru (Beddington et al., 2018). This was supported by major changes made by the military regime in terms of mining governance by passing the Mining Law of 1970, which reinstalled the central role of the State in the mining industry (Becker,183). The military regime created the first Ministry of Energy and Mines in 1969 (Becker, 1983; Guasti, 1985), as cited by Bebbington et al. (2018).

With regard to the evolution of the legal framework in Peru, 1981 was punctuated by the promulgation of the new General Mining Law with the aim of incentivizing the profits of private companies (Bebbington et al., 2018). The political climate of the time was against the idea of returning to denationalization because of ideological principles. Fitzgerald (1979); Glave and Kuramoto (2007), cited by Bebbington et al. (2018), highlighted the problems related to the provision of expected foreign exchange for public expenditure due to the burden created by corruption and mismanagement of Peruvian public mining companies.

Neoliberalism and mining in Peru is an era that ranged from 1990 to 2016, and it is divided into two sub-periods: the privatisation and expansion period (the 1990s) and the continuity and change in mining governance in the twenty-first century.

- The period of privatization and expansion (the 1990s) is a period in which technocrats and the central government decided together to return to the denationalization as asserted by Bebbington et al. (2018). Large national mining companies failed with policies in place to attract foreign exchange, creating social tensions and the country's reputation for being risky and unattractive. Pasco-Font and Saavedra (2001), as cited by Bebbington et al. (2018), mentioned that promoting resource-based development was not the priority of President Fujimori and his advisers.
- During this period, reforms of the mining sector began to be carried out, government officials and professionals from the private sector came together to resolve the outstanding conflicts between private companies and the Peruvian government as asserted by Munoz and Vega (2000), as cited by Bebbington et al. (2018). National companies' assets were returned to investors in a reduced space of negotiation around purchase prices and the bad shape of a larger number of the assets as mentioned by Bury (2005) as cited by Bebbington et al. (2018).
- Szablowski (2002) and Yanguas (2011) noted that at this time, international institutions such as the IMF and the World Bank were encouraging Peruvian legislators to formulate new environmental and social laws to deviate from known shortcomings of past practices.
- The continuity and evolution of mining governance in the twenty-first century (the 2000s) is a period characterized by the return of democracy in the Peruvian political context (2001). This period is equally punctuated by the boom in commodity prices allowing the installation of several new large-scale mining operations in Peru (Glave and Kuramoto, 2007) as cited by Bebbington et al. (2018). McMahon and Moreira (2014) asserted that in 2001, the Peruvian government collected 4.1 percent from mining sectors and between 2007 and 2011 was able to collect 17.5 percent of fiscal revenue. Combined with the democratic political climate in force, and management of institutions, the $1.1 billion collected in royalties was allocated 95 percent to the local government of the Peruvian State (McMahon and Moreira, 2014).

The historical context of resource-based development in Peru highlights the economic context of Peru which, with regard to mineral resources, has been strongly influenced by the political

context prevailing in the country, with a direct impact on the capacity institutional management.

4.6.2 Legal mineral framework development and government engagement as stakeholder

The mining sector of Peru is governed and regulated by the General Mining Law. Based on the Peruvian Constitution, the mining sector of Peru is directly managed by the Ministry of Energy and Mines (MINEM) (ICLG 2020), which is the main institution that administrates the sector, along with other institutional organisations such as the Geological, Mining and Metallurgical Institute (INGEMMET), the Ministry of the Environment (MINAM), the National Environmental Certification Authority (SENACE), the Supervisory Agency for Investment in Energy and Mining (OSINERGMIN) and the Agency for Environmental Assessment and Enforcement (OEFA) (Pinheiro and Sánchez, 2020).

Palomino and Bustamante (2020) described the legal framework applicable in the mining sector of Peru as follows:

- The political Constitution of 1993, Article 66;
- The Organic law for the Sustainable Development of Natural Resources, Law N0.26821 of June 26, 1997;
- The consolidated text of the General Mining Law, approved by Supreme Decree N027446 of April 23, 2001;
- The Law regulating Mine Closure, Law N0.28090 of October 14, 2013; and
- The Law on the right to prior consultation of indigenous or native peoples, recognised in Convention 169 of the International Labour Organisation (ILO), Law N0.29785 of September 17, 2011.

Pastor and Wise (1992) asserted that during the 1900s, the Peruvian mining sector experienced a crisis inherited from the 1980s. During this period the mineral sector of Peru was operated by public mining companies under a monopoly regime and failed to provide the public treasury with the expected amount of foreign exchange. Since the 1970s, annual losses were estimated at US$ 100 million, linked to the lack of influx of new investments (UNCTD, 2000). Radical changes in the Peruvian mining sector began to be implemented in 1991 when the Peruvian government started to get involved in a sustainable approach of its mineral sector as mentioned in the International Council on Mining and Metals (ICMM) report (2007). The Peruvian government has implemented a series of structural reforms aimed at opening up its mining

sector to foreign investment by creating a favourable environment for the privatisation of public enterprises.

Arellano-Yanguas (2008) asserted that the Peruvian government was committed to creating a safe environment of its mineral sector by enacting the Mining Investment Promotion Law (MILP) in 1991 as an amendment to the General Mining Law of 1981. This enactment consolidates important aspects such as the definition of the status of mineral rights and functionalities of a new cadastre, with an important aspect being the simplification of the principle of non-export of taxes and the suppression of discrimination between domestic and foreign capital (Arellano-Yanguas, 2008). The Peruvian government, as a major player in the mining industry, has also created an environmental institution that was created after the enactment of the Environmental Protection in the Mining Sector Regulation in order to command and control all environmental issues related to the mining sector. The evolution of the mining legal framework and mining policies formulation in Peru had an almost direct effect on the rapid development of its mining sector and of the country's economy as a whole, as asserted by Arellano-Yanguas (2008).

The beginning of the twenty-first century in Peru has been punctuated by institutional strengthening campaigns, as described by Arellano-Yanguas (2008). The Peruvian government has undertaken reforms at the governmental level by initiating the process of decentralization, promoting changes in the way of attracting foreign investments, and emphasizing the environmental aspects of the mining sector as well as regulations on mine closure and public participation:

- Political and administrative decentralization in Peru is one of the key components that characterized the 2000s in the country in terms of implementing sustainable resource-based development. According to Arellano-Yanguas (2008), the decentralization process that failed in the 1980s has been relaunched by the new government in 2001, by setting up a legal framework that breaks down the guidelines and stakeholders' responsibilities in terms of the allocation of resources to the regions. Arellano-Yanguas (2008) asserted that the new government has implemented a legal framework such that the 25 regions of Peru will operate independently with their own governmental structures, with full responsibility to promote development in their areas. The new Peruvian government has adopted the Mining Canon Law in which the central government made it mandatory that 50% of the income tax paid by mining companies

should be automatically redirected to respective regions to eradicate poverty, provided that Peru has 17 regions in which the mining industry is implemented (Molina, 2016).

- Arellano-Yanguas (2008) highlight the 2000s as an era in Peru when promoting foreign investments was on top of the list on the agenda of policymakers, with the enactment in 2003 of important law to incentivise investment in exploration activities. The government promulgated the Legislative Decree N0.708 official gazette of 14th November 1991.
- Public participation and environmental liability (under the Law of Citizen Rights of Participation and control N026, 300) are also one of the milestones achieved by the Peruvian government in terms of the legal framework and the role of the government as a stakeholder to the resource-based development. According to Arellano-Yanguas (2008), the civil society the citizens, under the 2002 regulation on the Citizen's Consultation and Participation in the Approval of Environmental Studies in Mining and Energy Sectors was enacted in order to ensure that the civil society and communities are integrated into the approval process of every single mining project which is supported by an environmental impact study. By adopting such a law, the government started to identify relevant stakeholders of its mining industry with the aim to have a holistic approach to the strategy of its resource-based development.
- Peru's economy has inherited a long history of political social unrest due to the nature of governmental structures that have prevailed throughout its history and triggered conflicts related to mining, as stated by Arellano-Yanguas (2008). In 2004 the Peruvian government undertook to organize 105 workshops with all stakeholders, such as NGOs and the civil society, in order to participate in mining conflict resolution (Truth and Reconciliation Commission).

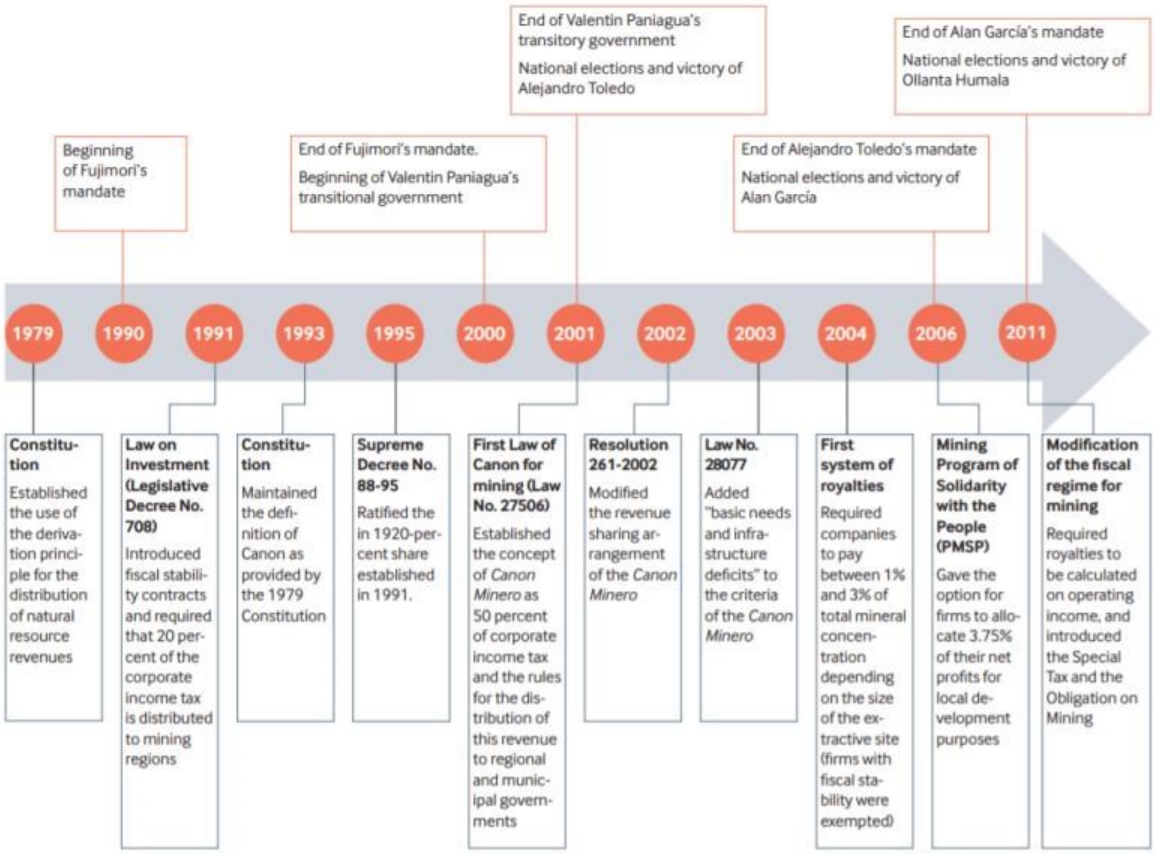

Figure 4. 5: Historical evolutions of the mineral policy formulation and legal framework of Peru. (Source: Mineral revenue sharing in Peru. Aresti, 2016)

4.6.3 Linkages-based strategy and related challenges in Peru

McMahon and Moreira (2014) asserted that Peru was able to initially draw up a National Development Plan which translated into a strategy using the rent generated by its mining sector to foster development in all sectors for the economy of the country. Through governance and institutions management, Peru is building fiscal linkage as follows:

- Mining rent collected of up to US$ 1.1 billion in royalty between 2005-2011;
- Mining canon funds collected up to US$ 7.7 billion during 2005-2011; and
- Using the Canon Law which stipulates that 50% of mining revenues must be used for poverty eradication projects such as health, education, social system.

Figure 4.6 illustrates the royalty allocation that was collected from the mineral sector and Figure 4.7 illustrates the Canon Law funds allocation.

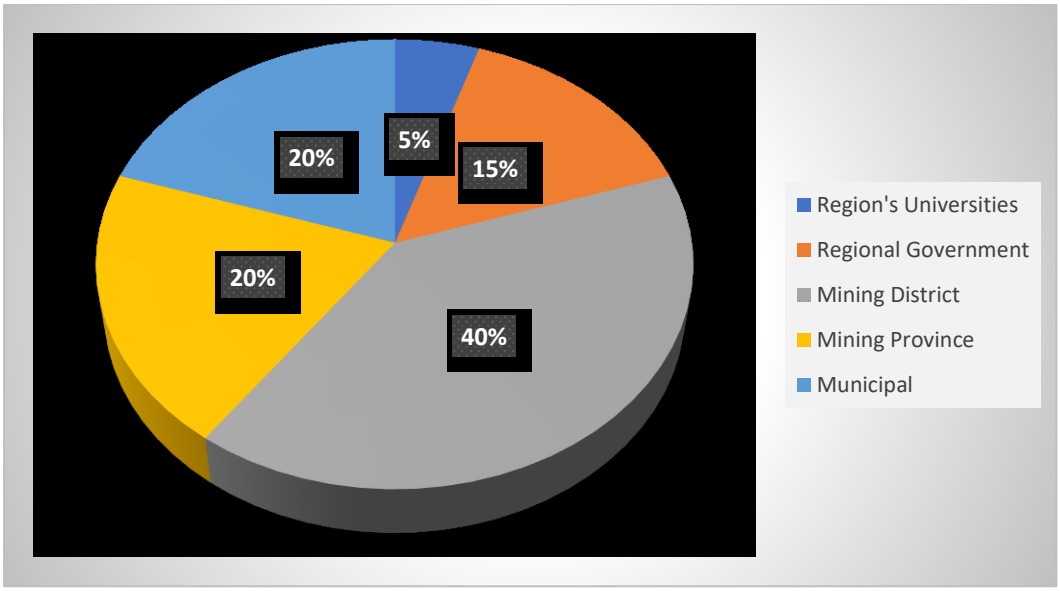

Figure 4. 6: Peru royalty allocation (McMahon & Moreira.2014)

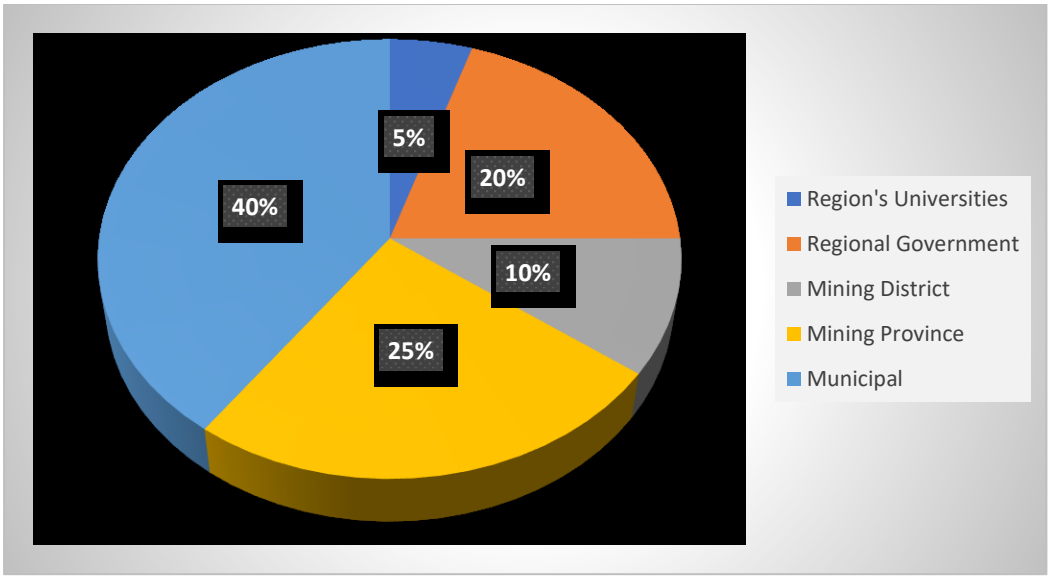

Figure 4. 7: The Canon Law in Peru (McMahon & Moreira, 2014)

In terms of stakeholder participation, the Peruvian government created a People's Solidarity Mining Program (MPSP) between 2007 and 2011 with the aim of promoting social welfare in mining areas, as mentioned by McMahon and Moreira (2014). The stakeholder participation included 39 mining companies, NGOs, the government, and other entities such as the civil society and the Truth and Reconciliation Commission. Figure 4.8 shows a diagram of what has been implemented in Peru and how stakeholders decided to work together.

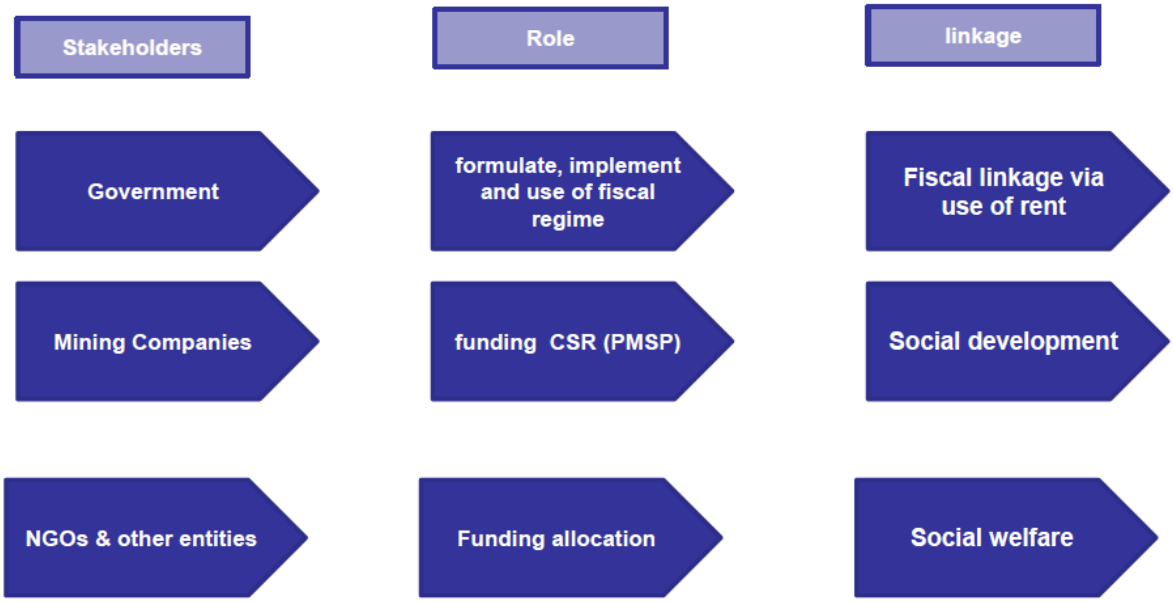

Figure 4. 8: Linkage-based development strategy of Peru (McMahon & Moreira, 2014)

Aresti (2016) claimed that there is no evidence that the revenue sharing system of Peru has produced the expected results in terms of eradicating poverty. According to Crabtree (2014), as cited by Aresti (2016), the Canon Law (Canon Minero) creates perverse incentives that discourage open and democratic local governments aggravated by the lack of a strong civil society.

McClintock (2014), as cited by Aresti (2016), after conducting a data analysis from 2004 to 2009, concluded that revenue from mining was one of the key factors of social conflict in Peru. Aresti (2016) asserted that Peru has a complex and complicated system of sharing mining revenue, accompanied by an irregular transfer of revenues from the national level down to the municipality entity.

4.6.4 Stakeholders engagement and participation in Peru

The advancement of a nation takes into account several factors for which the involvement of the actors and their related activities are preponderant and require particular attention to the associated laws likely to allow everyone to play their role well within the limits of their rights and obligations as shown in the Peru case study in Table 4.7.

Table 4. 7: stakeholders' engagement and participation in Peru

Stakeholder	Role	Comments
Government	Returned to a democratic system in 2001. Formulated the first canon law No27506 in 2001. Enacted the resolution 261-2002 on revenues sharing (2002). Enactment of the law 28077 by recognizing the concept of basic needs and infrastructure deficits to the criteria of the canon law. (2003). Integrated the first payment of royalties in the mineral sector (2004). Introduced the Mining Program of solidarity with the peoples (PMSP) by allowing mining firms to contribute to eradicate poverty in operating areas (2006).	The Mining Program of Solidarity with People was initiated by Peruvian government in 2006 but was effectively implemented in 2007 and from 2007 to 2011. The program aimed at promoting social welfare with high focus on education and healthcare. Peruvian resource-based development was essentially based at strengthening institutions through a strong decentralization system supported by the canon law.

4.6.5 Economic linkages development of Peru

Strategy implementation and policy making has been a concern of the Peruvian state to improve resource-based development by securing linkages of different types, including upstream, downstream, horizontal, spatial and technological, and fiscal, as shown in Table 4.8.

Table 4. 8: strategy implementation and linkages development of Peru

Type of Linkage	Findings	Policy	Strategy
Upstream	No substantial jobs creation despite fiscal linkage, the rise in job creation was recorded during the mineral boom period. Slow development of the local services sector.	Opportunity to be explored.	Ref IDB improving lives (Bloomberg, 1981).
Forward	The sector has slow growth.	To be formulated.	Skills development should be incentivized.

Table 4.8 (continued)

Type of Linkage	Findings	Policy	Strategy
Horizontal	Less competitive.	To be well formulated.	Strategy to be formulated based on developing human capital.
Spatial & technological	5% of the Canon Law allocation and 5% of mining royalties were allocated to the academic public system. Lack of local cutting-edge skills and technology. Peru was sourcing foreign technology in its mineral sector.		
Fiscal	The fiscal linkage was supported by a highly decentralized system.	Highly decentralized system. Canon Law. Royalty collection PMSP. Promoted accountability and good governance. The mineral policy was inclusive of all stakeholders of the mineral sector.	Mineral demand boomed during the implementation of the PMSP was seen as an opportunity to raise funds by the government. The vision of eradicating poverty was the main driver of the strategy. Democracy and return to good governance were key components to reinforce accountability and social contract between the government and the citizens.

4.6.6 Summary of Peru Case Study

This section basically described the role played by the main stakeholder (Government). The Peruvian case study is a perfect illustration of the impact of weak institutions on resource-based development. Throughout the process of strengthening their institutions, it is perceivable that

the mining sector could not adequately contribute to the development of the Peruvian economy. The next section illustrates the linkage-based strategy that was implemented by the Peruvian government, once supported by the adequate policies that had been formulated throughout the process. Figure 4.5 depicts the historical process of mineral policy formulation.

Arellano-Yanguas (2008), in his concluding observations, asserted that future challenges for sustainable resource-based development in Peru will require strengthening equitable distribution of the mineral rent through enhanced governance and social responsibility in order to eradicate social violence. Ghezzi and Gallardo (2013), as cited by Beddington et al. (2018), highlighted the growing recognition in the current Peruvian academic policymaking that the current macroeconomic approach of developing Peru has reached its limits, and asserted that there was a need to focus more on the quality and development of institutions.

4.7 Case study of Ghana

Ghana is located in West Africa and shares borders with Burkina Faso and Togo. According to a report by KPMG (2014), Ghana was the 72nd out of 189 countries in 2013 and 67th out of 189 countries in terms of ease of doing business in 2014. According to the report, Ghana has improved the accessibility of its population to electricity through tax reduction. For instance, the government of Ghana announced a three-month electricity subsidy from April to June 2020 due to Covid-19 (OECD, 2021). Those consuming less than 50-kilowatt hours per month received electricity free of charge, while the rest of the population were entitled to a 50% rebate on their electricity consumption (OECD, 2021). KPMG (2014), reported that Ghana's main minerals are gold (2nd after South Africa and 10th globally), bauxite, gemstones, and manganese.

4.7.1 Historical mineral resource-based development of Ghana (political context)

The history of Ghana's mining sector dates back over 1000 years, from the ancient kingdom of Ghana to the pre-colonial Arab gold trade in West Africa (Hilson, 2002). This shows the early involvement of Ghanaian society for a long time in an economic and political situation. Taxes were already levied on most commodities such as silk, swords, and gold, as noted by Davidson (1984) cited by Hilson (2002).

Dumett 1979, cited by Hilson (2002), highlighted a gold mining method oriented especially towards the alluvial type deposit was developed in the precolonial era. This, coupled with a strong cultural relationship between gold (land) and indigenous people (Meredit, 1812),

involved women in the gold refining industry. Hilson (2002) summarised the colonial period in the history of gold in Ghana in 9 keys events as follows:

- 1400 to 1500: the scarcity of gold in Europe prompted a financing expedition with a European company and leading companies in the banking system;
- 1471 is the period of the first Portuguese expedition in Ghana (Juan and Pedro Escobar);
- 1482, the Portuguese settled effectively in Ghana and built infrastructure including Elmina Castel, Shama, and Mount Pra River;
- 1553-1556 date back to the period of British colonization when traders from the United Kingdom settled in Ghana developing the first mining policy formulation (Hilson, 2002) and legal administration framework (Tsikata, 1997) as cited by Hilson (2002) to facilitate the implementation of mining operations in Ghana;
- 1576 the native tribe in the Accra Plains revolted against the Portuguese;
- 1595 was marked by the arrival of Dutch merchants in Ghana;
- 1598 was characterized by the Dutch colonisation in Ghana;
- The end of the 1500s was marked by the slave trade culmination period; and
- The takeover by the Dutch of the Portuguese infrastructure.

Ghana experienced a boom between 1800 and 1872 when mining of the Obuasi gold deposits was intensely developed by Europeans with the establishment of the African Gold Coast Company on February 16, 1878 (Rosemblum, 1972) and the purchase of more than 70 concessions of gold deposits (Silver, 1981) cited by Hilson (2002). However, the impracticality of gold mining due to some factors including low gold production, rudimentary expertise, and lack of skills, limited the mining phase to five concessions.

Acquah (1995), as cited by Hilson (2002) asserted that during the period from 1957 and 1983, the Ghanaian gold production decreased to almost one-third of its initial capacity, due to the fact that most of the mines deposit was depleted or closed. Acquah (1995) mentioned that the government acquired some shares in those mines in order to avoid the closure but, as mentioned by Jackson (1992), as cited by Hilson (2002), most of the gold mines were nationalized except the mine operation at Obuasi and Konongo.

Tsikata (1994), as cited by Hilson (2002) indicated that in December 1981, a military coup led by Lieutenant Rawlings replaced the government at the time under the Provisional National Defense Council (PNDC). According to Tsikata (1994), as cited by Hilson (2002), asserted during the same year, under the PNDC regime, the economy of Ghana experienced a decline

of 3.5%, 6.9% in 1982, and 4.6% in 1983. The leadership of PNDC decided to seek advice from the IMF in order to be able to elaborate a strategic development plan for the country.

Under the leadership of the IMF, the PNDC launched the Economic Recovery Plan (ERP) in 1983 pursuing its export earnings through a tailor-made policy to attract foreign exchange (Tsikata, 1994). Thus, like Peru, Ghana paved the way to the privatization of state-owned mining companies associated with fiscal linkage.

Since the formulation of ERP, substantial financing was allocated from IMF through its International Development Agency (IDA) to support Ghana's policy reforms with positive gold production output up to 250% annually (Sutton-Pratt, 1996), as cited by Hilson (2002). Ghana boosted its resource-based development process after 1983 through existing policies (Tsika, 1994), the enactment of the Minerals and Mines Act (PNDCL 153) in 1986 to reduce taxes and promote foreign companies. Besides gold, Ghana extended its resource-based development to bauxite deposits in the Tema region (McMahon and Moreira, 2014) and aluminium which required the Valco dam (Akosombo dam) on the Volta River to which the overflow of electricity created the opportunity to sell electricity to Togo and Benin.

4.7.2 Legal mineral framework and government engagement

The mining industry has been the highest tax-paying sector of the country's economy as it attracts over 50% of all foreign direct investment and generates over 30% of all export revenues and around 25% of the total expenditure of the mining sector are local procurement (Ghana Chamber of Mines, 2015). The legal framework governing Ghana's mining industry revolves around the Minerals Commission Act 1993 (Act 450) and the Minerals and Mines Act 2006 (Act 703) and 2015 (Act 900), (Tsikata, 2007 and Quashigah, 2009).

Despite the economic growth experienced by Ghana since 1983, it is perceptible today that the country's mineral policy remained in the form of draft since 1999 as asserted by the report of the Chamber of Mines of Ghana (2015). According to the report, the mineral policy of Ghana was only ratified in 2014 by the Minerals Commission because of the growing pressure of civil society and other related stakeholders such as local community representatives. The actors claimed the need for the mining policy to be operational in order to respond effectively to the needs of the country's development plan. In the needs of the country's development plan, stakeholders urged the operation of the mining policy to alleviate the pressure due to the lack of capacity to implement the development strategy (Mtegha, 2020).

Key issues addressed by stakeholders in April 2015 regarding a multi-stakeholder workshop in Ghana were included as follows (Chamber of Mines, 2015):

- To improve the mining policy framework by ensuring that key policy pillars are consistent with the provisions of existing legislation;
- To provide greater transparency in terms of the use of mineral rent and revenue sharing;
- To develop a national development plan that includes more local procurement capacities;
- To develop a strategic framework more focused on social investments and oriented towards greater participation of the local authority in terms of expenditure; and
- To build capacity with different stakeholders.

With the gold industry, Ghana has good prospects for resource-based development; however, there are still serious issues to be resolved in electricity, infrastructure and fiscal policy in order to promote much more sustainable development (KPMG, 2013).

4.7.3 Linkages-based strategy of Ghana and related challenges

The economic links resulting from the policy of Law 703 are covered by more than two thirds of the structure of the mining or mining value chain called "input cluster", produced by the companies (Walker and Minnitt, 2006) as cited by Bloch and Owusu (2012). There is a need to develop downstream linkages which remain weak in Ghana (Bloch and Owusu, 2012) due to the production of semi-pure gold bars exported in paternity to the Rand Refinery in Germiston (South Africa). Also, the market price challenge needs to be addressed as cheaper jewellery is imported from Asia and the Middle East and weak local refining technology and skills. Since the early 1980s, Ghana has successfully established fiscal linkages to promote its economic growth as shown in Figure 4.7.

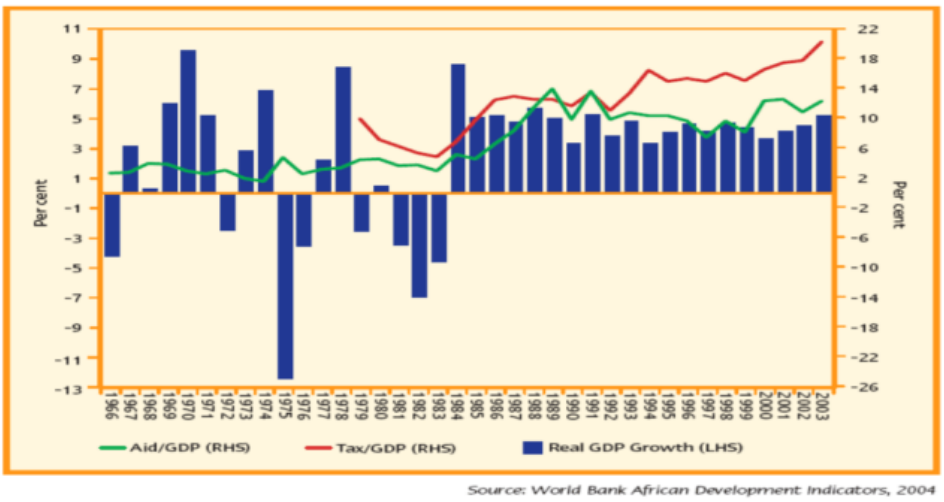

Figure 4. 9: Impact of the effective fiscal linkage implementation on the Ghanaian economy. (Source: The World Bank, 2004)

Bloch and Owusu (2012) reported that Ghana was able to develop and use its fiscal linkages in the form of tax revenues and royalties at a minimum rate of 3% of the production amount until 2011 when it rose to 5%. Moreover, fiscal instruments such as the reconstruction levy and corporate taxes were used as asserted by Aryee (2001) and Akabzaa (2009) as cited by Bloch and Owusu (2012). However, an inflow of funds in the range of 14% to 20% of total tax revenue was created by the fiscal linkages, which translated into $ 243 million in 2009 with weak development initiatives and investments in private projects (Bloch and Owusu, 2012). Bloch and Owusu (2012) mentioned that consumption linkages, as a result of commodity consumption such as gold, are difficult to establish in Ghanaian mining communities. Bloch and Owusu (2012) asserted that the International Council on Mining and Metals (ICMM) country case study on Ghana's gold mining industry (2007) provides some limited research findings in terms of consumption linkages that can be considered as the result of the gold industry. According to an ICMM (2007), the poverty reduction index in Ghana, was real and visible only in 7 out of 10 regions of the country. The Ashanti region had recorded 28% and the Western region 27% out of 40% poverty at the national level, indicating great discrepancies in the national system in terms of sharing the mining rent.

Bloch and Owusu (2012) asserted that backward linkages tend to increase in the gold mining sector with the emergence of a cluster of firms specializing in supply and delivery services in mining production and exploration sectors. Bloch and Owusu (2012) indicated that all these backward linkages are to a greater extent concentrated in the Greater Accra region in terms of knowledge-based services, information technology, labour supply work and subcontracting.

The large majority of the firms making up the mining inputs cluster are located in the Greater Accra Region, notably in the Accra Metropolitan Area itself, and in Tema (Bloch, 2012).

4.7.4 Stakeholders engagement and participation in Ghana

Ghana's portfolio in promoting economic growth requires strong stakeholder engagement and participation, as shown in Table 4.9, to ensure sound resource-based development.

Table 4. 9: stakeholders' engagement and participation in Ghana

Stakeholder	Role	Comments
Government	Formulated policy under the Act 703 in 2006; Promoted fiscal linkage; Structural adjustments in 1980s.	The Act 703 aimed at promoting local content; Opened the country to foreign investments; Enabled business climate.
Mining companies	Provided infrastructure in terms of electricity from the Akosombo Dam on the Volta river	Electricity spillover was converted in a tradable resource with neighbouring countries

4.7.5 Economic linkages development of Ghana

The economic linkages and development strategy are mandated by policy to contribute to different aspects of Ghana's development, including the integration of SMEs, promotion of local employment and local beneficiation, as shown in Table 4.10. Ghana is striving to revive its economy with the strategy of promoting local content by adopting a mining policy that is supposed to support resource-based development through an efficient mineral value chain comprising upstream, downstream, horizontal, and consumption linkages (Table 4.10).

The implementation spatial & technological linkage also has commercial, social, political and environmental benefits (Table 4.10). It can help both businesses and consumers optimise travel routes to beat traffic congestion and increase fuel efficiency and road safety. This saves time, reduces emissions and improves road safety.

The government, as the main actor, plays a fundamental role in the fiscal linkage to strengthen revenues in order to pursue the eradication of poverty. Thus, all major gold mining companies are expected to pay 10% interest to the government, which helps generate revenue to complete the country's development agenda (Table 4.10).

Table 4. 10: Economic linkages and development strategy of Ghana

Type of Linkage	Findings	Policy	Strategy
Upstream	Integration of SMEs into the main supply chain of the Gana's mining sector; Small scale activities to remain exclusive to national citizens.	Enactment of the Mining Act No703	Promote local content by prioritizing employment of national citizens; Gold mining firms to produce a recruitment and training plan for national staff; Expatriate staff replacement by nationals.
Forward	Prioritized indirect "local" employment.	Through 703 Mining Act policy.	Promoting local content prioritizing national citizens.
Horizontal	Remained weak with very low local beneficiation.	Through 703 Mining Act policy.	Prioritizing "Made in Ghana" products.
Consumption linkages	Proportionally affected by low volume of local beneficiation.	Through 703 Mining Act policy.	Promote local content by encouraging the consumption of locally produced goods.
Spatial & technological	Volta Dam by Valco.	Regional integration policy as a way of trade between nations.	Shared the spill over as a resource to support the economy.
Fiscal	10% government interest in all large-scale gold mining companies.	Through 703 Mining Act policy.	Strengthen government revenues for further poverty eradication programs.

4.7.6 Summary

After gaining independence, Ghana entered a three-decade period of political unrest that drastically degraded its economy (ICMM, 2007). The early 1980s were years of political and economic reforms, especially in the direction of democracy (institutions building), coupled with the implementation of mineral policies that have enabled resource-based development

through fiscal linkages instruments and, to some extents, backward linkages by way of the regulatory framework for the mining industry of Ghana.

Bloch and Owusu (2012), pointed to a booming future for Ghana due to growing demand for gold in the global market. They concluded that it is important for Ghanaian policymakers to act by promoting the positive aspects that allow the gold industry to provide a set of economic linkages (backward linkages, taxation and constrained consumption) with the rest of its economy. In other words, policymakers in Ghana should consider developing a competitive gold-based downstream strategy that promotes competitiveness and research and development.

4.8 Case study of South Africa

South Africa is the southernmost country on the African continent, commonly called as Republic of South Africa (RSA). The country shares common borders with Namibia, Botswana, Zimbabwe, Mozambique, and Eswatini, and surrounds the small Kingdom of Lesotho. RSA is endowed with several mineral resources. The total value of mineral resources available in RSA was estimated to be around US$ 2.5 trillion (CSIR, 2015). Ngcofe and Cole (2014) mentioned that the formal mining activities in RSA started with copper mining in the Northern Cape Province in the mid-1800s. During the same period (1867), diamond deposits were discovered in the region of Kimberley, and gold deposits were discovered in the region of the Witwatersrand in 1886. Ngcofe and Cole (2014) asserted that around 57 different minerals were extracted from 800 mines and quarries, encompassing important mining regions such as Gauteng, Mpumalanga, and the North West provinces.

4.8.1 Historical mineral resources-based development of South Africa (political context)

Feinstein (2005) reported that mining activities in South Africa took place before the arrival of Europeans. The mining industry in South Africa relied mainly on gold, copper, and tin which were subjected to beneficiation in the Northern Transvaal and Zimbabwe (former Southern Rhodesia) before the discovery of the Kimberley pipes as indicated by Ngcofe and Cole (2014). Feinstein (2005) said that similar to Ghana, the old mining industry was run by natives of Africa, with very little evidence that the industry was run by overseas supervisors. The “experts”, cited by Feinstein (2005), have indicated that the beginning of mining activities in South Africa dates back to the pre-Christian era. Schwank (2010) divided the historic industrial development of South Africa into three main eras:

Minerals discoveries, the period between 1867 and 1886 as also asserted by Ngcofe and Cole (2014), is the period that indicated the rise of the implementation of capitalism in South Africa. The discovery of an 80-carat diamond stone (lately named "Star of Africa") near the Orange River in 1867 marked the beginning of the industrial history of South Africa. In the periods of late 1600s, the economy was dominated by agriculture, with Europeans settled and confined only to the region of Cape peninsula. In the period from the 18th to the 19th century when Afrikaners slowly relocated along the coast and began to settle inland in the country, the economy was essentially agriculture-oriented (Schwank, 2010).

The discoveries of minerals in South Africa, mostly gold and diamond, radically shaped the resource-based orientation of the country, in that the immediate implications of such discoveries led to two decades of intense mining activities which accounted for more than 60% of the total value of exports of the country (Feinstein, 2005, p.101) as cited by Schwank (2010). The first stages of mining activities are punctuated by a monopoly industry-type because at the beginning, the industry was sufficiently financed by British funds. This allowed the South African diamond mining industry to organize itself into groups that the local mining industry, leaving only a very small number of independent diggers which had been completely absorbed by the construction of expensive and mechanized shafts (Schwank, 2010). According to Feinstein (2005), as cited by Schwank (2010), the same monopolistic pattern was implemented in the gold industry after the depletion of surface deposits. This no longer allowed independent diggers to have their stake in the mining industry, giving way to the sole consortium of consolidated mines such as De Beers Consolidated Mines, founded by Cecil Rhodes.

Fine and Rustomjee (1996), as cited by Schwank (2010), indicated that until 1932, the monopoly pattern of the South African mining sector crystallized around a central consortium of six mining houses, confronted with an almost unlimited demand for minerals plus a market with fixed commodity prices. Clark (1994), as cited by Schwank (2010), indicated that in that period, very few economic linkages were developed because the profits generated in the South African Mining sector were repatriated to donor countries, especially Great Britain. During this period, consumer goods were subject to intense imports. Even though some local manufacturing industries such as food processing, cement, chemicals and explosives, mechanical repair, and coal-based electricity existed at the time, the input to the local economy remained weak.

The manufacturing industry of South Africa has grown significantly due to the demand for infrastructure to supply the diamonds and gold industry as mentioned by Rhjin (1959). The main railway network had to be built at Thabazimbi for the iron ore and that of Postmasburg for manganese. However, at that time, the overall transport infrastructure in South Africa was weak and did not allow the economy to benefit from the positive global revival allied to the mining industry, brought about by World War I (WWI), by triggering high minerals demand. World War II (WWII) had benefited South Africa because of its ability to absorb a higher market share in terms of global demand for minerals, but also because the country had the opportunity to develop its transport infrastructure and its manufacturing industry (Schwank, 2010). Feinstein (2005), as cited by Schwank (2010), asserted that during WWII, South Africa had reached the level of standard large-scale methods of mass production. Table 4.11 illustrates the size of the industry and the respective contribution to the GDP of the South African economy. However, it is relevant to comment on the political context that prevailed in South Africa at the time.

Table 4. 11: Share of economic activity in percent of GDP (Feinstein 2005)

	Agriculture	**Mining**	**Industry**
1911	21.5	27.3	5.9
1918	24.2	18	9.7
1928	18.9	15.7	12.4
1938	12.7	18.3	17
1948	16.4	10	23.3

Schwank (2010) indicated that the Union of South Africa was administratively organized as a dominion of the British Empire who granted rights to vote only to the white population (Afrikaners) that were considered by the British as "poor and unskilled" labour force. Schwank (2010) asserted that South Africa's manufacturing sector absorbed most of Afrikaners with higher wages due to their lack of specific skills, while the African "natives" were mostly employed in mines, as it was a sector based on cheap labour. Schwank (2010) described the minerals' discovery period as an industrial era that lacked cohesiveness, saying that the industrial strategy implemented affected the economic linkages development. In fact, it was a segregationism-oriented resource-based strategy with long-term consequences on the economic growth of South Africa's manufacturing industry and lastingly affecting the country's unemployment rate.

The second era and Apartheid in the resource-based development in South Africa materialized with the victory of the National Party in 1948 (Schwank, 2010), and the period is characterized by the formalization of the Apartheid at the nationwide scale. Schwank (2010) asserted that this political and segregationist system remained in power for over 40 years, during which period South Africa experienced the so-called "post-war economic boom" and its progressive economic decline that started from the mid-1970s due to the global economic instability. In this era, the post-war period was marked by a high rate of economic growth in the 1950s and 1960s with the empowerment of the white South African class. During the economic boom period, the white South African class was able to create and strengthen economic linkages between the manufacturing sector and the mining sector. Massive orders had been placed by South African mining consortia in capital equipment, expanding the chemical industry and diversifying into the various domains of the manufacturing sector. In other words, the South African economy, although segregationist at the time, and aware of the fact that due to international pressure on the weakness of the prevailing human rights of their political system, decided to anticipate embargoes, taking advantage of the high demand for minerals on the global market to diversify their economy in order to be self-sufficient (Schwank, 2010).

The third era in South Africa was an era of the return of democracy to the international community and of internal pressure on the National Party. In 1994, the African National Congress (ANC) of South Africa won the elections, and inherited from social and economic stakes accumulated over several decades, particularly within the African community, as asserted by Linford (2011). The Apartheid regime had some positive aspects, such as a well-developed infrastructure in white residential areas, a modern and developed financial sector, and capital market associated with pockets of skilled labour expertise (research and development) and competitive group of competitive mining companies on the international market (Linford, 2011).

4.8.2 Legal mineral framework and government engagement (policies development)

Dale (1997) indicated that the mineral policy and the legal framework in South Africa were inherited from its colonial past until the election of 1994 which paved the democratic way for the country. Dale (1997) claimed that in the mid-1600s, the mining law was implemented by the Dutch who imported the law of Holland under the Roman-Dutch Law. In that era, the landowner was by definition also a holder of mining rights without reservation to the State of mineral rights or right to exploit. The legal framework was subsequently amended when the

British colonised South Africa and annexed the Cape Colony (Dale 1997). The amendment to the Dutch Roman Law was promulgated in 1813 by Sir John Cradock under the Proclamation on Conversion of Loan Places Act on August 6, 1813[7] (Dale, 1997). The enactment of 1813 was not applicable in the Boer Republics until the discoveries of gold ores in 1866 near Johannesburg and diamonds in 1867 in the Kimberley region which attracted the attention of the British Crown. This led to the enactment of legislation stating that the right to mine for precious metals and for precious stones was the exclusive property of the Crown or the State under the "Law 1 of 1871 (Zuid-Afrikanaasche Republiek), the Precious Stones and Minerals Mining Act 19 of 1883 for the Cape region and under the Natal Mines Act 43 of 1899 as stated by Dale (1997).

The Apartheid regime did not contribute much to the development of favourable mineral policies in South Africa under the National Party which ruled for almost 40 years (Schwan, 2010). Between 1956 and 1967 the "reserved rights to mine" were consolidated into a statute of which the most relevant were the Mines and Works Act of 1956, the Precious Stones Act of 1964 and the Mining Rights Act of 1967. In addition to these enactments, the legal framework evolved further from the point of view of health and safety, which included the accountability of the mine management and the compulsory aspect of consulting unions and employees in matters of health and safety (Dale, 1997). Mostert (2012) has indicated four generations in the development of mining policy in South Africa of which the period between 1964 and 1967 has been referred to as a generation of "conferrals" of the Precious Stones Act 73 of 1964 and the Mining Rights Act 20 of 1967 and Minerals Law 50 of 1991. Mostert (2012) described the second generation of mineral policy as a consolidation of the cacophony inherited from the colonial generation of mineral policy (the first generation).

Dale (1997) indicated that in the evolution of mineral policy in South Africa, the 1980s marked the beginning of a radical change in the legal framework of the country because of the provision contained in the mining law that covered a compulsory rehabilitation programme that should accompany surface mining operations. The Minerals Act of 1991, which came into force on January 1, 1992 (Dale, 1997), was based on privatisation because at that time the economy of

[7]The Act stipulated that "Government reserves no other rights but those on mines of precious stones, gold or silver; as also the right of making and repairing public roads, and raising material for that purpose on the premises: other mines of iron, lead, copper, tin, coal, slate or limestone are to belong to the proprietor"

South Africa was in severe decline and was forced to attract foreign or local private investments in addition to the external and internal pressures facing the National Party at the time. Mostert (2012) described the enactment of 1991 as marking a turnaround in the history of mineral policy of South Africa as the Act simplified the regulatory framework. Dale (1997) mentioned that the enactment of 1991 granted more power to the State in terms of mining rights over private landowners and no longer considered "reserve rights" as prevailed during the colonial period and more much of the apartheid era. The rights to prospect and conduct mining operations have replaced the reserve right on precious stones, precious metals, and oil. In addition, the health and safety aspects have been reinforced by mandatory plans for the rehabilitation of mines environmental requirements.

The Government of the National Unity formed by the African National Congress (ANC) of South Africa, took a much more comprehensive approach in terms of the roles of stakeholders by formulating a policy called "the Reconstruction and Development Programme of 1994" related to the resource-based industry (Dale 1997). The core policies formulated were based on the relevance of equality in terms of minerals rights for all South African citizens, the primary role of the State, emphasis on "minerals beneficiation" and financial participation of employees in mining companies.

The South African Mineral Resources and Energy Department (DMRE), on its website, asserted that mineral beneficiation in South Africa was an old concept from the 1990s (Dale (1997). During this period, as mentioned by the DMRE, the configuration of the mineral sector of South Africa shifted from an upstream-oriented industry to a downstream-oriented industry, which resulted in the creation of large-scale resource-based projects in the steel and aluminium industry. In accordance with the DMRE, the Mineral and Petroleum Resources Development Act (MPRDA) of 2002, Act 26 of 2002 grants the power to the Minister of Mineral Resources to promote and ensure in-the-country mineral beneficiation. Before a mineral is intended to be valued outside the country by a mining company, the request must be expressly addressed to the Minister in charge of mineral resources who can decide after consultation. Likewise, Stevens (2019) indicated that the legal framework in South Africa is governed by the Mineral and Petroleum Resources Development Act, 28 of 2002 (MPRDA), the text is considered to be the main component of the current mining legal framework in South Africa.

4.8.3 Linkage-based development strategy and challenges of South Africa

Walker and Jourdan (2003) indicated that South Africa needs to reassess its goals and objectives in order to achieve economic growth and development. Walker and Jourdan (2003) asserted that the South African economy was based on a strong interventionist development policy focused primarily on the domestic market (inward-oriented development strategy) since 1994, and recommended that an outward-oriented economic linkages-based development strategy be implemented with emphasis on attracting foreign capital. In their recommendations, Walker and Jourdan have identified five fundamental issues as follows:

- State-owned companies should be structured along global competitive lines by raising their level of competitiveness, promoting access to foreign markets, promoting innovation and international marketing;
- Strategize on tariffs protectionism and prices control;
- Reduction of fiscal deficit (promoting fiscal linkage);
- Focus on increasing flows of trade and investments in the country by creating economic clusters that should result from integration into international supply networks; and
- Sustaining employment creation through the promotion of downstream beneficiation along the mining value chain and through diversification.

According to Robinson and Von Below (1990), the growing concern about beneficiation in South Africa started in the 1960s. The authors also mentioned that in 1988, the main successful beneficiation sector in South Africa included refined products, manufacturing alloys, semi-manufactured articles, and manufactured articles. In June 2011, the South African government introduced the "Beneficiation Strategy for the South African Minerals Industry". The strategy was designed to develop seven mineral value chains and expand beneficiation projects in the country. South Africa has been able to develop technologies due to the abundance of minerals and unique circumstances or problems. The country has developed several policies through institutional reforms and the important role played by institutions. The country has also focused on the acquisition of relevant skills and knowledge in order to be capable of operating a lateral migration of its economy.

According to the DMRE, the promoting of the downstream beneficiation strategy has moved beyond wishful thinking and in 2005 the South African government established the Beneficiation Economic Directorate (BED) in 2005 to develop aspects related to Beneficiation Business Development and Beneficiation Strategy Development units. The DMRE implemented a beneficiation strategy which resulted in the formulation of a framework whose

scope is to translate South Africa's sheer comparative advantage into a national competitive advantage (in other words, the country aligned itself with the logic of the outward development strategy by adhering to the international economic logic of development). The DMRE beneficiation strategy identified key enabling factors in terms of creating a favourable development environment with specific provision at promoting research and development (R&D) and skills development to support competitiveness on the international market. Figure 2.10 illustrates the typical economic linkages structure of South Africa.

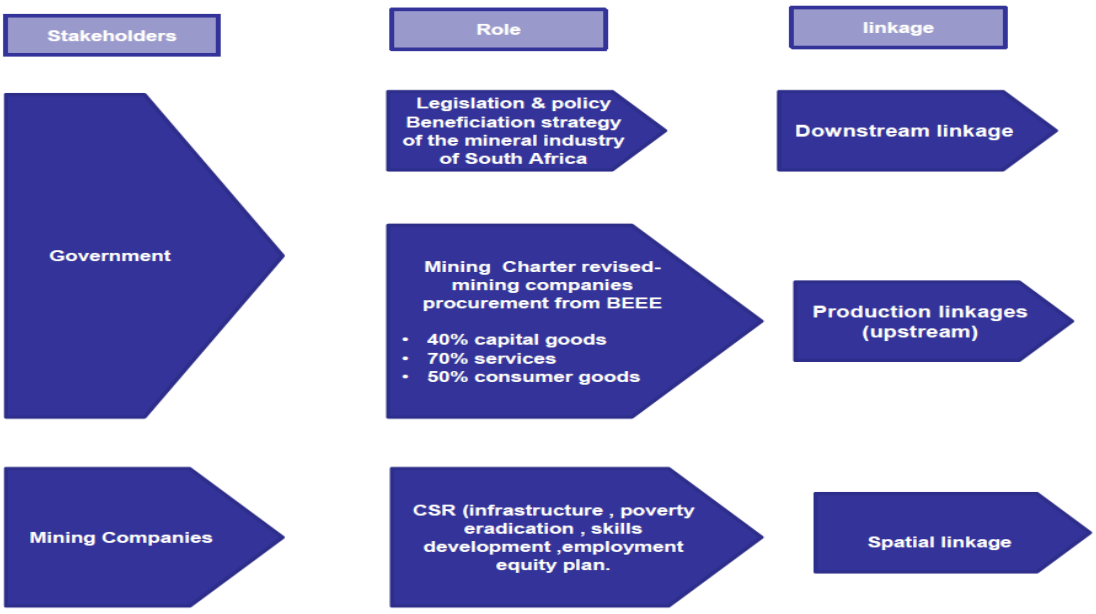

Figure 4. 10: Linkage-based development strategy of South Africa (McMahon & Moreira, 2014)

4.8.4 Stakeholders' engagement and participation in South Africa

In engaging stakeholders, the South African government seeks to ensure that the role is well defined, coordinated and that stakeholders understand how they can be involved, contribute and influence the plan's development as shown in Table 4.12 .

Table 4. 12: Stakeholders engagement and participation in South Africa

Stakeholder	Role	Comments
Government	Formulated a legislation and a policy in line with the beneficiation strategy for the mining industry; Revised the mining charter on mining companies based on the Broad-based Black Economic Empowerment; Spillover sharing in the SADC community.	Broad-based Black Economic Empowerment Act No.53 of 2003, as amended, was formulated in order to enhance the economic participation of black people in the South African economy.
Mining companies	Eradicating poverty through CSR program.	Educational and healthcare system improvement.
Universities	Worked in partnership with mining companies through CSR program.	Looking at developing local skills to support downstream beneficiation competitiveness.

4.8.5 Economic linkages development of South Africa

Linkages have played an important role in industrial development in South Africa, but they have often been reinforced by policy interventions as shown in Table 4.13 (Schwank, 2018).

Table 4. 13: Development of economic linkages in South Africa

Type of Linkage	Findings	Policy	Strategy
Upstream	Integration of SMEs into the main supply chain of the South Africa's mining sector.	Revision of the mining charter Act (2003) applicable to mining companies as follow: (1) 40% capital goods; (2) 70% services; (3) 0% consumer goods?	Create employment by promoting local content to support upstream linkage in relevant aspects of the mining industry.
Forward	Promoted indirect employment.	Through CSR policy.	Additional jobs creation and enabling local content.
Horizontal	Technological advancement; Lateral growth.	Creation of a development hub in research and development.	Move laterally the economy through diversification using skills acquired in the mining industry to other sectors.
Spatial & technological	Poverty eradication; Infrastructure creation; Skills development.	Through CSR policy.	Investing in local skills creation to be sourced locally by large mining companies.

4.8.6 Summary

South Africa is a remarkable achievement in resource-based development, although the country still faces challenges in terms of industrial integration and employment creation. South Africa has demonstrated that despite its geographical location, it is possible to be economically self-sufficient. Much remains to be done in terms of valuing minerals in the country, but the creation of downstream linkages in South Africa has been heavily forced by the self-sufficiency imposed by isolation due to sanctions resulting from the apartheid era. South Africa's economic growth, although unevenly distributed, was boosted by strong global demand for minerals and led to an improvement in the Human Development Index compared to the late 1990s (The World Bank, 2018). It should also be mentioned that the institutions that enable and facilitate the business environment have contributed to the economic growth of South Africa (Economic Policy Division, National Treasure, 2021).

4.9 Summary of cases studies

The history of resource-based development has enabled countries to retrace the dynamics of their economic growth related to the impact of their respective mineral resource value chain in order to implement the relevant policies that could enhance beneficiation, including upstream and downstream, and the linkages between different stakeholders. Resource-based development is not an automatic process. The case studies that have been covered in this chapter have served as an illustration in this research to corroborate the theories against resource curse. The chapter covered case studies illustrating that there is no deterministic approach to economic development based on mineral resources. However, the stakeholders involved in the case studies were very limited due to data availability, but using the government as the main actor in each case study ensured greater reliability. Each country has its own context.

The main factors that influence resource-based development are:

- The mining legal framework should be designed as a driving force for mining to stimulate the economy.
- The government must fully play the role of regulator and stimulator to commit the country to a clear vision of development.
- Implementing a strategy that enables effective linkage-based development and circumvents challenges.
- Implementing a good framework that attracts stakeholder engagement and

participation.

- Development of economic linkages that show a strong value chain including backward, forward, horizontal, consumer, spatial and technological, and fiscal linkages..

These main factors will serve as a guideline in the following chapter when discussing results based on primary and secondary data for Lualaba province and when carrying out a comparative analysis with regard to the development of a strategy in favor of an underdeveloped country.

CHAPTER 5: POLITICAL ECONOMY OF THE DRC

5.1 Introduction

This chapter discusses the political economy of the DRC that the current situation of the country is depicted with regards to the key theoretical components of resource-based development. The second part of the chapter addresses the political economy of the DRC with emphasis on the Lualaba Province.

5.2 Political economy of the DRC

According to the World Bank (2020), the DRC's mineral endowment is estimated at US$ 24 trillion, according to the National Agency for the Promotion of Investments (NAPI, 2020) and the United States Department Office of Investment Affairs (2018), the country is one of the poorest countries in the world. The World Bank, 2020 mentioned in 2018 that 72% of the DRC's population lived in extreme poverty (less than US$ 1.90 per day), especially in the North West and Kasai regions.

5.2.1 Political context

The DRC is considered to be a post-conflict country in which two Congo wars of the 1990s were raging (Diemel and Hilhorst, 2018). Felix Antoine Tshisekedi Tshilombo, the son of Etienne Tshisekedi Wa Mulumba (former opposition leader) is the current president who took office in December 2018 after Joseph Kabila ruled the country for the past 18 years.

5.2.2 Economic status

According to the World Bank the DRC experienced economic growth of up to 5.8% in 2018, before dropping to 4.4% in 2019, mainly due to the fragility of its economy (lack of diversification). This was due to its high reliance (more than 80%) on mineral exports, especially copper and cobalt, triggering a 2% drop in GDP between the closing balance sheet in 2018 and 2019.

Surprisingly, the pandemic of COVID-19 has not had an adverse economic effect as most mining companies have kept their production levels on target, in contrast to the forecasted economic recession of -2.2% in 2020 (World Bank, 2020). However, due to the development at the operational stage of a large-scale mining project operating in Lualaba province (Kamoa-Kakula mine), economic growth is expected to improve, as projected by the World Bank, by 4.4 % in 2019 to 4.5% in 2022.

The World Bank asserted that the depreciation of the DRC's currency (Congolese Franc) was limited in 2019 because the flow of foreign direct investments has been just enough to offset the government's public spending, while at the same time, a decrease in the volume of mineral exports has been observed due to the global market effect in terms of commodity prices. One of the main challenges facing the DRC economy remains the attractiveness of its business environment. According to the (KPMG, 2020), the ranking of improving the business climate and governance in the DRC is 184 out of 190 countries.

5.2.3 DRC's social context and challenges to development

According to a UNDP (2019), the DRC's HDI is 0.459 % below the average of the sub-Saharan average of 0.541%[8], and the DRC is ranked 135 out of 157 countries in terms of the human capital index. To date, the World Bank, 2019 has reported that 57% of families do not have access to potable water and only 20% have access to sanitation. The birth rate in the DRC reaches 6.1 children per woman compared to an average of 4.8 children per woman in the sub-Saharan region.

5.2.4 Historical mineral resources-based development

From a historical point of view, the economy of the DRC is very unstable; however, the growing global demand for minerals such as copper and cobalt combined with minerals such as coltan puts the DRC in a better position to benefit from such a global environment. Given the global environmental concerns that are driving the need to switch to greener energy by manufacturing electric vehicles, a booming demand remains to be recorded in the near future. It is clear that there is a set of mineral policies that must either be formulated or if they already exist, they must be supported by additional policy instruments in order to make them functional. But the DRC currently has many challenges to overcome in order to be on the path of development and before undertaking more in-depth investigations. The next section aims at providing a historical context in relation to the evolution of the legal and mineral framework of the DRC.

[8]The HDI of 0.459% means that children born today will be 45% less productive when they reach the adult age and receive a complete education and proper healthcare. The World Bank, 2019 indicated that Congolese children spend 9.2 years in the educational system and 43% of children are malnourished.

5.3 The vision of the DRC's mining industry

Since the beginning of the mining industry in the DRC in the early 1900s, the sector has produced and exported commodities such as copper, cobalt, and uranium and the management of mineral resources of the DRC as a State can be divided into three major eras:

1. **The colonial era (1908-1960):** The prevailing mining vision of the DRC at the time was mainly focused on reviving the economy of the Kingdom of Belgium. The extractive industry was upstream oriented, with no downstream beneficiation carried out locally. Industry linkages between the copper and cobalt sector and the manufacturing sector were non-existent. The first era is characterised by largely disconnected communities living in different forms of subsistence economy, the agricultural (industrial) sector was not market-oriented as asserted by Hesselbein (2007).
2. **The independence period and Mobutu era (1960-1997)**: Hesselbein (2007) mentioned that the Belgian bureaucratic system prevailing in the first era consisted of a fragmented society with a pocket of capitalism and rural economic systems. Former president Mobutu, who stepped in the office in 1965, re-structured the State in the form of a more inclusive political State (political actors and regions of the country). His strategy aimed at controlling the mineral resources scattered throughout the country and in particular in the Katanga Province. Hesselbein (2007) indicated that Mobutu concluded a joint resource extraction deal with the main players in the prevailing political landscape of the era. The DRC's mining vision was again affected by such a political deal with the complete absence of a resource-based development strategy. This era was characterised by a total disintegration of the State.
3. **The "two Congo wars" era to present (1997-to present)**: Laurent Desire Kabila, who came to power in 1997 and soon after, the country faced two civil wars as indicated by Diemel and Hilhorst (2018). In 2002, Joseph Kabila took over the leadership of the State and promulgated the 2002 mining code intended to revive the mining sector. The code was attractive and stimulating, but the major problem was that the institutions were run under a transitional regime with a form of "Un plus Quatre", one president, and four vice-presidents (Kisangani and Bobb, 2010). This transitional regime led to weak institutions that were supposed to implement the mining code to its full extent, resulting in contracts that had to be reviewed as mentioned in the Lutundula Report (Mercado and Yacoubian, 2007), only almost two decades after the beginning of the

last era that the Ministry of Mines has formulated the DRC mining vision associated with a strategic plan. The Minister of Mines, Mr. Martin Kabwelulu, officially launched the "strategic development plan (2016-2021) of the mining sector of the DRC" (World Bank, 2018), and declared in his speech "The DRC has one of the highest mineral potentials found in almost every province of the country. This is the reason why the Ministry of Mines decided to draw up a 5 years' strategic development plan for the mining sector of the DRC" (World Bank, 2018).

According to the available literature, the strategic development plan (2016-2021) is the only official document available that the DRC as a State has promulgated in order to support its resource-based development plan and vision. This study will focus on the strategic development plan of the mining sector (2016-2021) as the basis for carrying out this research.

5.4 The national Development Plan of the DRC

A country's political history and political economy are important elements of the policy-making process, especially when it comes to the mining sector (Rustomjee, 1993). Pamplona and Penha (2019) mentioned the importance of the policy-making process in the mining sector of Brazil. The overhaul of the policy-making process was formulated and benefited South Africa in the form of the post-apartheid mining policy enabling the country's integration into the global economy (Mosala et. Al., 2017). Dale (1997) indicated that in order to keep South Africa's mining sector competitive and undisturbed after the apartheid era, negotiations around a more participatory and inclusive stakeholders group were conducted.

The DRC has a political history very similar to that of countries like Brazil, Peru, and Chile. The DRC's colonial past and the prevailing political unrest in the country did not allow the policy-making process to improve. The DRC is today a carryover from the Belgian bureaucratic system, the weak institutions system inherited from 32 years of kleptocratic Mobutu's regime, and the two civil wars. Despite the democratic elections of 2018, the country still faces institutional credibility that affects the policy-making process to be effectively implemented at the national level.

Mazalto (2004) indicated that it is in the context of high instability and the prevalence of weak governance zones (especially in areas with high mineral potential) in the country that the DRC government and International Financial Institutions (IFIs) agreed to undertake major political reforms in the mining sector. In this regard, the peace agreement was signed by the belligerents of the armed conflict in DRC in 1999 at Sun City in South Africa.

The reform of the mining sector has focused on the contribution of the extractive sector to the economy of the DRC. The strategy that was developed was called "Stratégie d'assistance"[9]. As part of this strategy, several plans were developed as follows:

- The updated three-years National Development Plan (1999-2001): this plan was formulated between the World Bank and the UNDP, a plan in which priority was given to the reform of the DRC's mining sector;
- The Enforced Interim NDP (2001-2002): the plan was formulated by the DRC government and the Bretton Woods institutions. This plan mainly aimed at stabilizing the macroeconomic context of the DRC and attracting FDI; and
- The Multisectoral Program of Urgent Rehabilitation and Reconstruction (2002-2005): This plan aimed to support the transition government's economic program to fight against poverty. The immediate objectives were to aid the Government sustain macroeconomic stability, strengthen efficiency of public expenditure and civil service management, improve governance in natural resource sectors, and resume delivery of social services.

Former president's Chief of Staff (Néhémie Mwilanya) presented the "Programme National Stratégique pour le Développement" (PNSD) [10] , initiated in 2016 and intended to serve as a guide for the strategic development of the DRC from 2017 to 2021 and its extended version from 2017 to 2050. The document was later approved by the Commission Economique et Finances (ECOFIN). The PNSD suffered from the following weaknesses:

- Pessimism of relevant stakeholders that underlined the "unrealistic" aspect of the PNSD;
- Weak consideration of the relevant sectors of the economy at the provincial level;
- The extended version of the PNSD (2017 to 2050) was heavily criticized because the planning period was too long which did not take into account the risky macroeconomic

[9] The "Stratégie d'assistance" or Strategic plan of assistance" was a sort of Marshal Plan designed for the DRC economy in collaboration between the DRC government and the International Financial Institutions into conduct urgent policy reforms (after the civil war) with the intention to jumpstart the economy of the DRC and consolidate peace in the country.

[10] The PNSD (National Strategic Development program) was initiated in 2016 under the DRC instruction and guidance. The PNSD was financed at 90% by the DRC government. The PNSD was published into two main books and four annexes (www.provinces26rdc.net).

environment (the fragility of the DRC economy related to its high dependence on the mining sector and the market commodity prices fluctuations);

- The macroeconomic projections and forecasts were considered unrealistic; and
- The lack of an operational strategic plan intended to define the context of the applicability of the PNSD.

The PNSD was replaced by the Programme d'Actions Prioritaires, 2018 (PAP 2018-2022) considered to be more inclusive and more focused on sustainability. The PAP 2018-2022 had a reputation to be more focused on the priorities and objectives of relevant sectors of the DRC economy (with emphasis on the mining sector). The PAP 2018-2022 had the advantage of providing sector policy formulation combined with an annual operational plan divided into four objectives as follows (Eale, 2018):

- Provide stability of area of the country that is affected by armed conflicts;
- Consolidating a sustainable and strong economic growth;
- Support existing employment and create more job opportunities; and
- Improve the Human Development Index (HDI)

The PAP 2018-2022 was drawn up on the basis of the vision of development of the DRC which was mainly based on the following elements:

- Improving governance by changing citizen's mentality;
- Economic diversification and competitiveness by promoting research and development;
- Improving the social system and the HDI (GDP of $ 1,050 in 2028; GDP of $4,000 in 2040 and GDP of 12,000 in 2050); and
- Engage in environmental and climate change standard practices.

In terms of NDP and policy reform, the PAP 2018-2022 marked the beginning of a new era in terms of strategic and sustainable development in the DRC due to its inclusiveness in terms of climate change and environmental policy (Eale, 2018). The development strategy formulated in the PAP 2018-2022 identified seven development hubs such as Integrated Economic Zones (Agriculture, manufacturing, technology, research, and development) all connected by railway infrastructures and connected to a reliable power grid.

After the democratic elections of 2018, there was no evidence that the new president-elect Felix Tshisekedi and his government were aligned on the same logic. The DRC is now in political

turmoil to identify the political majority in order to start governing institutions under the new regime.

On the side-lines of the PAP 2018-2022, the DRC, through its bilateral relations with the United Nations Sustainable Development Cooperation Framework (UNSDG) has drawn up a Sustainable Development Financing Plan for 2020-2024 (SDP 2020-2024) articulated around three main pillars as follows (African Development Bank Group, 2018):

- Pillar 1: Consolidate and promote peace, human rights, and democracy
- Pillar 2: Focus on inclusive economic growth, agriculture development, value sharing, sustainable natural resources management.
- Pillar 3: Build a strong and sustainable educational and health care system.

The PAP 2018-2022 remains so far, the existing report that documents the development vision of the DRC.

5.5 The Regulatory framework of the mining industry in DRC

This section describes the regulatory framework for the DRC mining industry.

5.5.1 History of the mining industry of the DRC (Focus on the Katanga Province)

The 2013 GECO Project (The Geology for an Economic Sustainable Development) provides the following historical background to the mining sector in Katanga:

The Union Minière du Haut-Katanga (UMHK), the Chemin de fer du Bas Congo (BCK), and the Société Internationale Forestière et Minière du Congo (Forminière), united in a joint venture to start the extraction and transport of copper from the Katanga region in the early 1900s. Industrial-scale mining in the Katanga region started with the "Etoile" open-pit copper mine in 1910. Due to the expansion of mining activities, infrastructure development led to the construction of the city of Lubumbashi (formerly Elisabethville). Ore processing at this time was exclusively pyrometallurgical, producing blister copper ingots. The railway network was extended to connect with the railway going from Zambia (formerly North Rhodesia) to Cape Town (Jorgensen, 1983).

The development of the Katanga Province started to expand in 1911, with the construction of a second railway network intended to reduce the dependence of the Katanga region on the Zambian-South African railway network. The second railway line crossed Angola to the West coast of Angola at Lobito. In 1913, a copper plant was opened at Likasi. More than a decade later, in 1925, an underground mine was opened at Kipushi, and in the same year, an open-pit

copper mine started at Kolwezi, known today as the Kamoto Oliveira Virgule (KOV) pit (Zientek et al., 2014).

At the same time, Uranium was discovered in the Katanga region and mining activities took place between 1921 until the independence of the DRC in 1960, at the site of the Shinkolobwe mine. During this period, copper, as well as the uranium, were processed upstream and refined in Belgium at the Hoboken refinery.

The period after independence was punctuated by a great deal of political unrest. In 1965 President Mobutu supported the transition of the UMHK from private to parastatal. In 1971, it became Gecamines, under the so-called "Zaireanization". This allowed the former DRC president to have full control of the Katanga mining sector. In the early 2000s, after the promulgation of the new mining code under Kabila's regime, investors came back but without impact on how beneficiation should be carried out in the country. To date, the mining sector of the DRC, which is best developed in the Katanga region, is still upstream-oriented, with very little impact on local communities.

5.5.2 Diagnosis of the DRC mining sector, evolution of the legal and regulatory framework

According to a joint report by the DRC Ministry of Mines and the World Bank (2019), the legal and regulatory framework of the DRC is divided into two main eras, the colonial legislation (1910-1967) and the post-colonial legislation (1967-present).

The colonial legislation was implemented by decree of December 16, 1910, which was recently amended by the decree of April 16, 1919. The Congo-Belge government formulated its first mining legislation which was applicable only in the Katanga Province. The mining legislation of 1919 incorporated provisions for mining exploration and operations. By the colonial decree of September 24, 1937, the mining legislation became applicable to the whole country. The Decree of 1937 remained in force for three decades, until seven years after the independence of the Congo in 1967.

The postcolonial legislation is marked by the enactment of the first Congolese mining law that was promulgated under the Act No 67/231 of May 3, 1967. This mining law regulated both the mining and oil sectors before its amendment under the Act No81-013 of April 2, 1981, the General Legislation on Minerals and Oil.

The post-colonial period was marked by a drastic drop in the production volume of the DRC's mining sector, because of lack of incentives and attractiveness of the regulatory framework that prevailed during the post-colonial period and especially at the time of President Mobutu with an immediate impact on the fiscal linkage of the economy of the DRC (Formerly Zaire) (World Bank, 2018).

In 2002, and under the former DRC president Joseph Kabila, the mining sector was regulated by the Act No 007/2002 of July 11, 2002, as the DRC Mining Code and supplemented by the Act No 38/2003 of March 26, 2003, on mining regulations. Compared to the era of President Mobutu under the Act No 81-013 of April 2, 1981, the enactment of 2002 did not achieve all the expected goals, but the report mentions some relevant positive points (World Bank, 2018):

- Foreign Direct Investment has been made possible, in large part to a much more transparent process of granting mining rights, based on first in first serve approach;
- Attractive fiscal regime in which incentives have been included in order to attract investors;
- Contracts stability was guaranteed; and
- Environmental aspects and corporate social responsibility have been incorporated in the mining code.

At this stage in the evolution of the DRC regulatory framework, the DRC government has failed to provide a better business climate and failed to implement a sustainable resource-based strategy due to the lack of transparency and quality of governance (World Bank, Report, 2018). de Schoutheete et al. (2021) indicated that at the regional level, the DRC legal framework is also affiliated to the Organisation for the Harmonisation of Business Law in Africa (OHADA) since September 12, 2012 that law is in force in DRC in areas where the civil law of DRC is not applicable. The DRC has ratified the 1958 New York Convention on the recognition of foreign arbitral awards as well as the UK Bribery Act and US Foreign Corrupt Practices Act, it is mainly a question of facilitating and improving the business climate of the country in terms of business attractiveness.

In addition to the 2002 mining code, the DRC also enacted the creation of the Mining Cadastre (CAMI) on decree No 068/2003 of April 3, 2003, and decree No 05/160 establishing the national committee of the initiative for transparency (CN-ITIE/RDC). Lassourd (2018) indicated that the New Mining Code of the DRC, promulgated by decree No 18/024 of June 8, 2018, had positive aspects which were integrated. Importantly, the new mining code used a

much more comprehensive and inclusive approach in terms of the interaction of stakeholders such as civil society which has been involved in the process of revising the mining code from the start, resulting in provisions in the new mining code on community development and transparency. Lassourd (2018) analysed the new fiscal regime of the new DRC mining code and noticed an increase in tax compared to the 2002 mining code which appeared generous compared to the international standard (Figure 5.1).

Currently, the new DRC mining code (2018) is the subject of very divergent views between the state and the mining industry (Lassourd, 2018), mainly due to the absence of a broader consultative approach (particularly with regard to mining sector experts operating in the DRC). According to Lassourd (2018), the tax regime of the new mining code requires a tax of up to 10% on "strategic minerals" such as cobalt, coltan, and niobium and the same fiscal regime calls for a tax on additional profit. This is as shown in Figure 5.1 where the strategic substance of the RDC 2018 code increases to 72% against 62% of the non-strategic substance of the RDC 2018 code. Thus, the new mining code is less attractive for investors, a burden for medium-sized mining companies to invest and develop, and also very difficult to implement (Lassourd, 2018).

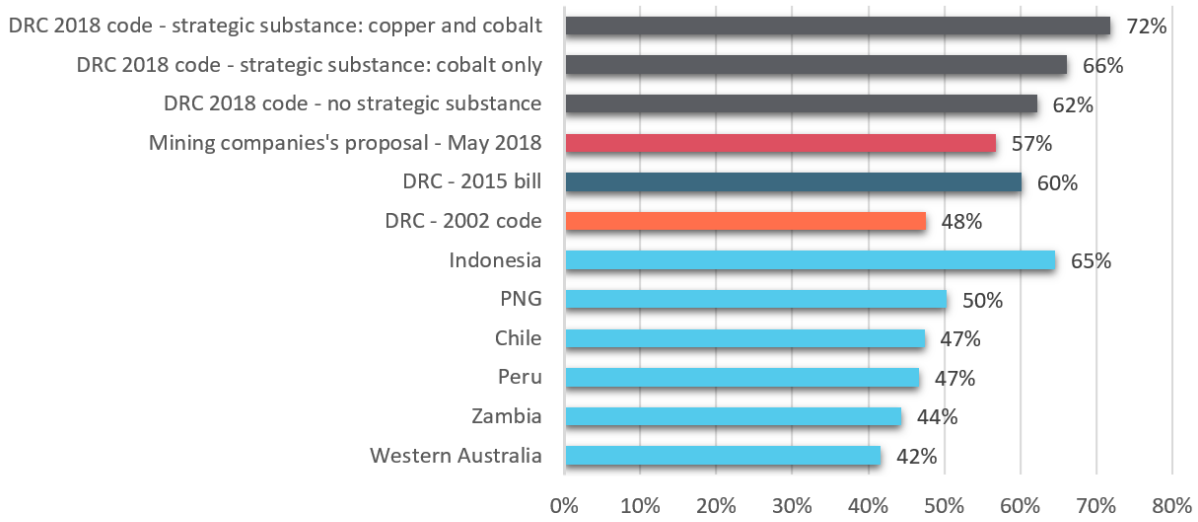

Figure 5. 1: Average effective tax rate[11] from a cobalt/copper project based on the Ruashi mining project (Lassourd, 2018)

Even though the country seems to have a good economic approach, industrial links such as manufacturing and downstream sectors are not developing as raw materials are exported as such, creating employment opportunities elsewhere, and limiting opportunities for the DRC to

[11] Based on a 10% discount rate, assuming price and cobalt prices trigger the superprofit tax. Source: NRGI, fiscal models

develop economically. The Mobutu era, due to the prevailing cold war and the strategic geographical location of the DRC, the mining code of 1967, followed by the nationalisation of companies (Zaireanization) in 1973, did not help the country to attract foreign investments. President Mobutu had played the role of staying in power in exchange for the DRC's mineral resources, especially the cobalt, as part of the so-called "National strategic stockpile strategy" of the USA and served foreign interests (lack of vision's ownership as a major stakeholder).

The total bankruptcy of Zaire as a State forced the Regime of President Kabila in 1997 and lately 2001, his son Joseph Kabila to draw up an attractive mining code aimed at attracting FDI. However, the literature review on the DRC history indicated the relevance of the Katanga Region as a potential source of minerals since 1910, and to this day, the region still provides the mineral resources that the DRC needs to trigger its development. Even today, the DRC government has implemented a decentralisation campaign aimed at subdividing and delegating part of the power of central government (including retroceding 40% of income tax generated by each local government) to the sub-regions or provinces. This makes the Lualaba Province one of the most mineral-endowed provinces in the country, with almost all the country's mineral potential of cobalt and more than half the wold's reserves of cobalt. The following section will highlight the challenges facing the DRC mining sector in general and in the future, and what can be done at Lualaba province level to promote the linkage strategy that could lead to sustainable resource-based development on the Province, and, by extension, nationally.

5.6 Stakeholders' engagement in the mining sector of the DRC

With the growing demand for raw materials such as copper and cobalt in the electric vehicle manufacturing industry, coupled with the DRC's strong mining potential, the participation of stakeholders in the country's mining sector has become an international concern. Although, armed conflicts do not directly affect the areas in which the copper and cobalt are extracted, it is relevant to underline the necessity of the DRC government, as a major stakeholder in the extractive sector, to engage to play its role effectively.

5.6.1 Mining in armed conflict areas (gold mining)

The eastern part of the DRC, especially in the region of Ituri, has been designated a weak governance zone by the Organization for Economic Cooperation and Development (OECD). Kapelus et al. (2009) indicated that a weak governance zone is an environment in which governments are unable or unwilling to assume their responsibility. According to Kapelus et al. (2009), such an attitude (inability to engage as the main stakeholder) of a government

triggered broader negative consequences such as endemic violence, crime, and corruption with immediate consequences on the HDI.

AngloGold Ashanti is an example that illustrates the challenges faced by multinational mining companies operating in an area of weak governance in the DRC. The DRC government granted the exploration license to AngloGold Ashanti to operate in the gold-rich region of Mongbwalu. Despite the deployment of a United Nations (UN) peacekeeping force "Mission des Nations Unies en Republique Démocratique du Congo" (MONUC) in 1999, the Mongbwalu region was largely dominated by a rebel group called Front des Nationalists Intégrationistes (FNI). The evidence collected by the Human Rights Watch (2005), alleged that in terms of stakeholder engagement, AngloGold Ashanti made a payment of US$ 8,000 to the rebel force which was accused of several human rights cases of abuse in the local community. Not only that, Kapelus et al. (2009) indicated that the multinational mining company provided accommodation, transport, and aerial freight support to the rebel force of FNI. Human Rights Watch subsequently published a report titled "The Curse of the gold" (Kapelus et al. 2009). The mining context in the DRC where a multinational operates in an area of weak governance has been widely commented on in the media. AngloGold Ashanti has been an example of stakeholder irresponsibility in terms of commitment to resource-based development.

5.6.2 Mining in non-conflict areas (copper and cobalt extraction)

Mining in the unarmed areas of the DRC is mainly dominated by the extraction of copper and cobalt which is located partly in the Haut-Katanga Province but is mostly in the Lualaba Province. The extraction of copper and cobalt is dominant by the size of the industry and also by the volume of government's revenues, and the activity is located on the Copperbelt [12].

The OECD Centre for Responsible Business Conduct (2020) published an article online on stakeholder engagement in the DRC (OECD, 2021). The OECD stakeholder engagement survey focused on copper and cobalt mining at both industrial (multinational mining companies) and artisanal levels.

The OECD expert visit to the DRC focused on the conditions under which copper and cobalt are extracted and brought to the international market, with an emphasis on the involvement of the end consumer in the electric vehicles manufacturing industry. The OECD addressed the involvement of politically exposed stakeholders and the corruption resulting from the alleged

[12] The Copperbelt is a natural region in Central Africa which sits on the border region between northern Zambia and the southern Democratic Republic of Congo. It is known for copper mining.

sale of DRC mineral deposits at less than their market economic value, causing a loss for the DRC government in terms of revenues. Not only that, the OECD communicated to the DRC stakeholders on media perception on the risk of child labour and the involvement of security forces in the mineral trade (both at industrial mine sites and artisanal). The stakeholders' engagement forum organised by the OECD also addressed the risk for multinational mining companies that conduct economic transactions with the DRC government over devalued mineral deposits (with little or no due diligence) to be exposed to legal liabilities. Paul Hollesen, the Vice President of the Environment and Community Affairs at AngloGold Ashanti, once said "Stakeholder's engagement is about treating each other with dignity and respect".

5.7 Mineral policy formulation process and beneficiation strategy in the DRC

This section is based on the literature review covered so far and will attempt to demonstrate how, in the light of widely accepted concepts, mineral policies have been developed in DRC. With respect to previous claims, it was found necessary to examine what the DRC has achieved historically in terms of mining policy formulation.

Mazalto (2005) indicated that soon after the peace treaty of Sun City in South Africa, the DRC government and the Bretton Woods Institutions worked actively to formulate a context for reforms for the mining sector in the country. The IFI supported the efforts of the DRC government to stabilise and promote economic growth by recommending the following:

- Eliminate the monopoly on diamonds market of the DRC;
- Formulate and promulgate an incentive investments code; and
- Promulgate a new mining code (lately promulgated in 2002)

5.7.1 Roles and responsibilities of stakeholders

Mazalto (2005) indicated that the mining code of 2002 had the advantage of redefining the role of the state by defining a new feature of the legislation, the liberty of minimum action of the State. Mazalto (2005) also indicated that the prospective investor is granted the rights of ownership, mining operator, and trader. It was a considerable step forward, Mazalto said in attracting FDI to the country, as the Zaireanization implemented by Mobutu had a negative impact on the economy by fostering uncertainty and putting FDI at risk. Mazalto, 2005 also underlined the positive movement that the mining reform of the DRC has taken with regard to environmental policy and accountability of stakeholders.

The mining code of 2002 included a provision prohibiting access to mining rights for people working in the public sector (avoid conflict of interests). Mazalto (2005) also mentioned that the 2002 mining code prohibited the export of raw materials unless the exporter demonstrates the DRC government's interest in doing so. The code stipulated that export authorization could only be granted after evaluation of local options for enrichment (such as the possibility of profiting from it at a lower cost).

The mining code of 2002 migrated from a conventional mining regime to a common-law mining regime meaning a more flexible mining regime that can allow exceptions under certain investment conditions (Mazalto, 2005). In addition, the mining code of 2002 introduced the "First-In, First-Out " concept in terms of submitting an application for mining rights by a prospective investor that will be recognised as "eligible" to be granted mining rights (Mazalto, 2005).

5.8 Mineral resources-based development of the Lualaba Province (challenges)

This section describes the Lualaba Province, in terms of geological reserves with an emphasis on the cobalt reserves as a potential trigger for its economic development on one hand, and also discusses the various challenges in terms of implementing the resource-based development strategy (as formulated by the DRC Ministry of Mines) on the other hand.

As aforementioned in Section 5.3, the DRC Minister of Mines, Mr. Martin Kabwelulu, officially launched the "strategic development plan (2016-2021) [13] of the mining sector of the DRC" (World Bank, 2018), and declared in his speech "The DRC has one of the highest mineral potential found in almost every province of the country. This is the reason why the Ministry of Mines decided to elaborate a five years' strategic development plan for the mining sector of the DRC". It is disappointing to note that half a decade later, the key elements

[13]The Strategic development plan of the mining sector of the DRC is a 5 years' plan, based on the vision to develop a competitive and sustainable mining sector, in order to be starting point of the DRC development and DRC citizens' well-being. In addition to that, the Ministry of Mines also asserted that the core mission of the strategic development plan is to ensure a good governance of the sector by using DRC's mineral resources optimally (World Bank, 2018). The Minister of Mines of the DRC asserted that this plan was the first of its kind, to be promulgated by the government of the country. Core aspects of this plan are: the focus on innovation, diversification, creating and adding value, increase shareholders' participation such as local communities, NGOs and civil society.

formulated in the strategic plan (diversification, innovation and shareholder participation) are far from being followed.

5.8.1 Location of the Lualaba Province

The Lualaba Province is located in the south of the DRC and the south-west of the former Grand Katanga region (Katanga). It shares borders with Angola on its western part, with Zambia on its southern part and the Haut-Katanga Province on its eastern part (Figure 5.2). The Lualaba Province represents nearly 80% of the cobalt reserves of the country (Figure 5.3). With Kolwezi as the administrative capital, the province has the highest concentration of cobalt deposits such as in Kamoto, Mashamba-East, Mashamba West, Kilamusembu, etc. Most of these deposits are located at the top of the geological structure of the copper belt that crosses the border with the Republic of Zambia. The Copperbelt minerals are generally associated with cobalt (malachite, heterogeneity) and are widely distributed.

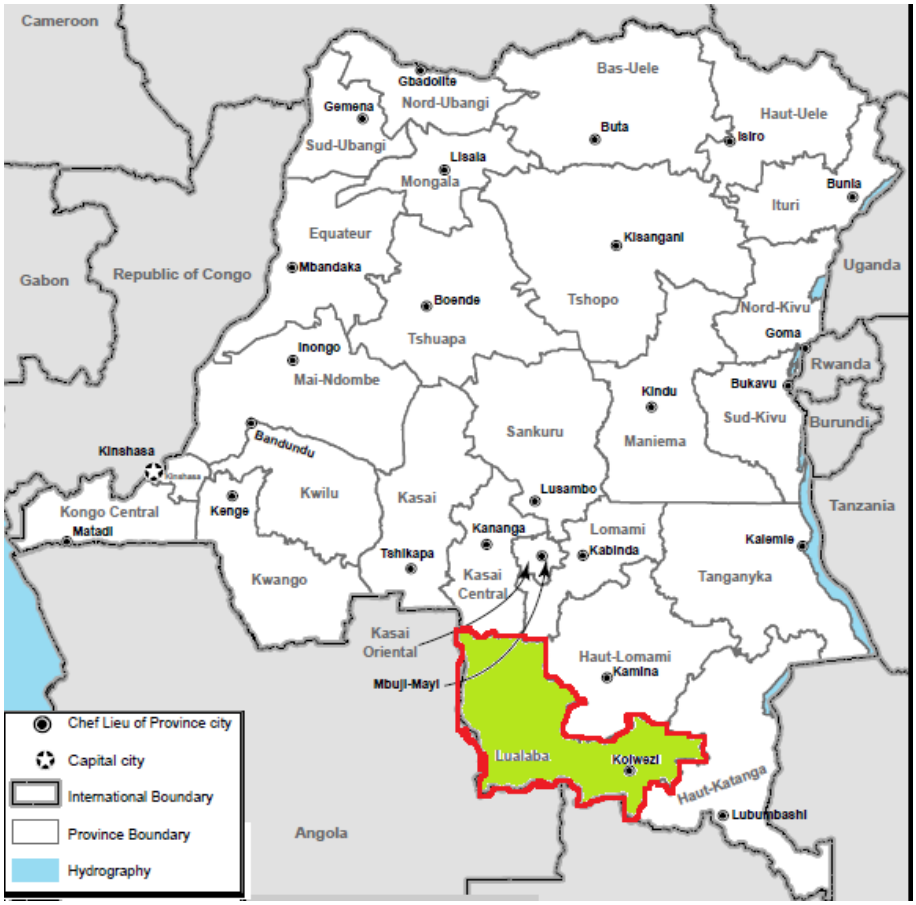

Figure 5. 2: Location of the Lualaba Province in DRC (map modified from UNHCR, Global insight digital mapping, copyright 1998, Europa Technologies) (UNHCR-DRC, 2015)

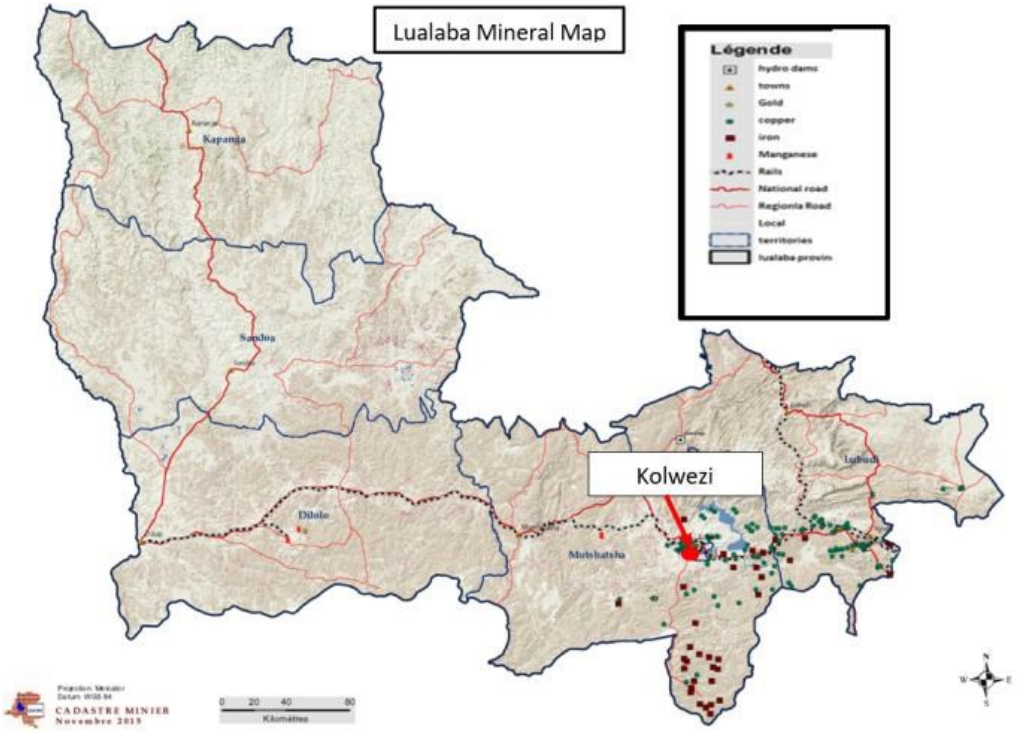

Figure 5. 3: Map of cobalt occurrences in Kolwezi (DRC Ministry of Mines cadastre, 2015. (CAID, 2015).

5.8.2 Geological settings of the Lualaba Province

Geologically located at the top of the Katangese Supergroup, Tsurukawa et al. (2011) published in the Oko-Institute the repot that the cobalt-rich deposits in the Lualaba Province are classified into five essential types:

- The Roan geological period as categorised by Dewaele et al. (2008), consisting of primary stratiform deposits of oxidized, mixed, and sulphide ores;
- According to Dewaele et al. (2008), vein-type ore deposits were discovered in the Lufilian Arc consisting of tectonic fractures and faults of the Lufilian orogeny sequence;
- Heterogenite-type of cobalt minerals, constituting of cobalt caps, supergene, enriched in a form of oxidized ores;
- Black earth cobalt-type deposits, consisting of ore concentrated into valleys; and
- Cobalt tailings resulting from decades of copper mining campaigns by the Belgian colony (de Haan and Kiezebrink, 2016).

The geological settings have shown, according to several researchers that cobalt is a mineral that is found in nature, associated with other primary minerals such as copper, and due to this

geological configuration, cobalt production is subject to certain industrial limitations which will be furtherly discussed in this study.

At present, the Lualaba Province hosts the largest part of foreign investors operating in the region and extracting copper and cobalt. It is relevant to mention that all mining companies extract or will extract copper as their main product, associated with cobalt as a by-product.

5.8.3 Use of cobalt in the global manufacturing industry

Cobalt has become a key commodity in high-tech industries and is particularly essential in the manufacturing of batteries for electric vehicles due to its unique ferromagnetic properties (Cobalt Institute, 2017). At the same time, as this exceptional demand for cobalt is growing, the lack of beneficiation of cobalt in the country results in a significant loss of economic opportunities in terms of government tax revenues and local employment in the DRC. According to Pistilli (2021) in the Investing News, the DRC's 2018 cobalt accounted for 70% of the global commodity production. Figure 5.4 shows the distribution of cobalt used in the global industry.

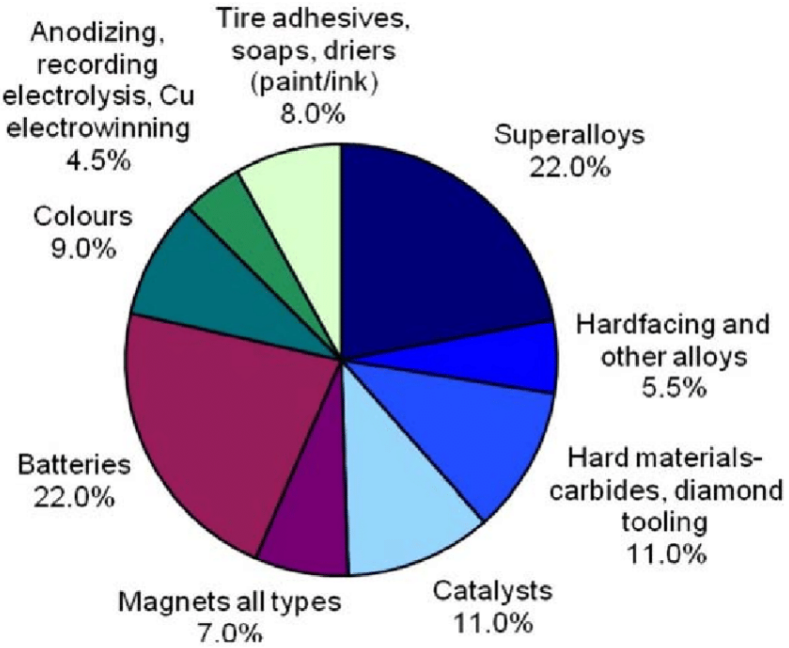

Figure 5. 4: Cobalt use distribution in the industry (GHGm, 2008)

Figure 5.3 shows that the superalloys market accounts for 22% and is one of the key components of the industry due to the superpower countries that need to upgrade their defence system continuously. The other major part of the use of cobalt is the batteries manufacturing

sector directly linked to the growing environmental concern about global warming, which requires the use of greener energy.

The cobalt beneficiation generally includes a primary beneficiation circuit (copper, or another mineral) from which it is derived to be furtherly enriched. Farjana, et al. (2019) provided a generic flow sheet of the process of extracting metallic cobalt from a copper-cobalt deposit as shown in Figure 5.5.

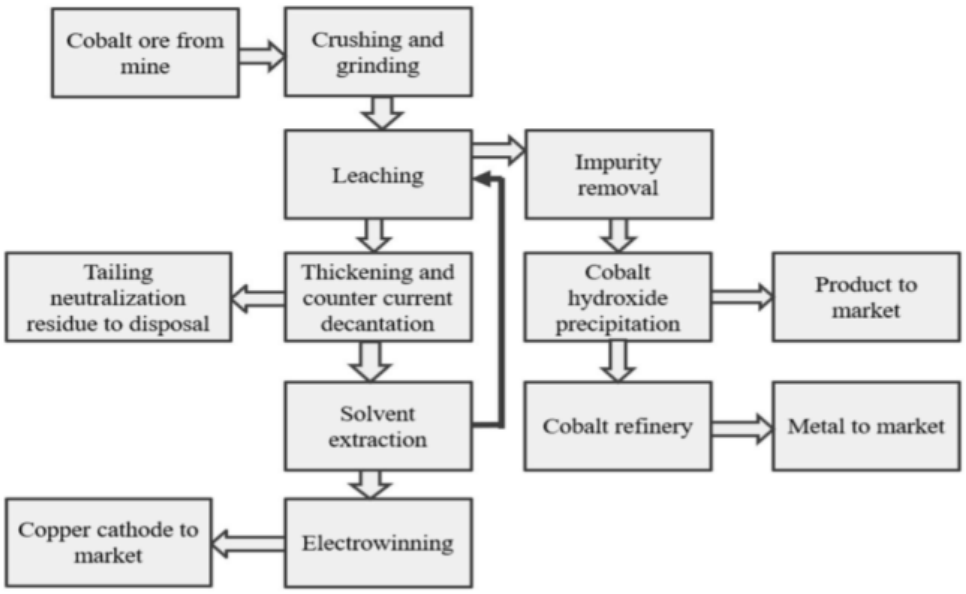

Figure 5. 5: Cobalt metal extraction process flow sheet. (Modified from Farjana et al. (2019)

The cobalt found in the DRC is associated with copper. Most companies in Lualaba Province operate as copper-oriented mining companies using hydrometallurgy. While cobalt is a by-product of copper production, its value chain is limited because cobalt production relies on the copper production process. The increase in cobalt production is linked to a much larger copper production capacity. Figure 5.6 shows the common cobalt value chain in the Lualaba Province.

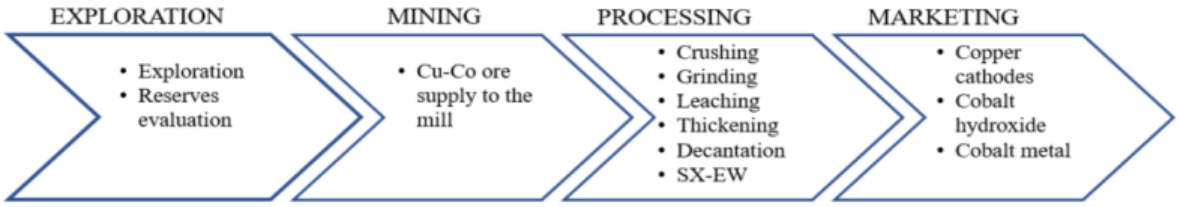

Figure 5. 6: Cobalt value chain (Baxter, 2005)

Exploration programs were largely carried out for a decade when the DRC's attractive mining code of 2002 was enacted and led mining companies to invest heavily in the area. The political turmoil that paved the way for each election period risked tarnishing the country's image in terms of the business climate, thus increasing the level of uncertainty instead of fostering investment and attracting FDI. The enactment and promulgation of the New Mining Code of 2018, categorising cobalt as a strategic mineral of the DRC, and the tax regime associated with it, has not helped to attract or create incentives for the development of exploration programs, having more companies focusing on a short or medium-term mining plan rather than investing massively in their mining properties. This has immediate consequences on the way companies' environmental and social responsibility is exercised in their areas of activity.

In other words, the mining value chain in the DRC is cut off from exploration at one end and downstream beneficiation at the other end. The following section will discuss the challenges that the DRC faces, with a direct impact on Lualaba province, in terms of resource-based development.

5.8.4 Current challenges of the mining industry of the Lualaba Province

The challenges facing the mining industry in Lualaba Province can be characterized into two main categories which are structural challenges and infrastructure challenges.

5.8.4.1 Infrastructure challenges

The infrastructure of the Lualaba Province can be separated into infrastructure such as road and railway networks on the one hand and power-related infrastructure on the other hand.

a) Power-related infrastructure challenges

At the country level, according to a snapshot report by PWC (2012), power blackouts and electricity shortages are frequent and are major issues in attracting new foreign mining companies (or limiting the increase in production of existing operating companies). The DRC faces a combined problem in terms of electricity; the obsolescence of existing power infrastructure and the need to build and capacitate new power facilities (PWC, 2012). KPMG (2014) claimed in its report that despite these challenges, the country has a hydroelectric potential of at least 100,000 MW, which can make the DRC the largest electricity exporter on the African continent.

At the provincial level (Lualaba), IVANHOE (2018), claimed that Executive Chairman Robert Friedland and General Manager Lars-Eric Johansson of the Kamoa-Kakula Copper Project declared that the company would invest in energy modernization Mwadingusha hydroelectric

power station which has tripled its production from 11 to 32 megawatts (MW)[14]. Executives of the Kamoa – Kakula copper project, indicated that tripling the output of the Mwadingusha dam to 32 MW is only a first step because this output only represents 45% of its total capacity (71 MW). Apart from Mwadingusha power station, IVANHOE (2018) officials also said that two additional hydropower stations such as Koni (dam downstream of Mwadingusha) and Nzilo1 (40 km north of Kolwezi) will also need to be restored in order to have 200 MW of hydroelectricity and meet all energy needs of the IVANHOE project only.

Efforts to provide sufficient power in the mining sector of the Lualaba Province have been spurred by a partnership between SICOMINES, a Chinese mining company operating in the region and the DRC government. In 2016, a US$ 660 million contract was awarded by the DRC government to companies based in Canada and China to build a 240 MW hydropower dam (Busanga dam) within 5 years to supply power in the Lualaba Province and primarily to SICOMINES in order to meet their electricity needs (Poindexter, 2016).

Kamoto Copper Company (a mining company also operating in Lualaba) has mentioned on that it is working closely with SNEL to repair two turbines at 1,424 MW Inga II hydropower plant in SNEL, in addition to restoring a 2,000 km power line to upgrade the facility with extra 450 MW, of which 380 MW will be exclusively reserved for the two Glencore mines in Kamoto and Mutanda Mine. The list of active mining companies that need electricity grows almost in proportion to the need for copper and cobalt on the world market, forcing the DRC government to import electricity from neighbouring countries such as Zambia (Alves et al., 2018).

b) Roads and railway networks infrastructure challenges

The "Société Commerciale des Transports et des Ports"(SCTP) and the "Société Nationale des Chemins de Fer du Congo" (SNCC) are the main railway companies in the DRC. The SCTP railway network extends from Kinshasa (the capital city of the DRC) to the Port of Matadi[15]. The SCTP railway network is still in service despite its 30 years of service and under acceptable conditions. The SNCC railway network is an extensive network and it is mainly concentrated in the former Katanga region and was dedicated to the exports of copper, zinc, and cobalt by Gecamines (the State-owned mining company), with its important branch being the major link

[14]Rehabilitating the Mwadingusha hydropower dam is conducted in association with the Société Nationale d'Eléctricité (SNEL) which is the State-owned electricity company in DRC.

[15]The Port of Matadi is located far west from Kinshasa and constitutes the only access of DRC to the Atlantic Ocean.

between the Katanga region to the Zambian and Angolan border in Dilolo (PWC, 2012). The SNCC network is in poor condition and almost difficult to support the export flows of minerals from operating mines in Lualaba province to Durban in South Africa due to its obsolescence in terms of the condition of the rails.

The road network has been at the top of the priority list of the DRC government since the end of the conflict in 2003, as asserted by PWC (2012). According to the DRC Ministry of Infrastructure, the DRC's total road network comprises 153,209 Km of which only 3,000 Km is currently paved after almost two decades of the end of the war.

In the Lualaba Province the reliable road infrastructure used for mineral exports consists of 410 Km from Kolwezi to Kasumbalesa via Lubumbashi (border with Zambia), for example the journey time of one week by road from Kolwezi to Durban. Kasumbalesa border is characterized by a concentration of State services and fiscal agencies, which makes the export-import process very long (sometimes 4 days) for goods to cross the border. Except for the Kasumbalesa border, there is a possibility for the Lualaba Province to export minerals using the road that should connect Kolwezi in DRC to Solwezi in Zambia on a shorter 85 Km road on the side of the DRC side and 91Km on the Zambian side (180 Km in total).

The 180 Km link between Kolwezi and Solwezi should expect to guarantee the link between the DRC national road RN39 and the Zambian national road T005. On July 18, 2018, the local government of Lualaba province and Zambian officials met to assess the cost and needs of the project. For political reasons, the central government of the DRC has never granted or approved the start of the construction of the road in question.

5.8.4.2 Structural challenges

Structural challenges are the most difficult to face because they are related to the institutions, to the existing policies and quality of governance ("How the mineral sector of the country and the province is currently regulated").

a) Institutional challenges of the mining sector at province level

The institutional challenges of the mining sector in the DRC are as old as those in Zaire, under President Mobutu's regime. Mazalto, (2005) asserted that as early as 1985, the IMF had already suggested institutional reforms for the mining sector in the DRC. The IMF recommended in 1982-1983 that the Zairian government partially privatise State-owned mining companies by allocating some of their mining concessions to artisanal mining activities. The IFM strategy was a sectoral approach and targeted the restructuration of Gecamines (State-owned copper

and Cobalt Company) and MIBA (Minière de Bakwanga) in order to mitigate the weakness of the institutional structures, especially in terms of management. President Mobutu's regime ended the collaboration with IMF at restructuring the mining sector in 1986, leaving the country on the brink of financial bankruptcy in 1986 (Mazalto, 2005).

Effective law enforcement has been difficult for the government, although a new mining law and regulation (2002), in line with best practice, has been adopted. Some argue that the institutional preconditions required to implement the transparency and governance provisions of the mining code do not currently exist. These include appropriate administrative structures, government institutions capable of oversight; well-trained (and well-paid) staff and intergovernmental/institutional cooperation (de Schoutheete et al. 2021). The mining code of 2002 was promulgated in order to incentivise the DRC mining sector, and attract foreign investment, but more importantly, the mining code of 2002 deliberately reduced the risks of the mining sector (DRC was reportedly considered as a post-conflict country and signed a peace agreement) by offering a guarantee of investment security and property rights to foreign mining companies (Mazalto, 2005). In this context, State-Owned companies and in particular Gecamines have adopted an approach of creating joint ventures supported by fiscal incentives such as tax exemption at the beginning of mining operations and for a certain period. The DRC's mineral resources were then handed over to foreign investors with the limited role played by the government as the peace treaty that was concluded in Pretoria ended with the creation of a transitional government that was not by definition, the appropriated structure of the State that govern and administer the DRC mining sector. It is in this context that most mining contracts in the DRC were negotiated (Mazalto, 2005).

In the introductory part of the R1 report (2016) of the DRC Ministry of Mines, the government asserted that the DRC's economic growth rate was 8% average in the period range of 2011-2014. The R1 report (2016) also claimed that the economic diversification has remained very low and almost non-existent, and the economy of the country has remained fragile due to its dependence on the mineral sector. The Ministry of Mines identified the following challenges, after consulting with the PWC Company:

- Lack of a well-formulated and shared vision;
- Lack of comprehensive and well-documented geological data;

- The existence of two administrative contexts (institutional overlaps) especially between the CTCPM[16] and the DEP[17];
- Lack of an organisational and collaborative framework between the entities of the Ministry of Mines and other governmental sectors of the Congolese State;
- Poor human resource management due to the lack of competitive and skilled workforce such as geologists, mining and metallurgical engineers associated with a high level of bureaucracy (payroll and other administrative issues like retirement, etc.); and
- Lack of financial and logistical means.

Based on this analysis, it remains clear that historically, the DRC government has failed to promote a strong fiscal linkage between its mineral sector and the rest of its economy. At the province level, due to the concentration of mining activities in the Lualaba Province and the size of its industry, what has been stated at the country level remains valid at the level of the Lualaba Province.

In terms of fiscal linkage, at the province level, Garrett and Lintzer (2010) questioned the positive impact of tax collection by the DRC government at the Katanga Province level. Garrett and Lintzer (2010) indicated the challenge of implementing the fiscal linkage in the DRC, provided that an equitable sub-national redistribution of mineral wealth has not historically occurred and in a country where the economy is still partially informal. The tax collection in the mining sector of the Katanga Province is potentially significant because the World Bank forecasted that the mineral production of the DRC could generate between $US 200 to $US 400 million in terms of tax revenues over a period of 5 years (Garrett and Lintzer, 2010). The DRC's tax system works is much more challenging as illustrated by Garrett and Lintzer (2010), with an emphasis on how tax collection agencies in DRC (DGDA former OFIDA), DGI, DGRAD) operates (incomplete isolation without exchanging any data between agencies). Rent-seeking behaviour and grand corruption practices are the standard practice in the mining

[16] The CTCPM (Cellule Technique de Contrôle et de Planification Minière) is an entity of the DRC Ministry of Mines that was created under the Mining Code of 2002 in charge of conducting and controlling the strategic mine planning sector at country level with regards to all minerals available under the mining rights granted to operating mining companies in the country.

[17] The DEP (Direction des études et planification) is an entity of the DRC Ministry of planning that was created in 2015 by decree N^{0}15/043 of the 28 December 2015

sector of the DRC. Mining companies do not pay what is required and government tax agencies do not operate in transparency.

This section has dealt with challenges (both structural and institutional) that the mining sector in the Lualaba Province is currently facing. The researcher considered it relevant to focus on the context in which, the section outlined how the political context of the country has a particular impact on the development of fiscal linkages, which is one of the important linkages if the economy of a country expects to harness its mineral potential for its economic development. Most importantly, the section illustrated infrastructure challenges and the lack of the existence of a comprehensive resource-based vision at a country level and at the province level.

b) Natural resource governance

Corruption, mismanagement, insufficient institutional capacity and fundamental deficiencies in governance have contributed to the poor performance of the lucrative mining and forestry sectors in the DRC (World Bank, 2008; Trefon, 2010). The local population of Katanga – the main copper and cobalt producing region of the DRC – for example, has not yet benefited from the region's resources (Afoaku, 2010). There is currently a significant gap between what should be paid in mining and forestry tax revenue and what is actually recorded (World Bank, 2008), largely due to a lack of transparency and accountability and fraudulent practices by companies and government agencies (World Bank, 2008). Bank, 2008; Trefon, 2010). Environmental governance cannot therefore be seen solely as a technical issue because it is also a political and social issue (Trefon, 2010).

c) Livelihoods and business environment

Food insecurity in the protracted crisis situation in eastern DRC must be addressed not only through short-term consumption support, but also through a political economy approach that addresses structural causes, such as the depletion of stocks of assets, and examines institutional contexts. Institutional frameworks play an important role as they mediate access to land and markets, which determine livelihood opportunities and household food security (Lecoutere et al, 2009). While property rights are protected by law in the DRC, the provisions are routinely violated by state and private actors (Afoaku, 2010). This can limit livelihoods and business opportunities.

5.9 Summary

The DRC represents one aspect of the resource curse as its mineral endowment is estimated at US$24 trillion while it is ranked among the poorest countries with 72% of the population living in extreme poverty. The economy of the DRC is unstable because the country is highly dependent on mineral exports, which, reinforcing the depreciation of the currency, does not allow the government to compensate for public expenditure. However, the DRC should be in a better position to benefit from the growing global demand for minerals such as copper and cobalt combined with minerals such as coltan.

The DRC's resource-based development challenges date back to colonial-era history until today, as several fluctuations in the management of mineral resources have occurred, leading to volatility in the economy. Likewise, the current mining policy is changed to revive the economy, whereas it was previously designed to restrict resource-based development with insufficient economic linkages, non-existent downstream beneficiation in order to revive the economy of Western countries. Furthermore, the mining code put in place in 2002 to revive the mining sector has been further improved with a new strategic development plan to date. Thus, there has been reform in the mining sector with the aim of maintaining macroeconomic stability, improving the efficiency of public expenditure management and the civil service, improving governance in the natural resource sectors and resume the provision of social services.

Mining expansion has worked for infrastructure development although the low value of the mineral chain is upstream oriented and also requires improvement for mining efficiency. In this regard, mining regulations have been gradually enacted in order to bring positive points in terms of foreign direct investment, attractive tax regime and environmental aspects and corporate social responsibility. Currently, the government has attempted to alleviate the resource-based development challenge through a new mining code with the introduction of a new tax regime deemed impractical by investors.

The government's decentralization drive has enabled Lualaba Province, the most mineral-rich provinces in the country, to strategize on aspects that can foster resource-based sustainable development. The inability of the DRC government to show its role as a major player has allowed some multinational mining companies to control the weak governance area by financing the rebels accused of several cases of human rights abuses in the local community. However, Lualaba Province has been a troubled area for decades and occupies a majestic

geological position being rich in cobalt known to host the bulk of foreign investors who were to promote resource-based development with an appropriate mining policy which promotes the expansion of the value of the mineral chain, including downstream beneficiation, good economic linkages and the stakeholders' engagement.

In addition, infrastructural and structural challenges have been an obstacle for the DRC to move forward on the vision of resource-based development that required a sound mining policy that promotes a win-win situation, an extended mining value chain that includes beneficiation upstream and downstream, effective economic linkages and reliable stakeholders. Thus, the government is basically working to increase energy capacity that meets its objective of expanding industrial mining, developing roads and railways, and building strong institutions that ensure accountability of stakeholders, support the tax system, and eradicate corruption and unrest.

CHAPTER 6: RESEARCH FINDINGS AND DISCUSSION

6.1 Findings

The research findings were based on data collected from a set of 18 open-ended questions and 23 closed-ended questions comprising 4 specific questionnaires addressed to the Ministry of Mines of the Lualaba Province (Appendix A). Closed-ended questions were addressed respectively to academic institutions, civil society, NGOs, mining practitioners, subcontractors, and local government.

The closed-ended questionnaire aimed primarily at providing stakeholders' participation and engagement and to highlight their relationship to the mining sector of the province, while the open-ended questionnaire provided insights on how respondents perceived the mining industry of the Lualaba Province and what they believed to be the appropriate strategy to apply in terms of economic linkages strategy development.

6.1.1 Share of respondents in the local industry

Respondents numbering 51 from local industry variously grouped into 7 stakeholder categories were asked to respond specifically to the questionnaires assigned to them and found to be informative on the issue related to resource-based development concerning the Lualaba Province (Table 6.1).

Table 6. 1: Share of respondents in the local industry

Sector	Industry	No of respondents under each group	Percentage
1	Mining Companies	9	18%
2	Ministry of Mines	5	10%
3	Civil society	8	16%
4	Academic	10	20%
5	Local community	6	11%
6	Subcontractor	7	14%
7	NGOs	6	11%
Total	7	51	100%

6.1.2 Respondents working experience in the industry

It was deemed important to group respondents according to their experience in the industry in order to determine the reliability of the information received relative to the number of years they have been in the industry (Table 6. 2). Jang, 2020 said: "Given the wide range of options

in conducting a survey, it is imperative for the consumer/reader of survey findings to understand the potential for bias as well as the strategies and techniques used for reducing bias, so that appropriate conclusions can be drawn from the data". In addition, several authors conclude that effort should be made to improve response quality by enhancing respondent experience and engagement, especially through cost-effective methods (Couper, 2000; Sleep & Puleston, 2008).

Table 6. 2: Working experience of respondents

Experience in the industry (years)	Respondents	Percentage
2 to 5	13	25%
5 to 10	17	33%
more than 10	21	41%
Total	51	100%

6.1.3 Education level of respondents

With regard to education, for example, education categories are more detailed or better documented in some datasets than in others. Education is a fundamental variable of social origin covered by all surveys and used in numerous statistical analyses, but very difficult to harmonise (Schneider, 2021). To facilitate this task and bring a harmonization which wishes to have an optimum of reliable information, a new framework of harmonization was set up with the use of the respondents of the variable levels of education as shown in Table 6.3.

Table 6. 3: Level of literacy of respondents

Level of Education of respondents	No of respondents under each group	Percentage
Elementary	1	2%
Matric level technician	6	11%
secondary school	3	6%
Undergraduate	33	65%
Postgraduate	8	16%
Total	51	100%

6.2 Close-Ended Questionnaire analysis

To analyse the responses of participants to the close-ended questionnaire, descriptive statistics tools such as central tendency and location have been used. The four important characteristics of a frequency distribution are:

- ✓ Measures of central tendency and location (mean, median, mode)
- ✓ Measures of dispersion (variance, standard deviation and range)
- ✓ The extent of symmetry or asymmetry or skewness
- ✓ The flatness or peakedness (kurtosis)

A summary of the results associated with the participants' responses is presented in Figures 6.1 and 6.2. Out of 23 questions, 17 questions resulted in a negative skewness showing that the maximum tail goes to -2.988 (Figure 6.1) because the averages are mostly to the left of the peak (Appendix D). This drops to Q15 where the percentage of respondents peaked at 90.2% to disagree that SMEs have access to materials or by-products from mines operating in the Lualaba Province (Figure 6.2).

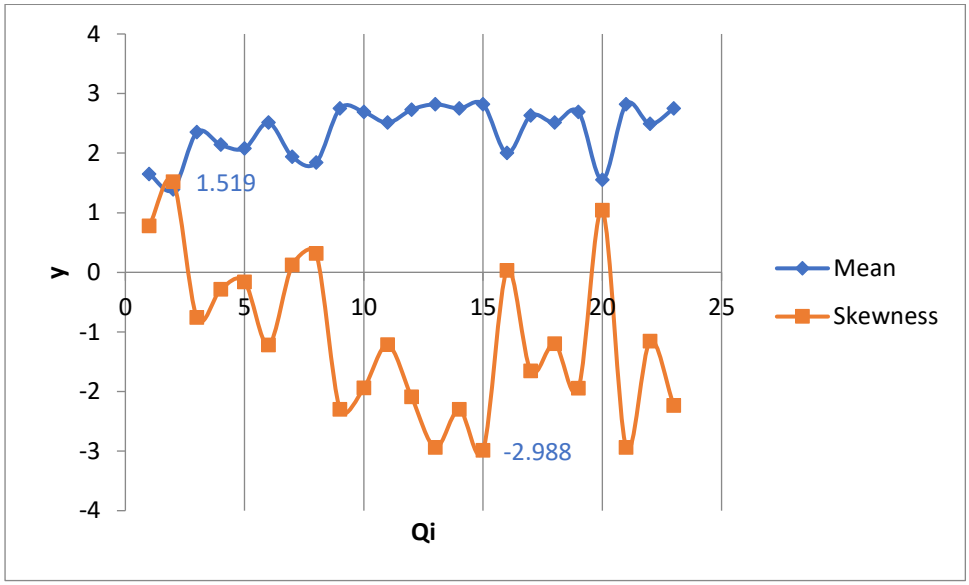

Figure 6. 1: Respondents effects on variant distribution

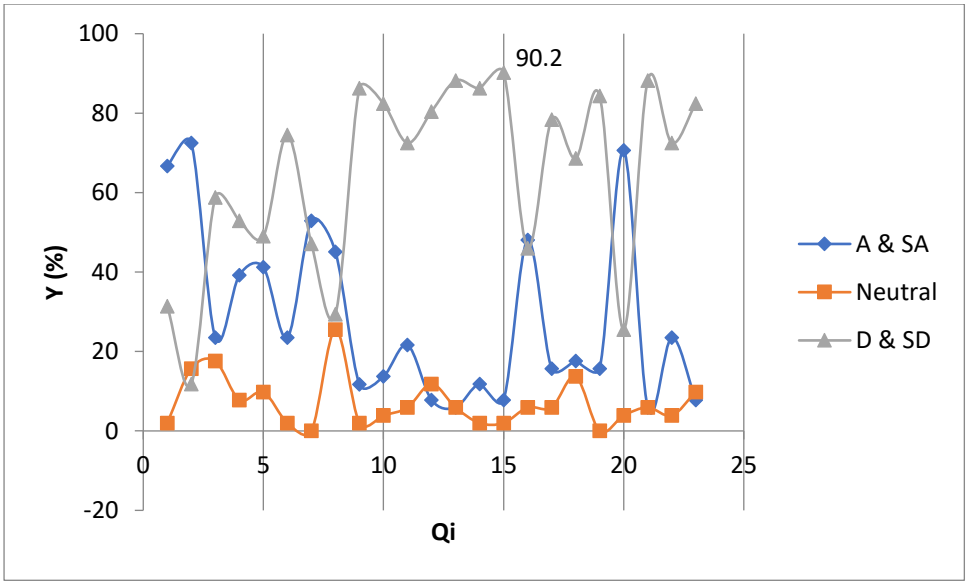

Figure 6. 2: Answer characteristic on respondents[18]

The results presented in Appendix A (Section D) as individual questions were presented according the objective of this study:

- Question Q1: The mine employs members of the local community

The purpose of this question was to evaluate the strength of linkages through economic multipliers. The question aimed at highlighting the level of local content promotion in terms of job creation and community involvement. Thus, 66.7% agreed while 31.4% of respondents disagreed. The skewness of 0.777 indicated positive feedback from respondents with a range of 2.

- Question Q2: The mine employs local skilled people

The purpose of this question was to assess the representativeness of community members in the highest paid employee category, as there is a strong perception that local people refer to the "workforce". The answers to this question resulted in 72.5

% of respondents agreed while 11.8% of respondents disagreed. This question yielded a mean of 1.390 and a positive skewness of 1.519.

- Question Q3: The mine employs enough local people in general

When the researcher separated the concept of "Local DRC citizen" and "National citizen" concerning employment, respondents demonstrated a very different attitude. Regarding the

[18] A & SA: agree & Strongly Agree; D & SD: disagree & Strongly Disagree

answers to this question, 58.8 % of respondents disagreed while 23.5 % agreed. The reason is that mining companies operating in the Lualaba Province have built facilities and camps to accommodate DRC nationals and expatriates and due to limited capacity, some other DRC nationals from other cities have had to relocate to the surrounding villages or communities to find a job in the mines. The DRC nationals who moved were highly skilled had been readily employed as local staff with a detrimental effect on the local community. This question yielded a negative skewness of -0.760 and a mean of 2.350. Here, the employment policy specific to mining companies must be clarified.

- Question Q4: The community feels the impact of mining activity in terms of jobs creation

This question was addressed to have comprehensive feedback on the local community's perception of "what to expect" from a possible downstream beneficiation strategy. This question highlighted that upstream of the value chain, the local community does not feel the impact of mining activity. In this regard, the community will likely be more frustrated downstream as it will need an even more skilled and competitive workforce. The answers to this question yielded 52.9% of respondents disagreed while only 39.2% of respondents agreed with skewness of -0.285.

- Question Q5: Community believes that making cobalt-based components can create more jobs for the local community

This question was intended to clarify question Q4. It was deemed reasonable to clarify the community's perception of a mining company deciding to go downstream. The perception of participants was overall negative. Focused on "local" citizens around the mine, respondents believe that the lack of an appropriate recruitment and employment policy will continue to negatively affect community members. This question yielded 49% of respondents who disagreed while 41.2% agreed with a mean of 2.08 and skewness of -0.161.

- Question Q6: Social programs of mining companies have been well communicated to the local community

The question aims to address the level of knowledge (quantity of information) of the community with regards to what and how to claim their rights, and how to explore the possibility of local content development. Respondents disagreed at 74.5% while only 23.5%

agreed. The perception of respondents is that the community is not really interested in the impact to be long-term regarding mining social program.

- Question Q7: Local communities around the mining activity understand what is meant by a social program

In line with question Q6, the researcher addressed the need to assess the level of understanding of a social program to follow up with relevant representatives of the industry. The researcher intended to clarify if the local community understands the purpose of a social program and if the community has a broad view of the relevance of such a program. This question yielded 52.9 % of respondents who agreed while 47.1 % of respondents disagreed. The perception of the researcher is that despite positive feedback from the respondents, the local community still has to engage in broader participation which must include the medium and long-term needs with regards to economic development claims of the local community should include a provision to move sideways. The mean was 1.94 and skewness of 0.121.

- Question Q8: The mine supports existing social programs

This question aims to achieve a state of the art in the province of Lualaba based on the reality on the ground. Mining companies operating in the Lualaba Province, especially Chinese investments are not following the social agenda closely. Most of those companies partially implement and monitor the program for the sole purpose of obtaining the operating license. The perception of respondents is that before granting the operating license, the government should consider a provision in the mining legal framework, include the realization of the social framework in the feasibility study. Respondent feedback was 45.1 % agreed, 25.5 % neutral and 29.4 % disagree, and a positive skewness of 0.314.

- Question Q9: The mine management promotes communication with local communities

The purpose of this question was to assess the communication level between the mine and the community. This question underlines the stakeholder engagement and participation and intends to assess whether the local community and the mine are working in a collaborative approach. Respondent feedback was 11.8 % of respondents who agreed, while 86.3 % of respondents disagreed. There is a lack of communication between the mines and the communities particularly with regard to the annual profits that the mines make are not clearly communicated in line with the 0.3% that must be reimbursed to the community as stipulated by the code of

2018 (Montembault and Adao, 2020). This question yielded a mean of 2.750 and skewness of -2.301.

- Question Q10: The mine provides enough infrastructure to the local community

Subsidiary to question Q9 concerning stakeholder engagement and participation, question Q10 has become more specific and the reaction of respondents was overall negative. Thus, 82.4 % of participants disagree while only 13.7 % of respondents agree and strongly agree. The purpose of this question was to assess the development of the spatial linkage in the community. Comments from respondents highlighted the issue of infrastructure, particularly electricity, in relation to the energy challenges facing Lualaba Province. The mean was 2.690 and the skewness of –1.940.

- Question Q11: The mine promotes health and education for local communities

The purpose of this question was to determine the level of development of the spatial linkage (infrastructure linkage) associated with skills and development linkage. The question is also whether the mine could do something other than its CSR, such as collaboration between the mining company and an educational or health institution. The question yielded overall negative feedback of 72.5 % of respondents while 21.6 % of respondents agreed. The mean was 2.51 and the skewness was -1.218.

- Question Q12: The community is aware of the uses and criticality of cobalt in the global industry

The expectation of the researcher behind this question was to assess the level of understanding of the finite aspect of cobalt as a mineral resource to help the community better understand and articulate needs regarding lateral movement at the community level, and in the future, at the provincial and national levels. Respondents' answers showed that there is a significant gap in terms of community awareness. Respondents at 80.4% think the community is unaware of the criticality, while only 7.8% of respondents agreed. The average was 2.730 and -2.092 skewness.

- Question Q13: The community is aware of what is involved in the production of cobalt

The purpose of this question was to determine key elements to consider as part of a strategy for promoting the local content using upstream linkages. The question was oriented to consider employment opportunities in terms of the supply chain, local skills, and R&D strategy. This

question demonstrated that 88.2 % of respondents had a negative perception that the awareness level was low while only 5.9 % of respondents agreed. The mean was 2.820 and skewness of -2.940.

- Question Q14: The community is aware that before producing cobalt, copper must first be mined

The expectation of this question was complementary to question Q13 and aimed to clarify what should be integrated into a downstream valuation strategy by policymakers. It was found that 86.3 % of respondents felt that there was no sufficient knowledge on the topic when only 11.8 % of respondents agreed. The mean was 2.75 and -2.301 of skewness.

- Question Q15: Small and medium-sized enterprises (SMEs) have access to materials or by-products from mines operating in the Lualaba Province.

The researcher expected to determine which policy should support accessibility to materials. This question was formulated to assess the current level of collaboration between SMEs and mining companies established in the Lualaba Province. Behind this question, there is the need to know what will be the scope of a collaborative approach between mining companies and SMEs in a long-term downstream beneficiation strategy. Thus, 90.2% of respondents disagreed while only 7.8% agreed. This is an indicator that if a beneficiation strategy is to be implemented, some policies must be inclusive and incentive in terms of stakeholder collaboration (Mineral Resource Department, SA, 2011). The mean was 2.82 and skewness of -2.988.

- Question Q16: SMEs are aware of what type of standard of goods and services they are expected to provide.

The purpose of this question was to determine what policy should be applied in terms of a collaborative approach that should promote competitiveness, skills development, and R&D. What strategy should be implemented in the short, medium, or long term? What does it take to make local SMEs competitive? Although the respondents' answers gave 48.1% agreement, the researcher understands that SMEs need strong state support in terms of training, skills upgrading and R&D.

- Question Q17: Mines are willing to promote local SMEs to make them sufficiently competitive at the global level

The purpose of this question is complementary to question Q16. What would be the attitude of mining companies if a downstream beneficiation strategy is formulated? What should be integrated with the legal framework to incentivize the collaboration of mining companies operating in the Lualaba Province? This question gathered 15.7 % of respondents who believe that mining companies will encourage the promotion of local SMEs and 78.4 % of respondents are not optimistic. The mean was 2.63 and skewness of -1. 654. This is a strong indicator of stakeholder collaboration.

- Question Q18: Mines are willing to work with SMEs to source more goods and services locally.

Mining companies established in the Lualaba Province source goods and services from foreign countries with a detrimental effect on the DRC economy in general and the Lualaba Province in particular. At the same time, the manufacturing sector in the province is non-existent. The question here was whether mining companies would help to clearly articulate their needs in terms of the quality of goods and services that can be subject of policy formulation regarding the development of a short, medium, or long-term strategy for the local content. Here, the manufacturing sector should gradually evolve from a non-existent stage to foster development capable of absorbing demand from the mining industry (creating backward linkages). The data collected showed that 68.6 % of the respondents felt that the mines in operations are unwilling to source locally when only 17.6 % of respondents agreed. The mean was 2.51 and -1.199 for skewness.

- Question 19: Mining companies are willing to go downstream the cobalt value chain

The purpose of this question was to address limiting development factors such as the business climate, corruption, good governance, fiscal linkage, transparency, and strength of institutions. The euphemism of this question is to assess mining companies' perception of the viability of downstream beneficiation against the associated challenges. In this case, 84.3 % of respondents indicated that mining companies operating in the Lualaba Province will not promote downstream beneficiation of the cobalt value chain.

- Question Q20: The government does not do enough to promote local manufacturing and downstream beneficiation of cobalt

The purpose of this question was to determine whether the government has conceptualized the criticality of the cobalt and whether the government is ready to take any responsibility

(stakeholder engagement) regarding the revival of the economy of the Lualaba Province. This question aims to determine if the government has adequate policies and a contextual legal framework in place regarding the cobalt value chain. In this case, 70.6 % of respondents agree and strongly agree that the government is not doing enough in terms of policy formulation.

- Question 21: The 2018 Mining code and Investment code do not provide enough incentive

The purpose of this question was to assess the effectiveness of the legal aspects that can promote downstream beneficiation in the cobalt value chain of the Lualaba Province. Regarding the respondents, 88.2 % indicated that improvements were still needed in terms of the legal framework regarding mining legislation of the DRC, even on the 2018 mining code while only 5.9 % of respondents believe that the legislation in DRC is correctly applied and that it is an incentive. The mean was 2.82 and skewness of -2.940.

- Question 22: The Local government of the Lualaba Province can help promote local downstream beneficiation of the cobalt value chain.

The purpose of this question was to determine if the local government has the means to promote downstream beneficiation in terms of transparency, fiscal linkage, infrastructure and spatial linkages, policy on corruption, good governance, legal framework, incentives. Thus, 82.4% of participants disagree.

- Question 23: Is there any clear formulated cobalt-based strategy at the province level and National level?

The purpose of this question was to determine if the local and national government had established a development strategy based on cobalt as a critical mineral. Thus, 82.4 % of respondents disagree and only 7.8 % of respondents agreed. The mean was 2.75 and skewness of -2.239.

6.2.1 Factor analysis and determination of constructs

Close-ended questions were formulated as a Likert-type questionnaire from which participant's answers were collected and processed using the factor analysis method. This research used correlation coefficients (Pearson correlation) to determine how variables (questions to participants) are interrelated as advised by Mair (2018). A reliability test (or pre-testing of the

questionnaire) was also conducted in this research using the Cronbach's coefficient to assess the validity of the factors as indicated by Mair (2018).

- Factor Analysis

The factor analysis technique was conducted in this study to reduce the amount of data and determine the latent variables of the constructs which constitute the outline of the research. For this research, the Principal Axis Method (PAM) was used as an Exploratory Factor Analysis (EFA) to determine the key factors and related variables. Mair (2018) recommended the use of EFA because it is considered a classic approach in terms of determining latent variables based on the correlation structure of data.

- EFA model formulation

The raw data from the close-ended questionnaire for this research consisted of an n x m matrix in which n=51 respondents and m=23 questions. The data were processed using SPSS software and the results are summarized in Appendix A (Section E)

In addition to the EFA method, the Varimax rotation method was used to simplify the expression of the items (factors) that the researcher used for the construct analysis. Forina et al. (2005) indicated that the Varimax rotation method is the last step of factor analysis. In this research, both the non-rotating and the rotating factors were determined as shown in Appendix A (Section E & F).

The not returned results which are displayed in Table 6.5 above showed the concentration of variables in the loading of factor 1, making it difficult to elaborate a clear construction on the study.
After applying the method of Varimax rotation as recommended by Forina et al. (2005) the rotated results were summarized in Appendix A (Section F).

For the factors to be more expressive in terms of latent variables, a cut-off value of 0.5 was applied to the results as discussed by Truong and McColl (2011).

Factors loading for this analysis were submitted to a Cronbach's Alpha coefficient calculation to assess the data reliability and the results are shown in Table 6.7 below. Field (2005, p.675) as cited by Zonwabele (2015) indicated that Cronbach Alpha value of 0.60 as a minimum threshold is considered acceptable when attitudes are measured.

After factor analysis, correlation calculation, and Cronbach's Alpha Value calculation, the results are presented in Table 6.7 below.

Factors 7 and 8 were single item-related and directly linked to their variables (Q21 and Q16). Table 6.7 above showed that the constructs yielded values above 0.6 which were deemed acceptable for this study.

Determination of constructs

The determination of constructs was elaborated around the research proposals indicated in Section 1.6 of this study:

- **Proposition 1**: The DRC government, as the main stakeholder still has a weak operational engagement and participation.
- **Proposition 2**: There is very little understanding of the positive impact of local downstream beneficiation.
- **Proposition 3**: The promotion of local content is weak and there is a need to develop this sector, which can potentially support the local minerals beneficiation.
- **Proposition 4**: There is a lack of an operational laid out National Development Plan to outline a clear resources-based strategy around the cobalt mineral potential (no existing short term, mid-term or long-term manufacturing strategy using cobalt as the main component).

F1: Social and economic impact of the mining industry, value sharing-related issues, and the role of the State (Q3, Q4, Q10, Q11) state as follow:

- The mining sector employs enough local peoples in general.
- The community feels the impact of mining activities in terms of job creation.
- The mining sector provides sufficient infrastructure to the local community?
- The mining sector promotes health and education for local communities.

F2: Forward (downstream) linkages development related issues (Q17, Q19, Q22) state as follow:

- Mining sector will support local SMEs to make them competitive at the global level.
- Mining companies are willing to go downstream on the cobalt value chain.
- The local government of the Lualaba Province can help promote local downstream beneficiation of the cobalt value chain.

F3: Stakeholder's communication related-issues (Q9, Q13, Q14, Q15) state as follow:

- The mine management promotes communication with local communities.
- The community is aware of the implementation of the production of cobalt.
- The community is aware that before producing cobalt, copper must first be mined.
- SMEs have access to materials or by-products from mines operating in the Lualaba Province.

F4: CSR and sustainable local content development strategy related-issues (Q1, Q2, Q7, Q8) state as follow:

- The Mining sector employs members of the local community.
- The mining sector employs skilled local peoples.
- The local communities around the mining activity understand what is meant by the social program.
- The mining sector supports existing social programs.

F5: Downstream strategy formulation and implementation (Q5, Q6, Q23) state as follow:

- The community believes that fabricating cobalt-based components can create more jobs for the local community.
- Social programs of mining companies have been well communicated to the local community.
- Is there any clear formulated cobalt-based strategy at province and National levels?

F6: Skills shortage (R&D) linkages and willingness to create and develop them (Q12, Q18) state as follow:

- The community is aware of the uses and criticality of cobalt in the global industry.
- Mines are willing to work with SMEs to source more goods and services locally.

F7: Lack of incentive policies development at the governmental and local level to develop and promote downstream beneficiation (Fiscal related linkages) Q21 as state below:

- The Mining code of 2018 and the Investment code provide sufficient incentive.

F8: Integrability of local industry into the global supply chain (Q16) as given below:

- SMEs are aware of what type of standards for goods and services they are supposed to provide.

6.2.1.1 Results of construct 1 (F1)

Construct 1 depicts social and economic impact of the mining industry, value sharing-related issues and the role of the State as the resultant of the questions Q3, Q4, Q10 and Q11 (Table 6.4 & 6.5).

a) Mining Company

This construction resulted in a negative skew of -0.258, with the perception of mining companies agreeing that employing local people saves costs and helps in the ongoing process of obtaining and maintaining a social license to operate. Recognizing these opportunities for social and economic development, governments use a wide range of policies and strategies to promote direct local employment in the mining sector (International Institute for Sustainable Development (IISD), 2018).

b) Minister of Mines

The investigation carried out with the Minister the Mines resulted in positive skewness of 0.59 of being agreed that the mine stays open to use local personal to assert that the promise of local employment is at the heart of the public debate. For local communities, decent jobs in mining companies that are secure, stable and fairly paid allow employees and their families to plan ahead to improve their livelihoods and financial security. For host governments, local employment in the mining sector supports national priorities and policy promises of job creation, human capital development and inclusive economic growth.

c) Civil society

A negative skewness of -0.659 for disagreement on the part of civil society was recorded on the various interactions between the mine and the local population or community. Civil society is strongly impacted by the growing inequalities between local populations. It is therefore important to uncover and understand the disparities that exist between the well-intentioned social and labour plans of mining companies and the low levels of socio-economic development that exist on the ground where the mines operate in Lualaba Province. Overall, the prioritization of mining jobs over other jobs has undermined the ability of social capital to act against mining risks.

It is therefore essential to improve the various interactions between the mines and the local community in order to promote sustainable development. The socio-economy must benefit

from mining, as mining companies must have a solid plan that addresses the social challenges in mining communities. In addition, it is good to identify the elements of social and labour plans that are more popular among projects implemented by mining companies, i.e. to understand why certain elements of social and labour plans are preferred over others. Mining companies should put in place a robust monitoring system that helps assess local economic development projects in social work plans to determine their adequacy.

d) Academics

The strong negative skewness of -2.737 shows the significant disagree on the part of researchers on the various interactions between the mine and the local population or community. Academics have more information about the mining situation and the local community. Thus, academics must be given more attention as they develop high critical thinking and problem solving skills that enable them to understand problems and have a better approach to solving them. Various efforts have been made to overcome unemployment with approaches such as entrepreneurship. However, one of the approaches has been education. The role of education in access to employment is well recognized (Organization for Economic Co-operation and Development (OECD), 2008; Stats SA, 2014). Giuliano and Tsibouris (2001) identified that unemployment decreases with the level of education. In other words, the more educated people are, the better their chances of getting a job. Conversely, with an outdated curriculum and inherent policies, the Congolese education system does not provide those who graduate necessary skills and knowledge in order to easily enter the labour market (African Development Bank, 2012), while education and relevant skills are the main factors of good labour market outcome (Ionescu, 2012).

The lack of collaboration between higher education and employers in determining the curriculum and policies add to corruption (trade of grades for money) and favouritism (giving high grade to relatives), underfunding (the budget allocated to education), lack of adequate human capital, lack of law enforcement in the education sector and long term effects of persistent wars on education are the challenges that the government should fight in the coming years. Graduate unemployment has also been associated with the Higher Education Institution (HEI) attended, as it was determined that some employers prefer to hire graduates from certain universities because of the trust and confidence they have in the education they provide (Moleke, 2010; Baldry, 2013; Oluwajodu et al., 2015; Walker, 2015).

Moreover, academics are aware that the quality of education is negatively affected because the infrastructure is so old and sometimes even dilapidated that it does not provide a good working environment for students and academics. There are no adequate libraries, no internet access, and no relevant laboratories. Even the shortage of water and electricity also affects academic circles in such a way that students do not know how to have well-established study programs as a result of which they are also victims of load shedding which has now become a regular situation which usually takes hours. Thus, based on these shortcomings of the educational system, the perception of academics could be oriented by equating their situations with the various interactions between the mining companies and the local population or community as a weakness to resource-based development.

e) Local community

The positive skewness of 0.857 shows that they agree that the local community benefits from mining employment with an impact on improving lives, as the mine provides enough infrastructure and effectively promotes health and education. The market channel works when the incomes of local community members increase because they obtain employment in local mining companies, receive higher wages, or provide them with goods and services through backward linkages with other sectors. In addition to these direct benefits, local communities can also benefit indirectly from the presence of extractive industries through the infusion of dynamisms into previously sluggish local factor markets, such as land and credit markets. Market and fiscal circuits will need to be strengthened if local communities are to derive greater benefits (Chuhan-Pole and Dabalen, 2017).

Local content laws are seen as a mechanism to improve market effects by deepening backward linkages. Although these measures are becoming widespread, they have so far produced mixed results. To improve the benefits to local communities through these local content programs, governments may be well advised to focus on improving business conditions, such as better access to affordable and reliable energy, better transport, access to finance and regulatory reforms, in order to facilitate the links between mines and the local economy. Through corporate social responsibility (CSR), mining companies have directly invested in community development: for example, by building schools and health clinics (Chuhan-Pole and Dabalen, 2017).

f) Subcontractor

A negative asymmetry of -0.366 states disagreeing on the interaction between the local population and the mining company with respect to employment, community impact, infrastructure provision, health and welfare promotion 'education. This shows the perception subcontractors have of mining based on what they are going through, as their business is expected to increase when mining is open to the community. Many companies have a business model that utilizes subcontractors for the entire mining cycle, maintaining a small head office to provide direction and control (Rupprecht, 2015). However, mine owners should consider the qualification of potential bidders; for example, the size of the company and its ability to finance the project (Rupprecht, 2015). Company experience and local knowledge are also important when screening potential subcontractors.

To be successful, the mine owner and subcontractor must understand each other's business and trust each other. Both parties exist to make profit, and if either party fails to do so, the contract will fail. Contractors must understand the mine owner's quality expectations, requirements and constraints in order to deliver an optimal result. Likewise, the owner must understand the realities of mining, production and stripping considerations, as well as other operational issues. Owners and subcontractors should establish and manage the relationship between the two parties with the goal of removing barriers, encouraging maximum contribution, and enabling both parties to achieve success and maximize project results. Thus, the interaction between the subcontractor and the mining operation benefits the local community as employment increases; the community feels the impact of mining activity in their area in terms of job creation which includes the development of infrastructures and the promotion of health and education.

g) NGO

Negative skewness of -0.870 which translates to disagree to show NGO perception on mining interaction with local community regarding job creation, impact of mining activity, infrastructure provision, health promotion and education. Mining companies have seen their public image badly scarred, fermenting a negative image toward their interaction with local community. This negative perception has also been seen by non-governmental organizations (NGOs) which are known as an organization that mainly works with the local people to properly investigate the real problem and find the effective approach to help in the sustainability of life. In this regard, the NGO can be frequented by local communities to point out that they do not benefit sufficiently from the income and the wealth of the mineral resources that belong to them. In other word, the NGO can be aware of the pressure that the local

communities exert on governments and mining companies to allow them to have a greater say in the operations and subsequent benefits derived from minerals extracted from resources within such communities.

6.2.1.2 Results of construct 2 (F2)

This construct concerns forward (downstream) linkages development related issues that the questions are Q17, Q19 and Q22 (Table 6.4 & 6.5)

a) Mining Company

A negative skewness of -0.5 indicating disagreement shows the perception of mining in competitively promoting SMEs and associating with them for downstream beneficiation of the cobalt value chain and local manufacturing of cobalt-based components supported by the provincial government of Lualaba Province. Framework conditions for improving SME competitiveness include an SME-friendly legal, regulatory and administrative environment, SME access to finance, SME support institutional structure, availability of appropriate skills and supporting infrastructure, integrated within the framework of national development (OECD, 2004). If these conditions are not met, it will be practically difficult to promote a globally competitive SME. This deficiency could perhaps be seen by mining to challenge the promotion of SMEs in a competitive way on a global scale.

It should be noted that SMEs are mainly based on the domestic market. However, there are many drawbacks to basing an industrial development program on manufacturing for the domestic market. The protection that it is possible to provide to companies engaged in them against competition from imported products, in terms of price and quality, often has unfortunate consequences on the output and cost price of these industries, not only during their start-up period, but afterwards. The quality of their products will most often be lower than world standards, but the consumer, unable to obtain the imported product, will have no choice but to "take it or leave it" the local product. In the absence of real competition from producers of good quality items at low cost prices, it is likely that firms working for the local market will continue to perform poorly, no real pressure coming force them to become efficient or close their doors. On the other hand, if protection is kept low and imports are allowed, local manufacturers will feel the healthy pressure of international competition. If, within the country, several firms manufacture the same products, it is obviously possible that real internal competition will act as a spur to manufacturers; but the opposite is also possible.

Good teamwork between mining companies and local SMEs is necessary to create and strengthen the linkages that could enable the strengthening of resource-based development. These linkages include: downstream (or forward) linkages into mineral beneficiation and manufacturing; upstream (or backward) linkages into mining capital goods, consumables and services industries; spatial linkages into infrastructure, such as power, logistics, communications and water; and knowledge linkages into skills and technological development (Leeuw, 2012). Thus, the true meaning of partnership between mining companies and local SMEs is to appropriately manage resource-based investments that can lay the foundations for diversified economies (OECD, 2015). Conversely, if the province of Lualaba cannot establish these linkages, it would be better to leave the resources untapped until the linkages can be established in order to avoid falling under the "resource curse".

However, in developing strong linkages with the cobalt value chain, Lualaba Province faces a significant hurdle. Given present shortfalls in domestic capital, technology and national skills, the DRC is highly dependent on foreign direct investment to develop its mining sector, which can seriously jeopardize the development of linkages. Like all businesses, mining investors focus on maximizing wealth for their shareholders, not the host countries. They often have global purchasing strategies and are therefore much less likely to use local suppliers, thereby undermining upstream linkages. Likewise, they seek to optimize their processing and manufacturing facilities globally, which can negate downstream opportunities in host countries. Knowledge linkages also tend to be concentrated in home countries, and foreign investors have much more scope and incentives for transfer pricing to evade tax.

Putting the mining business in the DRC context is relevant to the "risk", not that the Lualaba Province is in unarmed conflict area, but the risk is associated with mining contracts as the Lutundula report (2006) indicates, but also to the fragile fiscal linkage associated with corruption, weakness of institutions in terms of governance. Mining companies have a general perception that it will be costly for them to go downstream because there is no local manufacturing industry, no adequate infrastructure, and not enough electricity.

b) Minister of Mines

This resulted in the highest positive skewness of 1.838 showing agree. The Ministry of Mines could have a plan to strengthen local SMEs that want to be competitive because they operate on a global scale. Promoting downstream beneficiation of the cobalt value chain requires more attention as it is fundamental to reviving the economy of Lualaba province. Thus, strengthening

linkages between stakeholders, such as linking mining companies with SMEs, is important as downstream beneficiation is seen to result in significant investment in new industrial capacity, creating jobs and driving transformation. According to the Minister of Mines, the government of the Lualaba Province as one of stakeholders is able to promote the local manufacture of cobalt-based components. A multi-stakeholder setting with key actors throughout the supply chain, globally and in the DRC, including government, cooperatives and dealers, civil society organizations, workers and manufacturing companies and end users, will be essential in developing systems that promote responsible practices in the production and marketing of cobalt. In addition, foreign earning could be improved if local manufacturing of cobalt-based components is increased and this will also enhance the human capital development of the local people.

c) Civil society

The civil society response resulted in a significant negative skewness of -1.486 indicating disagree. However, civil society organizations play multiple roles which include an important source of information for citizens and government, monitoring government policies and actions, and holding government accountable (Ingram, 2020). They engage in advocacy and propose policy alternatives to government, private sector and other institutions, deliver services, especially to the poor and underserved (Ingram, 2020). They advocate for the rights of citizens and work to change and maintain social norms and behaviors (Ingram, 2020). From these roles, civil society organizations must be sensitized to the situation of SMEs because they bring together possible assets to follow the economic movement of the country with the government and the population.

The challenge is that in developing countries, the characteristics of SMEs determine poor communication with their environment and limited socially responsible behaviours: public visibility and lack of permanent establishments (Azmat and Samaratunge, 2009). SMEs are somewhat isolated and disconnected from the local community…and are unlikely to develop personal relationships with stakeholders and society at large. Moreover, their struggle for existence, their low level of education and awareness, and their connection to local markets only further limit their socially responsible behaviour" (Azmat and Samaratunge 2009, p. 440). Thus, the connection between civil society and SMEs is poor and needs to be enriched by promoting SME business networks (Biggs and Shah, 2006, p. 2). A business network is made up of lasting and strategically important inter-firm links for these firms (Inkpen and Tsang

2005, p. 147), and is mainly based on trust and relational contracts (as opposed to legal contracts) (Biggs and Shah 2006, pp. 7-8).

Furthermore, civil society organizations should be well informed about the government roadmap in order to know that nothing is initiated vis-à-vis the government of the province of Lualaba to help promote the local manufacture of components based on of cobalt. But it is important to know the effectiveness of the interaction between government and civil society organizations which can be based on coercive or non-coercive power. This will require firstly uncovering the ideas that dominate government and civil society discourse (Sassen, 2006; Arato, 1994; Bunyan, 2014; Cohen & Arato, 1997). Secondly, to study the institutional arrangements through which coercive and non-coercive interactions between governments and civil society organizations are constructed (Lowndes & Roberts, 2013; Rhodes, 2006). Thirdly, know the street-level strategies that work within government and civil society organizations (Kim, 2014; Davies, 2011a, 2011b).

d) Academics

Disagree and Strongly Disagree as academics gave a skewness of -0.272 show their view on the overall competitiveness of promoting local SMEs through mining which thus promotes downstream beneficiation of the cobalt value chain. Likewise, the same skewness gives the opinion of academics on the support of the government of the province of Lualaba in promoting the local manufacture of cobalt-based components. Academics can identify the mining company's challenge to promote globally competitive SMEs, knowing that local people are resentful of not benefiting from their mineral resources and requirements to achieve this vision, such as access to finance to enable the growth and development of SMEs. The presence of an alarming rate of failure of SMEs in the DRC and the insignificant contribution to the country's GDP has raised serious concerns in the Congolese economy; there is an urgent need to study the challenges faced by SMEs when seeking finance (Atsede et al., 2018). It is rather ironic that despite the role played by SMEs and their obvious growth potential, they are the most constrained when it comes to accessing external finance (Atsede et al., 2018).

In the vision of an association between mining companies and local SMEs, academics should develop more research that paves the way for downstream beneficiation of the cobalt value chain. Such research should be granted by mining to involve academics in the vision that intellectual property policy should be implemented to secure the research output of academic

institutions. In addition, conferences, symposia, forums and workshops should be organized in the academic field on the various topics that support the vision.

Similarly, the local manufacture of cobalt-based components is intended to boost the economy of the DRC. However, the DRC government lacks the necessary resources at the provincial and local levels to control the mining sector (Nordbrand and Bolme, 2007). The Bank Information Center (2006) is a Washington-based NGO working to make financial institutions promote social and economic justice and environmental sustainability. The provincial ministry also lacked its own independent laboratory to evaluate environmental samples and data provided by mining companies (Nordbrand and Bolme, 2007). This information is accessible to academics, which leads them to have a negative perception of the promotion of the local manufacture of cobalt-based components.

e) Local Community

Positive skewness of 0.326 shows the local community agrees on promoting local SMEs to operate globally competitively. SMEs are all the more likely to get involved in their local communities as their owners typically live in the community in which they work. With this often comes a greater desire to help the community and encourage it to grow and develop to the best of its ability. Promoting local SMEs in a globally competitive manner is the path to implementing sustainable development, which, elevating local community, is defined as the ability of current generations to meet their needs without compromising the ability of future generations to meet theirs (World Commission on Environment and Development (WCED). 1987). While, sustainable development can only be given real meaning by investigating the ideas through a multi-stakeholder approach (Rotheroe et al, 2003). Many mining companies realize the important role of other stakeholders and emphasize stakeholder engagement in the process of mine planning and design, permitting, operation and closure. Thus, using local SMEs as one of the mining stakeholders is well suited for global competitiveness to improve the cobalt value chain, including downstream beneficiation.

Governance and local community participation refers to the ability of citizens to engage in matters of public management not only by participating in voting and other democratic processes that hold decision makers accountable for the interest public, but, more importantly, by participating in the decision-making that would ultimately respond more proactively to citizens' concerns (Ricciardelli, 2018). Thus, the local community is relevant to understand

the position of the government of the province of Lualaba to promote the local manufacture of cobalt-based components.

f) Subcontractor

The negative skew of -0.764 shows disagreement with subcontractors' perception on related mining program with SMEs and government intentions on downstream beneficiation. This is unexpected because mining companies and subcontractors for a given vision always work as a team. However, the subcontractor performs an entire range of activities right from getting possession of land, relief and rehabilitation, mine planning to development and operation of mine and mineral extraction and transportation on behalf of the owner. They outsource a substantial part of operations by awarding contracts to smaller players.

Although the global initiative for open contracts is growing, all these initiatives are limited by the disclosure of contractual information involving a public-private interface. None of these initiatives aims to promote transparency of information on subcontracting when both partners belong to the private sector. This can bias the perception of the subcontractor in the interaction between mining companies and SMEs. It is necessary to open up information because a large number of SMEs depend on a few large companies (Prasad, 2021).

The new mining code that Congo passed last year confirmed that subcontracting in the mining industry will be limited “to companies of which the majority of capital is held by Congolese (Morse, 2022). However, subcontractors bear the brunt of mining companies escaping responsibility for unsafe working conditions that subject workers to excessive hours, discrimination and physical abuse. Therefore, it is difficult for subcontractors to have a true perception of the Lualaba provincial government's intention to promote manufacturing cobalt-based components, as the existing conditions must be met first rather than the upcoming ones.

g) NGOs

Regarding the NGOs, a negative skewness of -0.935 attested to disagree on the related mining interaction with SMEs and the government's intention to promote the manufacture of cobalt-based components.

NGOs recognize the existence of actors with extremely risky status, which hinders access to finance (especially access to capital to support business operations) (Sofala Partners, 2019). As a result, mining operators and cooperatives have limited leverage with financial institutions. This is a strong resistance for mining to promote SMEs globally competitively as well as to

join forces to promote downstream beneficiation. To overcome this challenge, government-associated NGOs (Sofala Partners, 2019):

- to strengthen engagement between mining operators / cooperatives and their business partners (local exporters)
- to benefit from consistent inventory financing (from midstream actors) and potentially from credit / loan facilities from financial institutions
- to reinforce formalization (through third party donor-led technical assistance and support)
- to promote Artisanal and Small-Scale Mining (ASM) aggregation in terms of both supply volumes and the formation of recognized associations/platforms of responsible artisanal operators.

6.2.1.3 Results of construct 3 (F3)

The construct 3 related to Stakeholder's communication related-issues which gathering questions Q9, Q13, Q14 and Q15 (Table 6.4 & 6.5).

a) Mining Company

This resulted in disagree with negative skewness of -0.717. Over the past two decades, the industry has witnessed the need for and emergence of community relations and development (CRD) functions, primarily under the rubric of sustainable development (SD) and corporate social responsibility (CSR) (International Institute for Environment and Development (IIED), 2002, Buxton, 2012). Most mining companies focus on the "cahier de charge" or the claim book but ignore partner feedback. It is also a well-known issue that most mining companies that operate in the Lualaba Province, communicated with communities just to get the mining license, but did not fully comply with the cahier de charges. Most Asian companies, for instance, have been granted licenses to operate under the blessing of former President Kabila without providing any supporting documentation such as a quality stakeholder engagement and participation framework. The community and the SMEs have the impression that the mining sector is not communicating with them and the perception is also that the local government is mainly focused on tax perception rather than providing sustainable solutions for other actors in the mining of the Lualaba Province.

In addition, cobalt is an essential mineral used for batteries in electric cars, computers and cell phones. Demand for cobalt is growing as more electric cars are sold, especially in Europe, where governments are encouraging sales with generous environmental bonuses. According to recent projections by the World Economic Forum's Global Battery Alliance, the demand for

cobalt for batteries will quadruple in 2030 due to this electric vehicle boom (Campbell, 2020). However, the community is unaware of this benefit involved in the production of cobalt as perceived by the mining company. The community can also be disrupted by the recurring conflicts between artisanal miners and the security personnel of large mining companies that manifest themselves in child labor, fatal accidents and violent clashes.

Since the mining companies are located in remote areas where the population does not have access, the media actions are supposed to open the minds of the community to the real operations undertaken which benefit them. But there is one aspect to consider, and that is that most small mines operate illegally on the periphery of large mining operations.

SMEs do or do not succeed generally begins and ends with systemic constraints, including financial access, infrastructure, market integration, and government rules and procedures. Yet, other challenges pertaining to market access and some very specific to the DRC exist (World Bank, 2019). While there is overall progress in these areas, these challenges need to be fully explored. This justifies the perception of disagreement of mining companies on the access of SMEs to materials or by-products of mines operating in the province of Lualaba.

b) Minister of Mines

The positive skewness of 0.544 shows the perception of the Minister of Mines agrees on the different interactions between mining, local communities and SMEs. Due to increased levels of poverty and unemployment, the relationship between host communities and mining companies is increasingly strained. To be precise, the relationship is characterized by deep resentment, suspicion and mistrust. The tension stems from the fact that despite mining communities' being the rightful owners of mineral wealth inherent in their communities, it seems these communities are not benefiting meaningfully from mining operations. However, one of the key elements of sustainable development is to have also the local communities interesting in planning, design and ultimately decision-making.

The empowerment of local communities through participatory communication strategies so that these communities are included in policy formulation and mineral development, implementation, monitoring and evaluation should be a priority in minerals and mining development. This could respond to the agenda of the government in the DRC since the Minister of Mines affirms the promotion of communication of the management of the mines with the local communities. In addition, the community must therefore be informed about the

cobalt value chain, which will allow them to sufficiently understand the production of cobalt and what it entails.

SMEs are partnering with mining companies to promote the development plan in line with the government's roadmap. In this regard, SMEs should have access to mining assets to the extent necessary to fulfil their responsibility (OECD, 2004). This justifies the perception of the Minister of Mines to agree and strongly agree that SMEs have access to materials or by-products from mines operating in the Lualaba Province? (Especially tailings)

c) Civil society

Civil society perception manifested as a negative skewness of -1.982 as disagreeing on the different interactions between mining, local communities and SMEs. Local communities have questioned government misuse of mineral revenues because they have suffered the adverse socio-economic consequences of mineral operations, such as destruction of livelihoods and the influx of large numbers of migrants with their attendant economic and social consequences, without seeing significant benefits. This disadvantage is well known to civil society which, in certain situations, acts as the link between the community and the government. Local communities are unlikely to have the capacity to respond fully on their own to the issues that arise in the context of mineral wealth management. Due to a lack of communication, local communities are isolated and then support each other, sometimes in the wrong way, leading to unrest that hinders the progress of mining. Mine management has a vested interest in promoting communication with local communities to bring them together and understand the extent of cobalt production.

In addition, SMEs needed to get companies to see them as more than instruments for compliance. If SMEs advocated for change, and lobbied for policies that encouraged more equitable relationships between mining corporates and SMEs, corporates would adapt (Engineering News, 2019). This would strengthen the access of SMEs to materials or by-products from mines operating in the province of Lualaba whose perception of civil society has been in disagreement.

d) Academics

A negative skewness of -1.406 shows disagreement with the perception of academics on the related interaction between mining companies, local communities and SMEs. In academics point of view communication is the essence of social interaction which requires a sender, a message, a receiver and a channel of communication. Promoting mine communication with

local communities would create a framework of understanding that could circumvent any form of ambiguity that may have existed as a drawback to the sustainable development that both actors are meant to focus on. Communication between mining and local communities should have benefits by providing broadband speeds and forming a flexible and reliable foundation to securely support multiple applications on cost-effective physical infrastructure (Hitachi Energy, 2020).

Educating the community about what cobalt production entails, and the copper must be mined before producing cobalt, requires understanding the education system that is supposed to infuse this knowledge. The university contains within it faculties capable of forming cadres in society to understand of mineral processing from mining to finished products including the related trade in all extent. The entire upstream and downstream beneficiation of mineral value chain is well mastered and in this, engineers and technicians are launched on the job market in order to meet the demands of mining companies. This represents only a part of the community whose skills cannot be inferred from the whole community.

In addition, there is a technical school in Kolwezi, namely the "Institut Technique de Mutoshi" established in 1953 by GECAMINES (General of Mines and Quarries) to train a skilled workforce that corresponds to the development based on mineral resources in Lualaba Province (Innovate, 2014). Unfortunately, the education system has deteriorated over the past three decades. The facilities are old and in poor condition. Permanent professors retire and are replaced by temporary contract employees who often leave teaching for a better job in the mines (Innovate, 2014). The repeated complaint is that the equipment is outdated and needs to be replaced if students are to gain the hands-on instruction they need to succeed in the mining industry.

The perception of academics shows that the communication system is not designed to have enough interaction between mining companies and local communities. Much more needs to be done to promote better communication that will allow the community to fully understand how the mining system works, especially as it relates to cobalt.

e) Local community

The negative skewness of -0.075 was very insignificant compared to the number which is approximately zero. This really depicts the ambiguity of asserting whether to agree or disagree qualifying the characteristic of this redundant perception.

f) Subcontractor

Regarding the subcontractor perception which goes to negative skewness of -1.760 to assert disagree on the related interaction between mining companies, local and SMEs. In most cases mining villages are a community unto themselves, which means they will occasionally have problems with electricity and plumbing etc. Because villages are generally well equipped, they cannot just have a contractor waiting for something to go wrong. It is in these cases that an outside contractor is employed to fix things if necessary. For people looking to work in the mining industry using their own current skills, this may be a good option.

Mining is an incredibly fast paced industry; if something is broken, it must be repaired to a high standard and in a timely manner. Many mining companies employ contractors directly on site as they are very limited with the services available to them, simply due to the remoteness of the site. Subcontractors play an important role in mining companies with a high impact on the local community, as they mainly operate at the request of mining companies to cover certain services, including the construction or renovation of infrastructure and the management of the energy system, health and education. They have developed a characteristic of friendship with the local communities since they refer to them to provide mainly part-time jobs to carry out the services entrusted to them by mining companies. In this respect, subcontractors' perception of the interaction between mining companies, local communities and SMEs is based on certain lived realities. Again, it is recommended that mining companies improve the communication system with local communities to enable them to understand the essentials of the cobalt value chain and implement the system that allows SMEs to have access to materials or by-products from mines operating in Lualaba province. This will strengthen the vision of resource-based development.

g) NGO

Perception of NGOs resulted in a negative skewness of -1.148 indicating disagreement regarding the interaction between mining companies and local communities regarding communication and awareness of what is involved in cobalt production as well as the access of mining to materials or by-products of the mine in the province of Lualaba. NGOs advocate for human and environmental rights as related to extractive industries including mining. This makes NGOs so sensitive to the attitudes or opinions of local communities in relation to a given deficiency. Thus, once again, it is clear that the communication system must be improved and an effective mechanism must be put in place to allow SMEs to access materials or by-products from mines operating in the province of Lualaba.

6.2.1.4 Results of construct 4 (F4)

Construct 4 related to CSR and sustainable local content development strategy with questions Q1, Q2, Q7, Q8 (Table 6.4 & 6.5)

a) Mining Company

A negative skewness of -0.069 being almost zero is then symmetry therefore difficult to say agreement or disagreement. This may seem contradictory with Construct1, but it has to be put in the context of the mining boom. DRC nationals (skilled and semi-skilled manpower) have moved from large towns to surrounding villages around the mines (due to the limitation of accommodation in the camp provided by the mine) to find employment. It is statistically difficult to determine the proportion between DRC nationals that have historically left the community and DRC nationals who have moved. The employment policy of mining companies was pointed out by the heads of local communities in several complaints from respondents. The issue of identifying communication channels was equally addressed.

b) Minister of Mines

A positive skewness of 0.595 indicates that agreement with giving the privilege to the local community to be employed in the mines as an approach to reducing the unemployment rate. In this regard, education must be at a level that allows quality personnel to have a spirit of creativity and competitiveness to promote sustainable development.

It is very important to know that the conversion of a nation's development potential is strongly linked to the size or quality of its human resources. The increase in human resources requires special attention from the government, which must have a long-term vision. The government that has only short-term visions avoids its own human resources and turns to those of foreign nations. It should be noted that in most cases, foreign nations release their personnel by imposing conditions that sometimes jeopardize the management policy of the nation requesting them. Therefore, these conditions create restrictions on the development of the nation. This is why any nation that aspires to competitive development must promote quality education and raise the level of scientific research in order to have a qualified local workforce.

As agreed and strongly agreed by the Minister of Mines, it is important to local communities around mining activities understand what is meant by social programs which include Employment Insurance Benefits, Family Benefits and Public Pensions. Services-based

social programs provide services that support personal, social and emotional well-being. These include health care, housing and education.

From the Minister of Mines, it is known that the mine supports existing social programs which support the government's roadmap to revive the economy by increasing GDP. Mining companies are also concerned about the need and means by which to obtain and maintain their "social license to operate", including local community support (The World Bank, 2010). Various industry-wide initiatives have examined ways by which such support can be proactively obtained and retained, including approaches to help define a company's role in community development. A worker is therefore a man who provides a programmed mental or physical effort in return for remuneration. In no case can it be considered as an extension of the machine, but rather as a complex being whose psychological, social and personal aspirations require the attention of the nation or the State. It is important to mention that the sources of profits and productivity are very numerous; if human productivity is only one of forms, it is nevertheless one of the most important and probably the most indispensable of them, and one can safely assert that in the future and in improving the productivity of staff.

c) Civil society

A negative skewness of -1.818 shows a significant perception of disagreements on related issues. In the eyes of civil society, members of the local community are not employed in mine. While the mine should prioritize the local community in order to promote the sustainability of life and prevent the country and businesses from the adverse consequences of unemployment. The personal and social costs of unemployment include severe financial hardship and poverty, debt, homelessness and housing stress, family tensions and breakdown, boredom, alienation, shame and stigma, increased social isolation, crime, erosion of confidence and self-esteem, the atrophying of work skills and ill-health (McClelland, 1998). These realities could not be denied by the civil society which advocates for the local community for the sustainability of life, including the promotion of employment and education for the acquisition of skills and makes them aware of the expected social program from mine to their advantage. The perception of civil society shows that much remains to be done in terms of local community employment and social program to reinforce the vision of resource-based development in Lualaba province.

d) Academics

The positive skewness of 1.018 related to agree asserts a good interaction between mining and local community regarding employment and social program. The lack of viable employment opportunities has fuelled the market for artisanal miner (ASM), informal miners who extract a share of the wealth, using bespoke and dangerous methods.

Today there are about 150,000-200,000 artisanal miners' currently working cobalt deposits in Congo, with more than a million others directly economically dependent on their activity (Skidmore, 2021). These miners are at significant risk of death or serious injury, with little oversight from government or mining authorities. This is one of the characteristics of employment provided by mining companies to the local community in Lualaba Province. However, this type of employment does not require a lot of skills as girls and boys are very much active as miners on the unofficial artisanal mining sites around Kolwezi. From an early age they participate in the full range of artisanal mine activities, from digging to washing and sorting. Nevertheless, research clearly shows that many children choose work within the context of family choices and are not overly constrained (World Vision, 2013). However, there is evidence that children are exploited in terms of pay and working conditions. Conversely, civil society shows that mining employs local skilled people in order to promote production that could meet the global standard in the international market. This works with the social agenda to meet harmonized labour policy regulations.

e) Local communities

The very negative skewness of -2.449, as the local community's perception disagrees, which contradicts the civil society, shows that the local community benefits from the mining companies in terms of employment and social program. Apart from artisanal mining which mostly operates outside of regulation, mining companies strive to reduce poverty, eradicate crime and monitor the social agenda for the sustainability of life in the local community.

f) Subcontractors

The skewness being zero means that there has been no perception on the part of the sub-contractors with regard to the employment and social program for the local community in the mining companies.

g) NGO

The perception of NGOs was a positive skewness of 0.330 to affirm the agreement of the employment and social program on the local community with the mining companies. NGOs are recognised to work effectively to address the widespread human rights abuse in the area

used by ASMs. NGOs are committed to breaking the cycle of abuse and violence against children, women and girls and to eradicate child labour in cobalt mining, promoting and protecting children's rights. Thus, the local community benefits from the employment offered by the mining companies as well as the skilled local community and social program as NGOs could not base their perception on local community irregularities caused by ASMs.

6.2.1.5 Results of construct 5 (F5)

This construct is related to questions Q5, Q6 and Q23 to show the expansion of the mineral chain value which includes the manufacture of cobalt-based components as a benefit to the local community with more jobs (Table 6.4 & 6.5).

a) Mining industry

A positive skewness of 0.809 shows the perception of mining companies to agree on related questions which are Q5, Q6 and Q23. Cobalt-based components, in particular, are today pointed in a supply chain to fuel the electric vehicle revolution as a future approach to decarbonization. The World Bank estimates that demand for cobalt production will increase 585% by 2050 (Pattisson, 2021). The mining industry has shown wholehearted support and social responsibility to win feelings within and in neighbouring communities. Obtaining positive information can, in turn, help protect and sustain operations through the Social Development Management Program (SDMP) (Cuartero and Leva, 2014). However, the DRC government and Lualaba Province are responsible for formulating a clear vision that supports the development of a cobalt-based strategy for global demand.

b) Minister of Mines

A negative skewness of -1.361 resulted in disagree to oppose the mining industry category. It is known within the government to carry out through the Ministry of Mines the development program concerning mineral resources. To this effect, the information expected from the Ministry of Mines should bring more certainty given that the government is supposed to have regulatory power to lead the country towards development according to an assigned roadmap. In this regard, the significant negative skewness on Construct 5 clearly shows that the community is somehow desperate or biased not to expect job creation from the manufacture of cobalt-based components, while the expansion of the cobalt value chain promises to be more open to investment.

c) Civil society

With the negative asymmetry of -1.951, civil society disagrees and strongly disagrees on the community's thinking of bringing more jobs to the local community with the manufacture of cobalt-based components. Nowadays, cobalt-based components are booming with the development of advanced technologies to solve the problem of global warming with one of the examples advanced battery manufacturing to improve storage capacity in the use of renewable energies and strengthening the electric vehicle. Additionally, most cobalt alloys have been proven with effective selectivity in catalysis technology (Total Materia, 2002). Conversely to civil society perception, this gives the prospect of an expansion of employment behind cobalt-based components. However, civil society is aware of the situation in which the community could find itself caught off guard in understanding the benefits of cobalt-based compounds in job creation.

Thus, it is recommended to awaken the spirit of the community with different media actions, including forums, conferences, leaflets, posters and trainings to enable them to understand the benefits of cobalt-based components in job creation for the local community as well as the transmission social local programs. Such media actions might involve the formulation of a precise vision on how to develop a cobalt-based strategy with regards to the global demand. For the community should not be left behind in the resource-based development plan to prevent resistance from occurring due to lack of understanding.

d) Academics

Academics perception resulted in positive skewness of 1.538 as agree and strongly agree on questions related to Construct 5. This opposition to civil society shows the category of community to which academics refer. Since academics are knowledgeable about the impact of job creation in the manufacture of cobalt-based components and the local social programs of mining companies to communicate to the local community. Similarly, academics affirmed good communication of the local social program to the local community and the formulation of a clear vision on how to develop a strategy based on cobalt in relation to global demand. This shows that the academics perception was oriented to the category of instructed community who is supposed to attend some related program. However, the reality on the ground could be otherwise according to civil society perception.

e) Local community

This perception with a very insignificant negative skewness of -0.075 is approximately zero, which means that there is no argument for the local community regarding related issues.

f) Subcontractors

The subcontractors' perception resulted in negative skewness of -1.147 asserting disagree and strongly disagree for the relate questions to Construct 5. Subcontractors who partner with mining companies to perform certain services entrusted to them might understand the attitude of the community and find that there is no incentive to manufacture cobalt-based components as a downstream strategy for creating more jobs. The social program is also not communicated to the local community, and there is no clear vision on how to develop a strategy based on cobalt in relation to global demand.

In November 2021, reports revealed the poor working conditions, abuses and low wages that workers in the Democratic Republic of Congo faced when working in the cobalt mines supplying manufacturers of electric vehicles. Many workers were employed through subcontracting companies, which was reportedly done in order to reduce labor costs, reduce legal liability, and prevent workers from unionizing (Business & Human Rights Resource Centre, 2022). Cobalt from the five mines could be traced to well-known electric vehicle manufacturers. This insufficiency of the community in terms of cobalt-based components to manufacture electric vehicles was considered by the subcontractor as an obstacle to develop the idea of job creation.

g) NGO

A negative skewness of -0.319 affirms disagree and strongly disagree according to NGO perception on issues related to Construct 5. A survey by NGOs namely Rights and Accountability in Development (RAID) and the Legal Aid Center (CAJJ) found a link between ramping up production of electric vehicles and serious labour rights abuses at five industrial mines largely run by Chinese companies. Workers reported low wages, excessive working hours, discrimination, unsafe working conditions and disregard for workers' health, violence and degrading treatment (Business & Human Rights Resource Centre, 2022). In reference to this, NGOs find an obstacle to job creation on cobalt-based components due to the shortage found in the production of electric vehicles.

6.2.1.6 Results of construct 6 (F6)

This construct related to skills shortage (R&D) linkages and willingness to create and develop them in support of Q12 and Q18 (Table 6.4 & 6.5)

a) Mining company

Mining Companies have shown a negative skewness of -1.801 which states "agree and strongly agree." Cobalt is mostly produced as a by-product. Several studies have suggested that the supply of by-products is inherently riskier than that of host metals, because their recovery is contingent upon the economic health of their corresponding primary commodity market (Hayes and McCullough, 2018; Sprecher et al., 2017b).

Production of cobalt is highly concentrated, with more than half of the world's cobalt being mined in the Democratic Republic of the Congo. Furthermore, mining in Congo can be problematic from a social point of view. Several reports by NGOs and academic studies provide evidence of cobalt-mining related to human rights violations and environmental negligence in the Katanga region of the Democratic Republic of the Congo (e.g. Amnesty International, 2013; Cheyns et al., 2014). Besides industrial mining, an estimated 15–20 % of the total cobalt production in the Democratic Republic of the Congo comes from artisanal mining (BGR, 2017). The Centre for Research on Multinational Corporations (SOMO) estimated that 40,000 children work in under- ground tunnels, without protective equipment. Amnesty International reported that in one year 72 artisanal cobalt miners died in collapsed tunnels and other underground incidents (SOMO, 2016).

For mines willing to work with SMEs, a number of companies have adopted preferential sourcing policies towards local suppliers and distributors. Many of these are increasingly being implemented through provisions in national policies and legislation regarding foreign direct investment through, for example, joint ventures, partnerships and outsourcing as a means of locating multiplier effects. The DRC has adopted a law stating: "subcontracting activity is reserved for companies with Congolese capital promoted by Congolese" (Southern Africa Resource Watch (SARW), 2021). It aims to give Congolese Small and Medium Enterprises (SMEs) space in a sector that is still not very inclusive. In this respect, industrialization is the driving force behind the promotion of SMEs through legal subcontracting within the mining sector. This will grow the national economy, and it will be the basis for job creation and the creation of several other economic opportunities. Although many multinational mining

companies have opened branches in DR Congo, this has created few jobs. Small and medium-sized enterprises (SMEs) have only limited access to international markets. There is also a shortage of skilled workers. At the same time, thousands of people work in hazardous conditions in artisanal mining without formal employment contracts or work permits. Here they extract the minerals with the simplest means - often with their bare hands. Many families depend on income from these activities to survive (GIZ, 2019).

Supporting local businesses is an important way to benefit communities and strengthen human and financial resources. Preferential sourcing policies to local suppliers and distributors should be incorporated into mining agreements and company policy. Local sourcing should be accompanied by skills development and, ideally, the identification of additional economic activities, to reduce community dependency on the mine.

b) Minister of Mines

This construct resulted in positive skewness of 0.846. As agreed and strongly agreed, a safety measure should be implemented to protect the community in the use and criticality of cobalt in the global industry. In the government's vision of having mines working with SMEs to source goods and services locally, they must ensure sufficient availability, good quality, sufficient product delivery and competitive pricing. However, the benefits of local resourcing are as follow:

- Reduced supply chain costs
- Reduced currency risk
- More flexibility
- Better control
- Reduced environmental impact
- Good for your community
- Additional income
- Launch products faster

c) Civil society

A negative skewness of -1.140 resulted in agree and strongly agree on the awareness of the community on the use and criticality of cobalt in the global industry as well as the willingness of mines to work with SMEs in order to source goods and services locally. This is strengthen life sustainability that the civil society is deemed to fight for community within the government.

Civil society advocates on behalf of the local community with the government so that the community's problem is heard and resolved. The negative perception reveals that civil society knows something about the community regarding the misuse of cobalt ore which, to some extent, is critical. Because the cases of deaths and injuries recorded with regard to these abusive uses are only increasing and nobody talks about it because everyone is focused on their own interest to earn money. Moreover, the community's recurrent complaints regarding social life reveal that no action is taken by the mines with SMEs for the supply of goods and services. However, the community recognizes that it should benefit from the mineral resources it has on the ground.

d) Academics

Academics disagree on the awareness of the community on the use and criticality of cobalt in the global industry as well as the willingness of mines to work with SMEs in order to source goods and services locally. This resulted in a negative skewness of -1.140 to understand academics' perception on the community for the related issues. The level of literacy of academics creates a revolution to discover that mining companies take advantage of the shortage of skills in the community to use them like machines. It is not possible to equate a human being with a machine that has neither feeling nor consciousness. A human being must be placed in conditions that allow him to give the best of himself, his social life must be taken into account, that is to say housing, subsistence, health and leisure. However, the mining companies seek to unfairly maximize their profit by reducing the payment of the community which, in despair, is looking for nothing to survive (Rights and Accountability in Development (RAID), 2021).

e) Local community

The asymmetry was 0.00, which means that the perception of the local community is unclear regarding the use and criticality of cobalt in the global industry as well as the willingness of mines to work with SMEs in order to source goods and services locally.

f) Subcontractors

A negative skewness of -1.400 resulted in disagree and strongly disagree regarding the use and criticality of cobalt in the global industry as well as the willingness of mines to work with SMEs in order to source goods and services locally.

Labour rights violations are directly linked to an outsourcing model in which workers are not hired directly by the mines, but are instead employed indirectly through subcontracting

companies. At least 57% of the workers employed in the mines are supplied by subcontractors (Rights and Accountability in Development (RAID), 2021). In some mines, the percentage was significantly higher (Rights and Accountability in Development (RAID), 2021). Thus, the subcontractors working together with corporates have a saying on how to how to resolve the issue of skills shortage linkages and willingness to create and develop them.

g) NGO

NGOs showed a negative skewness of -0.889, which translates into disagreement and strong disagreement on the use and criticality of cobalt in global industry, as well as the willingness of mines to work with SMEs to source goods and services locally. The perception of the NGO claimed that the community operates for cobalt mining at a stage of ignorance of its criticality in the global industry. Indeed, most mining companies, especially ASMs, abuse the community by using unqualified people or children. Additionally, mining companies reduce their expenses by denying miners their right to have appropriate Personal Protective Equipment (PPE) which should be provided by SMEs in case they are willing to partner with them to source goods and services locally. However, according to Raoul Kitungano, director of the NGO "Justice pour tous" which fights against child labor in the mines of South Kivu, the local population continues to practice small-scale and artisanal mining in part of the mining site granted to multinationals (Boko, 2021).

As for NGOs working to end child labour, they have limited resources but have tried to remedy these irregularities by communicating to parents and children that it is illegal for children to work in the mines, but that much remains to be done to put an end to these unnatural practices (Boko, 2021). Jobs must be created and alternatives must be put in place to get children out of mining. Under pressure, the government released a strategic document in October 2017, setting out its aim to “eradicate child labour in mining by 2025" (Boko, 2021).

Drawing on child protection laws that condemn the worst forms of child labour, article 299 b of the mining code, which was revised in 2018, bans "mining and the sale of mining products from sites where laws protecting human rights and the rights of women and children” are violated. The fine is $10,000 dollars a day until the violation has ceased (Boko, 2021).

6.2.1.7 Results of construct 7 (F7)

Construct 7 linked to the lack of development of incentive policies at the governmental and local level to develop and promote downstream value addition (linkages linked to taxation) with the only question Q21 (Table 6.4 & 6.5)

a) Mining Company

An insignificant negative bias of -0.036 approximates zero like symmetry that is neither agree nor disagree. The construct challenges the legal and the investment frameworks that govern the DRC mining sector in general and the Lualaba Province in particular. In addition, it addresses the issue of existing incentive policies in terms of the mining and investment codes. There is a derivative issue here regarding legal frameworks and it is widely accepted by respondents that the legal texts are formulated but are not applied in practice. Raw materials are still exported with a partial or very low level of beneficiation. Social spending by the local government does not correspond to the mineral rent in terms of the development of basic infrastructure. Governance and corruption challenges associated with the lack of transparency are permanent ingredients of the Lualaba Mining sector and a highly dollarized economy. The perception of respondents is that there is a lack of incentives policy associated with the political will to change the current pattern.

b) Minister of Mines

A positive asymmetry of 1.714 indicates of agree. The DRC government is committed to working on the legal and regulatory framework from the colonial era until today, as demonstrated in Section 5.5.2 mining codes have been improved to secure the vision of resource-based development without which the DRC's economy will never benefit from its great position in mineral resources. Given the challenges faced by the DRC in terms of infrastructure and structures, it is clear that there is still much to do on the mining codes to promote investments of SMEs and large-scale mining companies. The mining code must help the government to solve the following essential problems related to resource-based development:

- Industrial development and market integration;
- Infrastructure in support of regional integration
- Peace and security cooperation

c) Civil society

A negative skewness of -0.522 was recorded for asserting that civil society disagrees and strongly disagrees that more needs to be done regarding the 2018 mining code to foster investment from SMEs and large mining companies. The mining code has been subject to improvements since 2002 until 2018 to place the country in a position that could bring more

development. Further improvements will still be possible depending on what has been shown as a drawback after years of applying this mining code.

The civil society perception shows that enough has been done on the 2018 mining code, if there are still some inconveniences on the ground, the applicability of this code may not be followed with more attention knowing that corruption dominates many institutions. The law, meant to "promote SMEs with Congolese capital, to protect the national labor force," is commonly accepted – although without certainty – to compel majority Congolese ownership of contracting firms (Global Business Reports, 2019). Companies now rely on local contractors to be on the right side of the law, but these local contractors often lack the appropriate expertise, compromising mine safety (Global Business Reports, 2019).

d) Academics

A negative skewness of -0.132 although insignificant in number, shows the perception of disagreeing and strongly disagreeing for academics that there is still something to be done about the 2018 mining code to favour investments from SMEs and large mining companies. However, the SME finance facility is very difficult as the loan application is usually subject to rejection or discouragement due to unfavourable conditions including complex application procedures, unfavourable interest rates, high collateral requirements, size and insufficient loan maturity (Zuidberg, 2019). These insufficiencies need to be addressed as SMEs are responsible for the bulk of job creation and, as a result, economic growth, stability and prosperity.

e) Local community

A skewness of zero shows that there is no fixed statement of agreement or disagreement that SMEs are aware of providing a specific type of standard of goods and services.

f) Subcontractor

A negative skewness of -0.383 as perceived by subcontractors indicates disagreement and strong disagreement on more to be done regarding the 2018 mining code to promote investment by SMEs and large mining companies. However, subcontractors are calling for some relaxation in the 2018 mining code. Likewise, certain provision of the law could deprive contractors from an efficient recourse against subcontractors for reasons of defects or bad workmanship (McGuireWoods, 2017). Due to the law, Congolese SMEs may view outsourcing as too complex and formal a process and decide not to participate in it, which would again render the law ineffective (McGuireWoods, 2017).

g) NGO

A positive skewness of 0.495 shows that NGOs agree and strongly agree that 2018 mining code should be worked more to promote investment by SMEs and large mining companies. In the financing mechanism that SMEs struggle with, NGOs can work by finding an approach as a solution to the problem. More than finance, SMEs are ill-prepared to attract and use finance effectively. Significant pre- and post-investment technical and managerial support is needed to ensure returns to investors as well as sustained growth for SMEs (Zuidberg, 2019). This funding and support gap can be filled in two ways (Zuidberg, 2019):

- Creation of new investment funds, coupled with support structures, targeting the low end of SME needs
- New donor-funded programs that target SME development and growth.

6.2.1.8 Results of construct 8 (F8)

Construct 8 is related to the integrability of local industry into the global supply chain with question Q16 (Table 6.4 & 6.5).

a) Mining Company

A negative skewness of -0.606 led to disagreement that SMEs are aware of the type of standard to provide regarding goods and services. Cooperation between major players in the mining industry is characterized by mutual distrust. There is currently a lack of transparency in the management of mining and participation opportunities that would take into account the needs and expectations of the various important interest groups.

b) Minister of Mines

Concerning construct 8, related to the integrability of local industry in the global supply chain, question Q16 gave rise to "disagree and strongly disagree" to affirm the inability of SMEs to deliver the type of goods and services standards as expected. This is impractical for spurring resource-based development, but SMEs are key players in the broader economic and business ecosystem (OECD, 2004). Across countries at all levels of development, SMEs have an important role to play in achieving the Sustainable Development Goals (SDGs), by promoting inclusive and sustainable economic growth, providing employment and decent work for all, promoting sustainable industrialization and fostering innovation, and reducing income inequalities (OECD, 2004).

c) Civil society

On civil society perception depicted by a negative skewness of -1.440 with outcome disagree and strongly disagree, SMEs are not aware on what standard of goods and services they are expected to provide. However, the Investment Code (Law No. 004/2002) provides for the promotion of SMEs in which they have access to training that will enable them to understand the operating mechanism to meet the needs of the government allocated to local community (https://www.sadcin/files/8413/9323/6347/DRC.doc). In this regard, they are authorized on the one hand to deduct from their profit amounts spent on the training and upgrading of the enterprise manager and his personnel, on protection and conservation of nature and on the other hand to calculate their repayments on a sliding scale of charges.

One important thing is to know that the quality of management is particularly important for SMEs, which need to be able to adapt quickly to changing markets and circumstances, but often have limited resources that prevent SMEs from achieving the assigned objective. But with the exception of administrative tax, SMEs benefit from total exemption from fees/rights and taxes at importation, for machinery and material, even second hand tools, spare parts as well as for industrial inputs necessary for the realization of the approved investment. Thus, all the facilities allowing SMEs to provide quality goods and services as expected are put in place, but they are not aware of them, as the civil society asserts.

d) Academics

A slight negative skewness of -0.132 resulted in disagreement and strong disagreement shows the perception of academics on the ignorance of SMEs in delivering quality goods and services as expected. As developed in the same dossier with civil society, SMEs are intended to strengthen the development program according to the plan assigned by the government insofar as their tax exemption is well oriented.

e) Local community

A negative skewness of -0.857 resulting in disagree and strongly disagree to show the perception of local community on the ignorance of SMEs to provide quality goods and services. The local community is not served by standards of goods and services as many SMEs operate in the informal economy and do not undergo training.

f) Subcontractor

A very negative asymmetry of -2.646 was recorded to express the contractor's perception of disagreement that SMEs are aware of the type of standards of goods and services they are expected to provide. Leading companies recognise that local economic participation is one of

the keys to maintaining their social license to operate and to demonstrating that they are contributing to the long term development of communities and regions. Some companies are now also seeing the business benefits that can flow from increasing local content, such as lower logistics and labour costs.

While the value of supporting local business development is increasingly recognised, in practice it can often be difficult to bridge the gap between the capacity of small and medium-sized enterprises (SMEs) in local communities and the contractual requirements often rigidities of large resource companies (Esteves et al., 2010). This can be an obstacle for the SME to provide goods and services according to the expected standard. However, subcontractors, being with the SME in the supply chain corporation, understand that there is no adequate mechanism in place that can enable the SME, including them, to deliver to the standard as expected. SMEs should also be provided with a set of tools and examples to guide decisions regarding their involvement in providing goods and services to the local community in accordance with the type of standard in the context of Lualaba Province.

g) NGO

A negative skewness of -1.369 represents the perception of NGOs disagreeing on the awareness of SMEs to provide a specific type of standard of goods and services. SMEs have recognized NGOs as important stakeholders, able to put pressure on the corporate environmental activities, for example by influencing the expectations or behaviour of customers or regulators and competitors (Zilahy et al., 2015). This enables NGOs to understand well SMEs activities and their operability in their interaction with the local community according to the duties they are encountered to promote resource-based development. This allows NGOs to fully understand the activities of SMEs and their operability in their interaction with the local community according to the duties they face to promote resource-based development. According to the perception of NGOs, it should be noted that SMEs experience some unrealistic challenges that make them ineffective in their activities to meet the needs of the community.

Table 6. 4: Showing stakeholder' skewness effect on Construct

Stakeholder' category	**Construct 1**	**Construct 2**	**Construct 3**	**Construct 4**	**Construct 5**	**Construct 6**	**Construct 7**	**Construct 8**
	Skewness	Skewness	Skewness	Skewness	Skewness	Skewness	Skewness	Skewness
Mining	-0.258	-0.536	-0.717	-0.069	0.809	-1.801	-0.036	-0.606
Ministry of Mines	0.590	1.838	0.544	0.595	-1.361	0.846	1.714	-0.567
Civil society	-0.689	-1.486	-1.982	-1.818	-1.951	-1.140	-0.522	-1.440

Academics	-2.737	-0.272	-1.406	1.018	1.538	-0.863	-0.132	-0.132
Local community	0.857	0.326	-0.075	-2.449	-0.075	0.000	0.000	-0.857
Subcontractor	-0.366	-0.764	-1.760	0.000	-1.147	-1.400	-0.383	-2.646
NGO	-0.870	-0.935	-1.148	0.330	-0.319	-0.889	0.495	-1.369

Table 6. 5: summarizing valid constructs based on Cronbach's Alpha coefficient

Factor	Construct	Variables	Cronbach's Alpha Values	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.
F1	Social and economic impact of the mining industry, value sharing-related issues and the role of the State	Q3, Q4, Q10, Q11	0.841	**0.612**
F2	Forward (downstream) Linkages development related issues	Q17, Q19, Q22	0.731	
F3	Stakeholder's communication related-issues	Q9, Q13, Q14, Q15	0.735	
F4	CSR and sustainable local content development strategy related-issues	Q1, Q2, Q7, Q8	0.708	
F5	Downstream strategy formulation and implementation	Q5, Q6, Q23	0.637	
F6	Skills shortage (R&D) linkages and willingness to create and develop them	Q12, Q18	0.613	
F7	Lack of incentive policies development at governmental and local level in order to develop and promote downstream beneficiation (Fiscal related linkages)	Q21	Single loaded factor	
F8	Integrability of local industry into the global supply chain	Q16	Single loaded factor	

6.2.2 Summary Close-Ended Questionnaire analysis

Overall, the survey was conducted through a closed-ended questionnaire analysis with various categories of actors and Constructs. The average of skewness in terms of Construct is shown in Figure 6.3. With the exception of Construct 7, all Constructs revealed negative skewness, arguing that the DRC must come up with sound strategies that will help revive its economy based on its dominant position as a cobalt ore resource in the Lualaba Province. The State must really play its role as regulator to promote the positive impact of the mining industry on the social and economy.

Similarly, the expansion of the value chain with the development of forward linkages will be very beneficial in improving product quality, enhancing skills, creating more jobs and promoting global competitiveness. In addition, the communication mechanism must be

improved to put stakeholders in effective operability, and promote corporate social responsibility (CSR) and sustainable local content. The state should review mining policy and ensure that the mining code is enforceable to eradicate the incivility (child and female abuse) and skills shortages linkages, to drive taxation appropriate to resource-based development and to promote the integration of local industry into the global supply chain.

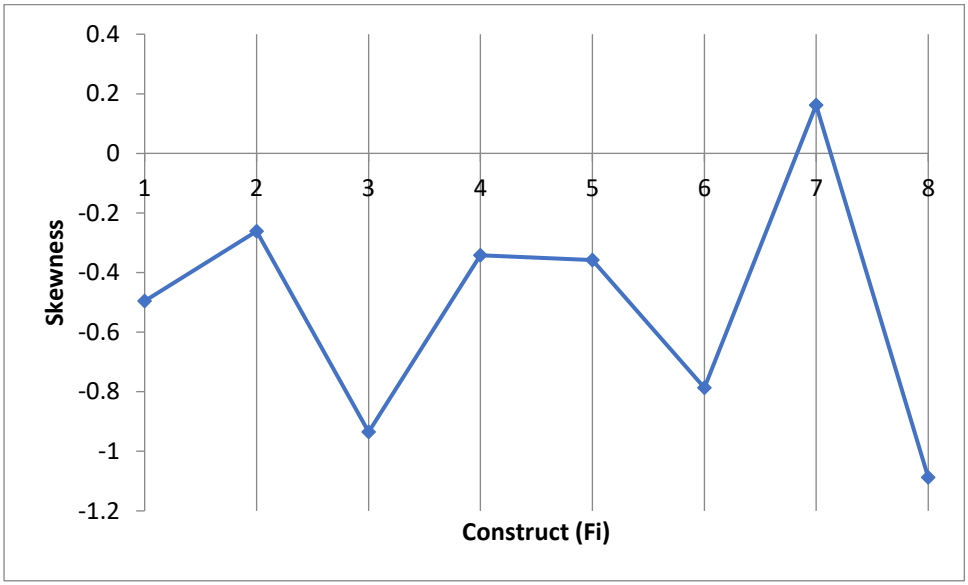

Figure 6. 3: Skewness average for every Construct

6.3 Open-Ended Questionnaire analysis

The data gathered from the open-ended questionnaire is presented and analysed in this section. Due to restrictions encountered regarding access to the sites of certain organizations, the questionnaire was first translated into French (the official language of DRC) and sent by email or on a hard copy to the participants. Answers from respondents were translated into English after ensuring that the context of the answers was preserved. Qualitative data were subjected to qualitative data analysis using NVIVO 11 software. Themes and sub-themes resulting from the analysis are presented in this section.

6.3.1 Qualitative data presentation

Answers collected from the stakeholders in the Lualaba Province to question T1 suggest that 47 respondents out of 51 participants provided an incomplete definition of the mining value chain (Appendix B (Section B)). Respondents provided a definition that is primarily "upstream-oriented" without specific reference to the downstream beneficiation.

Below are few examples of respondents' statements:

- "The extractive sector is a sector in which industries or mining companies extract raw materials from the subsoil."
- "The extractive sector is a sector in which mineral resources are extracted."
- "The extractive sector is essentially the exploitation of ore containing any type of valuable mineral."

Answers to question T1 appeared as a theme certainly due to the historical pattern (Colonial) of the conduct of mining activities in the Lualaba Province.

In question T2, 46 respondents confirmed that mining royalties have a very low impact on the local economy, while 33 respondents have a strong perception that the cobalt sector in the Lualaba Province is promising and can contribute more to the local economy. Paradoxically, 51 respondents out of 51 participants of the industry in the Lualaba Province (sub-theme LEM), all seem to agree that there are still poor employment opportunities in the province. The theme emanating from question T2 corroborates the construct F1. Some examples of respondents are listed below:

- "The cobalt extractive sector in the Lualaba Province is one of the most promising sectors of the local economy, but it is being confiscated by the ruling political class with very little effect on the local and national economy."
- "According to the Mining Code of 2002, the DRC government enacted a law on the retrocession of mining royalties to local communities of provinces that produce commodities, but currently it is noticeable that the retrocession is not taking place."
- "Our perception of the contribution of the mining sector of the Lualaba Province is a little pessimistic. Over 65% of copper and cobalt mining comes from the Lualaba Province and at the same time there were still a population deprived of basic needs such as access to potable water and electricity."

Question T3 yielded results of 34 respondents out of 51 participants under the theme "SUD" related to the lack of promotion of sustainable development, 28 respondents out of 51 participants indicated that the Mining Code in force in DRC is not enforced enough (theme MIC), while 30 respondents believe that local institutions are weak and unsupportive regarding their role (LI), and 44 respondents indicated that there is no local development program based on the cobalt mineral. Question T3 is quite explanatory of the themes emanated from question T2.

Few respondents' declarations are listed below:

- "The role of the local government in our opinion is not completely fulfilled, with regards to the expectation of human development and the development of the economy of the province. Improving the rule of law, public spending should focus on building basic infrastructure."
- "The role of local authorities is not well defined because the allocation of revenues from the mineral sector is opaque. It seems like the national and local authorities are redistributing the mineral rent among themselves. There is no adequate basic infrastructure in the Lualaba Province."
- "The efforts made by the local authorities to improve the quality of life of their citizens are visible but the perception is that it is rather a lack of support structures as well as the implementation of mining legal texts that need to be improved."

The results of question T4 yielded 32 respondents (PRA theme) out of 51 participants who felt that the strategic aspect of the cobalt as a mineral is not well understood by the local authorities and at the same time, 40 respondents out of 51 participants (MRM theme) believe that cobalt mineral resources are not managed properly. It is also interesting to see that 49 respondents out of 51 participants agreed that downstream beneficiation of the cobalt should be implemented in the local mining value chain of the Lualaba Province.

Below are few answers from respondents:

- "In the case of the Lualaba Province, there is no existence of a development vision based on the cobalt. Politicians are keen to make self-profit to enrich themselves at the detrimental of the peoples."
- "Theoretically, the local government seems to understand the strategic aspect very well, but in practice, nothing is done to guarantee the survival of the province regarding its cobalt mineral potential."
- "Local and national authorities do not seem to understand the strategic aspect of the cobalt mineral because it was only in 2018 that the mining declared the cobalt mineral as such."

Question T5 had 29 respondents out of 51 participants who indicated that most small-scale mines operate in illegal areas (most in areas owned by industrial mining companies) and at the same time 31 respondents out of 51 participants mentioned that the regulations are ineffective both for the artisanal side and the industrial side. Respondents indicated that two themes (SSM

and MSR) are determining factors that will not allow the artisanal sector to eradicate poverty in the Lualaba Province.

Below are some answers from respondents:

- "It is an informal economy with harmful consequences, it is necessary to connect this sector to the large scale mining industry to harness the 20% cobalt potential which is represented in the artisanal sector."
- "Operating in the artisanal cobalt mining sector is a disease of the mining industry in the Lualaba Province. The management of this sector requires awareness of local authorities and rapid adequate response from the State. It is necessary to improve structures of the artisanal sector and promote the ease of access to loans and microcredit. Restructuring the artisanal sector by the State should be a priority."

Question T6 had 26 respondents out of 51 participants on the SCN concept; all 26 participants agreed that local communities around mines face poor social conditions which lead to the rise of child and pregnant women labour. The SOP concept yielded 29 respondents out of 51 participants who indicated that the cobalt mining sector should conduct adequate reforms of the artisanal sector in the Lualaba Province and, possibly, integrate the artisanal sector into a cobalt downstream beneficiation process.

Below, some respondents' feedbacks are listed:

- "Child and women's labour is triggered by widespread poverty around mining areas. The local and national government will have to assume its responsibilities and its participation to improve the social living conditions of the citizens."
- "Unauthorized artisanal mining areas should be closed; the local government should look for ZEA (Zones d'Exploitation Artisanales) correctly referenced on an official map from the Ministry of Mines."

Question T7 yielded answers from 13 respondents out of 51 participants on the topic ES. The respondents indicated that there is a need for educational programs oriented to the needs of the mining industry with an emphasis on cobalt mineral. On the MCP topic, 24 respondents believe that mining companies operating in the Lualaba Province should formulate their needs concerning the skills they would like to have in their sector. Question T7 yielded 36 respondents out of 51 participants who indicated that support in terms of education and health, additional efforts must be done by mining companies. Respondents strongly felt that mining companies were not doing enough to support social development programs.

Feedbacks from some of the respondents are listed below:

- "The rules and standard in terms of mining legal framework are theoretically established, but there is no effective monitoring on the ground by local government side to ensure that mining companies are willing to achieve and closely monitor their social programs."
- "The relationship between the mining sector and the educational and health system of the Lualaba Province must be improved. There is no recorded and available evidence that a mining company built more than two reliable schools or hospitals to international standard, except for those who had been rehabilitated based on existing infrastructures."

Question T8 indicated that there were 43 respondents out of 51 participants who mentioned that the business climate in the mining sector is constantly associated with political uncertainty in the Lualaba Province.

Respondents' comments are listed below:

- "In our country in general, and the Lualaba Province in particular, there is an opacity that prevails in the management of institutions. The primacy of mining law does not make itself felt effective."
- "Some mining companies use their influence over politicians at a national level to dictate their direction to the local authorities; this with immediate consequences on the lack of corporate and social responsibility achievement."

Question T9 collected answers from 51 participants on the TSR topic, while only 26 respondents out of 51 participants responded on the BHV topic. Respondents made it clear that the 2018 mining code is an incentive but lacks support and operational structures in terms of law enforcement. Respondents further indicated that a form of rent-seeking behaviour is one of the key elements fuelling the lack of full implementation of the mining code.

Below are some of the reactions formulated by respondents:

- "The 2018 Mining Code is incentive enough from a point of view, but there is an apparent lack of effectiveness in law enforcement and also an apparent lack of accountability on the part of the authorities."
- "The 2018 Mining Code is not the problem in my opinion, but rather, its implementation. The State and local authorities should focus on technical structures that could help prevent law violations. There is also a need to have qualified peoples."

Question T10 received 28 answers out of 51 participants indicating that the mining code of the DRC is not the issue of investments but most likely major components such as opaque tax collection system, lack of transparency, political uncertainty, and corruption. Comments of respondents are listed below:

"The Mining Code of 2018 promotes investments in the mining sector of the Lualaba Province but the opacity of the tax system is one of the key problems at a local level."

"The Mining Code of 2018 promotes investments but for local entrepreneurs in the sector have difficulties mainly due to the burden constituted by the rent-seeking behaviour of the authorities and the opacity of the tax system."

Question T11 yielded 27 respondents out of 51 participants on the CIS topic and 25 respondents out of 51 participants on the LOA topic. There is a general perception from respondents that the civil society has been involved in the development process of the Lualaba Province with regards to the cobalt sector. However, due to political influence at the national level, respondents have a strong perception that sensitive issues (electricity and roads) that civil society addresses to mining companies are not strictly monitored or taken into account. The attitude of certain civil society actors has also been questioned (knowledge of the cobalt value chain, the criticality of the cobalt in the global industry, and their ability to manage the civil society).

Below, some respondents' statements:

- "In our opinion, civil society is sufficiently involved in the development process of Lualaba province; it often addresses its issues, opinions, and recommendations, but their opinions are rarely or partially taken into account."
- "Civil society is sufficiently involved in the process, but mining companies are slow to get involved and commit to the implementation of development plans, and it would be beneficial for the government to be more involved in the implementation monitoring process."

Question T12 collected 41 respondents out of 51 participants on the LCO topic while 17 respondents out of 51 participants responded on the DV topic. Forty three respondents out of 51 participants responded on the LMS topic. Question T12 was formulated based on the viability of the local content and addressed the issue of the viability of upstream and backward linkages as defined by Hirschman (1976). There was a large consensus from respondents that the creation of upstream linkages (local content) is weak because the economy of the Lualaba

Province is outward-oriented. Respondents indicated that a development vision is more than necessary to promote local content and especially the manufacturing sector.

Some of the respondents argued as follows:

- "The local market cannot meet mining business standards due to the lack of a well-established manufacturing industry that can support the cobalt mining value chain of the Lualaba Province. There is always a high volume of imports relative to the volume of exports. Lawson local producers and suppliers of goods and services should formulate and monitored alongside with the establishment of the local manufacturing sector."
- "In our opinion, the fact that there is no local manufacturing industry established in Lualaba Province, there will be a continued loss of financial and employment opportunities if a development vision is not formulated by the local authorities."

Question T13 had 22 respondents out of 51 participants on the RD theme, 13 respondents out of 51 participants on the HUB theme, 31 respondents out of 51 participants on the SKL topic, and 29 respondents out of 51 participants on the SKE topic. It was widely accepted among respondents that the mining business representatives and local authorities and other key players such as academics that a common development vision should be adopted. Respondents widely agreed on the necessity for the mining sector to formulate needs in terms of required industry skills (technological linkages). Local authorities were asked by respondents to get involved with mining partners to formulate skills development programs in the form of skills development hubs and exchange programs with specifics aspects of the cobalt mining sector.

Reactions of few respondents are listed below:

- "The DRC is one of the countries that do not invest enough in the technological and industrial development of its citizens. A skilled national workforce tended to emigrate for better employment opportunities. There is no existing retention governmental policy at a national or local level to keep skilled citizens."
- "The educational system should be adapted to the needs of the mining industry in Lualaba Province to create a sustainable skilled workforce."
- "Local authorities, mining business representatives, and universities must work together and formulate a skills development strategy specific to the cobalt mining industry."

Question T14 yielded 18 respondents out of 51 participants on the LMF topic. Respondents indicated that the reason why the manufacturing sector in Lualaba Province is not developed is mainly due to some requirements that are not met, such as the lack of policies and organized structures that can oversee the creation and the sustainability of the manufacturing sector. Fiscal and electricity were indicated as major burdens for the development of such an important sector.

Reactions of few respondents are listed below:

- "Incentive texts in terms of development of such an industry exist but the practical implementation of the texts is not effective."
- "The country in general and the Lualaba Province, in particular, do not have a clear development plan and associated budget to formulate and conduct the development of the local manufacturing industry."
- "The criteria for access loans to funds new start-ups and SMEs, in general, are tailored to certain priority entrepreneurs with regards to their political engagements and often, loans granted to them are never repaid."

Question T15 had 14 respondents out of 51 participants on CBC topic, 22 respondents out of 51 participants on DWB topic, 25 respondents out of 51 participants on AI topic, and 27 respondents out of 51 participants on AM topic. On the creation of the "Entreprise General du Cobalt" (EGC) creation, frequency of words that led to the T15 topics, respondents widely perceived the necessity of developing downstream beneficiation of the cobalt mineral that will be produced from the artisanal sector. Respondents indicated that it would be beneficial for Lualaba Province to have some cobalt-based components manufactured locally to open the local economy to the burgeoning market for electric vehicles. The scepticism of respondents was focused on the required technology to acquire to go downstream.

Comments of few respondents are listed below:

- "It all depends on the expected motivations that led to the creation of the EGC. In our opinion, before undertaking local downstream beneficiation of the cobalt, EGC should look at mechanisms to acquire the required technology."
- "To manufacture cobalt-based components locally, the EGC should consider working with local authorities to have a sustainable supply of minerals from the artisanal sector by creating ZEAs (Zones d'Exploitation Artisanales) and by creating support structures in the artisanal sector."

- "The EGC should be considered as one of the priority projects in the mining sector by the local authorities. As soon as the local government can implement a sustainable artisanal cobalt supply chain for the EGC, this can also affect positively the large-scale cobalt mining sector."

Question T16 accounted for 28 respondents out of 51 participants on the FLC topic and 32 respondents out of 51 participants on the INS topic. This topic yielded a strong perception that mining companies are unwilling to engage in finance-related issues with the local government. Respondents feel that transparency and accountability should be a priority focus if such a fund is to be allocated and the fund management structure should be clearly defined. Although respondents argued that mining companies are unwilling to support such a development program, there is broad agreement that mining companies should collaborate with local authorities to have a better quality of education and health systems.

- "Investing in a trust fund is a good idea as long as transparency is encouraged and a well-formulated social development plan is formulated."
- "Some of the communities surrounding mining operations are already benefiting from these funds but it is sad to see that the quality of education and healthcare does not meet international standards."

Question T17 was a complementary question to the themes emanating from question T13, 31 respondents out of 51 participants answered the SLC theme. The feedback is that local sub-contractors do not have all the necessary skills and technical know-how to compete with the mining industry sector. There is a strong perception that an upgrade of technical knowledge is more than necessary with the development of a local manufacturing sector.

Below, the comment from respondents:

- "Certain services providers (subcontractors or SMEs) provide the goods or services requested in certain areas. But they are unable to provide specifics goods and services such as heavy machinery equipment or specialized software support."
- "There is no comprehensive list of subcontractors available in the Lualaba Province, but for those who listed locally, the services that they provide often do not meet international standards in terms of quality or delivery time."

Question T18 collected answers from 24 respondents out of 51 participants on the TRN theme. The majority of respondents agree on the need to involve mining companies in the formulation of a training program to support the SMEs sector which should respond effectively to the

demand for support and services from the local mining sector. In addition, this SMEs sector will be strengthened to high competitiveness which will enable it to meet the challenge at the level of the global supply chain. The scepticism and apparent unwillingness of mining companies operating in the Lualaba Province remains a challenge. Below are some respondents' answers:

- "The expectations of mining companies operating in the Lualaba Province in terms of supply quality need to be well-defined to provide a good training orientation to SMEs."
- "It will be a good initiative to train local SMEs, but it will also be preferable to facilitate access to loans and credit from financial institutions in the province."

The sub-themes were grouped according to the research proposals, as summarized in Table 6.6, 6.7, 6.8 and 6.9 to facilitate the discussion of results.

Table 6. 6: Compiled sub-themes with regard to research proposition 1 (Aggregate1)

Sub-themes	Participants	Government engagement and participation is weak
SUD=34	51	Sustainable development is not promoted locally
LI=30	51	Local institutions are weak and unsupportive
PRA=32	51	Political and regulatory authorities and public spending
SSM=29	51	most of small-scale mines operates in illegal areas
MSR=31	51	mining sector regulations are ineffective
SOP=29	51	The cobalt mining sector should consider to integrate the artisanal sector into a strategic and operational plan that include a local downstream beneficiation stage
TSR=51	51	Lack of technical structures of law enforcement regarding the mining code
INV=28	51	lack of investments promotion
FLC=28	51	Willingness to fund local content development

Table 6. 7: Compiled sub-themes with regard to research proposition 2 (Aggregate 2)

Sub-themes	Participants	Low understanding of the cobalt mining value chain
MVC=47	51	Partial definition of the mining value chain

Table 6. 8: Compiled sub-themes with regard to research proposition 3 (Aggregate 3)

Sub-themes	Participants	Viability of Local contents

RYT=46	51	very low impact of Mining royalties on the local economy
SCN=26	51	poor social conditions are triggering child and pregnant women labour
SDP=36	51	weak support of social development programs by mining companies
BC=43	51	Business climate is permanently associated to political uncertainty
CIS=27	51	behaviour of the civil society actors
LCO=41	51	Viability of local content is weak because the local economy is outward oriented (high volume of imports)
LOA=25	51	Local authorities are under the supervision of national government who doesn't always support local civil society because of conflict of interest (self-oriented interests) in the mining sector.
LMS=43	51	local manufacturing sector
CBC=14	51	Cobalt-based components should be fabricated locally
DWB=22	51	Downstream beneficiation companies
AI=25	51	Automotive industry (electrical vehicles) is a long-term opportunity for the local economy
AM=27	51	Artisanal mining must be included into the downstream strategy
INS=32	51	International standard education and healthcare is required
SLC=31	51	Integrability of the local supply chain to the global supply chain must be considered when elaborating a skills development plan
ES=13	51	educational programs should be oriented toward the cobalt industry

Table 6. 9: Compiled sub-themes with regard to research proposition 4 (Aggregate 4)

Sub-themes	*Participants*	*Lack of an operational laid out national development Plan based on cobalt*
PRS=33	51	cobalt industry is a promising sector
LEM=51	51	Local employment opportunities are weak
MIC=28	51	Mining code is not enforced enough
DPR=44	51	Lack of appropriate development programs based on cobalt
MRM=40	51	Mineral resources management of cobalt is weak
DWB=49	51	Lack of a downstream beneficiation strategy of cobalt
MCP=24	51	Mining companies
BHV=26	51	rent seeking behaviour
DV=17	51	Development vision must be formulated
RD=22	51	Mining business representatives and local authorities must adopt a common development vision

HUB=13	51	Development hubs must be created
SKL=31	51	skills development
SKE=29	51	skills exchange programs
LMF=18	51	Local manufacturing requirements
TRN=24	51	Training & competitiveness of SMEs

The results compiled from the sub-themes relate to the research proposals show correlations which need to be examined in more detail. The following table presents the main drivers and challenges for the implementation of the downstream strategy in the Lualaba Province that emanated from grouped sub-themes about the research propositions. Results are summarized in Table 6.10 below.

Table 6. 10: Main drivers and challenges

Main drivers for cobalt downstream beneficiation and development	Main challenges for local downstream beneficiation strategy to be implemented
Access to education	Lack of effectiveness of legal texts
Investing in Research and Development	Legal framework observance is weak
Local content development	Transparency
Integrability of the local supply chain to the global supply chain	Corruption
Legal framework observance	Lack of collaborative and participative approach within stakeholders
Incentives of legal texts	Lack of infrastructure
Participative approach	Lack of Willingness to fund local content development
Collaborative approach	Rent seeking behaviour

Stakeholders engagement and participation	Opacity of tax system
Social corporate responsibility	Child Labour
Business climate improvement	Pregnant women Labour
Creation and development of Infrastructures (roads, bridges and electricity)	Artisanal Mining
Need of local manufacturing industry	Value Sharing from cobalt
Access to Loans	
Need of a development vision (operational strategy) with emphasis on good governance	

6.4 Grouped sub- themes (aggregates) and constructs analysis and discussion

This section discusses the results of primary data collected from organizations that granted access to the researcher. Emanating findings from primary data are compared to secondary data based on the literature review in Chapter 2 and also based on successful case studies analysis in Chapter 4.

6.4.1 Aggregate 1: The DRC government, as the main stakeholder still has a weak operational engagement and participation.

The aggregate 1 has associated sub-themes which describe the situation prevailing in the Lualaba Province with regards to the role of the government as the main stakeholder. The sub-themes associated with the aggregate corroborate results of Construct1 in which there was a collective disagreement on the socio-economic impact of the mining sector on the economy of the province and the role of the State as the main stakeholder. The result for academics (85%), civil society (94%), and NGOs (50%) in disagreement shows that most of the respondents agreed that public spending does not match the tax resulting from the mining sector. The aggregate 1 continues to indicate that the regulations in the mining sector are not effective in practice and the lack of technical structures of law enforcement is weak.

Secondary data collected in Chapter 5 referring to the institutional challenges of the mining sector at the provincial level, the weak role of the State can be explained by the lack of comprehensive and well-documented geological data at the national level. Therefore, it is

difficult for the local authorities of the province to define permanent ZEAs for the artisanal sector. Weakness in the human resources management in the public sector due to lack of competitive and skilled workforce associated with the lack of financial and logistical means. Secondary data of this research also indicated that DRC was ranked 184 out of 190 countries in terms of business climate and governance.

N'Gambwa (2011) said that since the Democratic Republic of the Congo (DRC) gained its independence in 1960, the country's leadership has been lacking three attributes of the utmost importance to the country's welfare: a real vision for the DRC's future, the competence and ability to execute the vision, and the character needed to ensure the realization of the vision with sound judgment, integrity, and equity. To break from the DRC's past patterns of poor governance a clear and practical vision for the country's future must be articulated and implemented, requiring concerted effort from a new and energized leadership. This type of leadership should come from the Congolese people—both those living in the country and those who are part of its far-flung diaspora (N'Gambwa, 2011). The United Staes Agency for International Development (USAID, 2014) reiterates that strengthening Congolese institutions' ability to transparently respond to citizen needs will be critical to establishing legitimacy. Responsive institutions will further stability and thereby attract the investment needed by this country for growth.

6.4.2 Aggregate 2: There is a very low understanding of the cobalt mining value chain

Cobalt supply has issues of concentration and risk of disruption, as it is mainly produced in Democratic Republic of Congo and China (Alves et al., 2018). A poor understanding of the value chain leads to a poor understanding of actual and potential risks in the cobalt industry and reinforces trends and gaps against future legislation and expectations for companies in cobalt industry (Cobalt Institute, 2022). It also reduces engagement with stakeholders involved in the value chain to help drive impact-driven results (Cobalt Institute, 2022).

The sub-theme that constitutes aggregate 2 was a single related item. Primary data from respondents appears to provide an incomplete definition of the mining value chain. Despite their strong background in the mining industry, respondents failed to discuss the exploration phase and the downstream beneficiation phase.

Secondary data collected in the literature review in Chapter 2 defined the mining value chain as reported by Baxter (2005). The incomplete definition of the number of participants (51) led the researcher to conclude that there is only a partial understanding of the cobalt mining value

chain and mainly upstream-oriented. The explanation for this result can be found in the historical background of the DRC mining industry and especially, in Section 5.3 of this research.

6.4.3 Aggregate 3: Promotion of local content is weak and there is a need at developing the sector in order to support local mineral beneficiation.

A weak local content affects negatively the local community in the workforce, and the promotion of local suppliers, goods, and services. Aggregate 3 includes all aspects related to the development of local content. This group was constituted according to sub-themes related to what is currently happening in the Lualaba Province, using respondents' answers to questions such as "why the local content is not developed?" or "what are the challenges and problems affecting the local content in the province?" Proposition 3 of the research is broadly confirmed by the sub-themes incorporated in group 3 and also illustrates the mechanism of the four main channels through which human development can be achieved as indicated in Chapter 2 of the literature review in Figure 2.1. Aggregate 3 is also explanatory of the definition of development as formulated by Sid (2021) and by Seers (1972) in the literature review in Chapter 2.

Construct 2 resulting from a close-ended questionnaire also indicates that respondents largely agree that the business climate in the DRC is a latent problem and in particular in the Lualaba Province. Respondents from Construct 2 indicated that the business climate in the Lualaba Province is relevant to high risk fuelled by the prevailing uncertainty in the mining sector. In addition, components such as corruption and the nature of mining contracts are also contributing factors that led to poor support from mining companies to promote local content.

Construct 3, seen as a consequence of Construct 2, clearly highlighted the communication problems between relevant stakeholders in the province as reasons not to promote local content. Lack of trust is one of the most important communication problems, as Construct 5 also indicates.

6.4.4 Aggregate 4: Lack of an operational laid out National Development Plan to outline a clear resources-based strategy around the cobalt mineral potential.

Aggregate 4 gathered all development issues-related resources, emphasizing the lack of a development plan. Aggregate 3 are dependent on a chain reaction that started in group 2 (poor understanding of the cobalt mining value chain). The lack of understanding resulted in group 2 which ultimately created group 1. The respondents largely agree that the cobalt industry is a

promising sector, and at the same time, all respondents indicate that there is a lack of employment opportunities, lack of law enforcement, lack of management of mineral resources, lack of skills development. They continue to specify that manufacturing requirements are not met and in many instances, all respondents agreed that there is a lack of a development strategy including a downstream stage. Construct 5 agrees, under Aggregate 4, much on the aspect of prevailing pessimism regarding employment opportunities related to the downstream beneficiation. The components of construct 5 indicated that if the role of the State is not effective and if there is no effective downstream beneficiation strategy of the cobalt, lack of job opportunities that happen on the upstream side is likely to happen on the downstream side. Construct 6 corroborated results of aggregate 4 in terms of skills shortage and the necessity to re-evaluate skills requirements to be competitive not only in the downstream stage but also upstream stage. Construct 6 highlighted the need to develop R&D linkages before promoting and strengthening upstream and downstream linkages (manufacturing and procurement) that must support and enable local content.

6.5 Main drivers for cobalt downstream beneficiation and development

The main factors emanating from the answers of respondents were listed in Appendix B (Section B) and include access to education; investment in research and development; local content development; integrability of the local supply chain into the global supply chain; legal framework observance; incentives of legal texts; participative approach; collaborative approach; training and competitiveness; stakeholders engagement; social corporate responsibility; business climate improvement; creation and development of spatial linkages; the need for the local manufacturing industry; access to loans and need for a development vision emphasizing on good governance.

- **Access to education**: Access to education was one of the most relevant components highlighted by respondents in their answers. Access to education in DRC in general and in the Lualaba Province, in particular, has been historically impacted by the lack of political stability that has affected the general economic development of the country. Secondary data collected indicated that the third main pillar of the PAP 2018-2022 PAP was to build a strong and viable education and health care system.
- **Investing in research & development**: Investment in R&D has been identified as one of the important components in formulating a downstream beneficiation strategy for the Lualaba Province. For a country or province to produce a skilled and competitive workforce and researchers, it is very important to restructure and implement a strong education system

(from elementary to postgraduate). Respondents generally agreed that there is no such investment in research and development at the local level and also agreed that it is important for the province to begin to move towards building competitive skills.

- **Local content development**: local content development is directly linked to the development of the upstream and backward linkages, which are by definition production linkages that can create employment opportunities and attract infrastructure. Upstream linkages involve procurement, whether it is a local or foreign supply chain, as discussed by Hirschman (1976) in the literature review in Chapter 2. Respondents identified this component as one of the main drivers to be implemented in the Lualaba Province. The example of Chile, the USA, South Africa, and Australia in Chapter 4 of case studies clearly demonstrated how local content was developed.
- **Integrability of the local supply chain to the global supply chain**: the world economy has become globalized and trade patterns have drastically changed from what it was at least a decade ago. The argument that the local supply chain should be implemented at the provincial level should be carried out by integrating aspects such as competitiveness in terms of quality and costs. Respondents broadly agreed that integration of a local supply chain is not only necessary for the Lualaba Province, but also needs to be carried out under a well-designed skills development strategy, supported by a strong educational system and access to education. The case study of Chile, presented in Chapter 4 of this study, is an example of local content development and integrability of local suppliers into the global supply chain.
- **Legal framework observance**: The need to respect the legal framework in force in the mining sector of Lualaba Province has been addressed in several instances by the respondents. Legal texts in the mining sector exist but there are practical limitations in terms of effectiveness. The case studies in Chapter 4 showed strong similarities in terms of the formulation of evolving mining legal frameworks in their respective contexts, and in several instances, the close relationship between the mining sector and the legal framework was clearly indicated as a driver of their resources-based development, through the creation of dedicated legal instruments and institutions to enforce and implement the legal texts of the mining industry.
- **Incentives of legal texts**: respondents broadly agreed that the legal texts for the mining industry of the DRC in general and the Lualaba Province, in particular, are incentive-based. This may be partly due to a vulgarization campaign by the Ministry of Mines on the Mining Code of 2018, but also to the perception of DRC nationals as citizens of multinationals that do not share enough benefits with local communities. In the introductory chapter of the research,

Lassourd (2018) indicated in an NRGI report that the tax regime of the 2018 DRC Mining Code is higher than the international standard with likely immediate consequences of limiting the development opportunities of the extractive sector of the Lualaba Province in particular. Lassourd (2018) indicated that the legal texts of the mining sector, with a tax regime, may lead to the eradication of medium-size producers.

- **Participative and collaborative approaches**: respondents and in particular those from civil society broadly agreed that the development process of construct 3 in the Lualaba Province corroborated this perception. Respondents remained under the strong impression that a participative and collaborative approach is one of the main drivers to take into account to achieve sustainable resource-based development that includes a downstream stage in the Lualaba Province. In Chapter 1 of this research, Lassourd (2018) indicated that the DRC mining code was not a consultative process and asserted that such a code would trigger conflicts between the State (DRC) and its extractive sector. Mtegha et al (2006) made recommendations on the importance of using a strong participative and collaborative approach when designing mineral policies as most resources-based development has not been successful because the concerned stakeholders did not have the development's vision ownership.

- **Stakeholders' engagement and participation**: Stakeholders' engagement and participation are one of the recurring components of respondents. Likewise, stakeholder engagement has been identified by respondents as one of the key components to drive sustainable resource-based development in the Lualaba Province. This concept seems to encompass all the above components insofar as the role of the State forms the basis for all of the other components necessary to conduct sustainable resource-based development. Based on the drivers of the collaborative and participative approach, it is highly visible that the stakeholders in the Lualaba Province are not committed to a common development vision. Legal texts, incentives, legal framework observance, local content development, and supply chain development are key components to confirm the necessity for strong stakeholder engagement and participation. Chapter 4, devoted to case studies, has amply illustrated the commitment of the state as the main stakeholder, as well as that of the various actors in the mineral sector to work together for sustainable resource-based development. Lualaba Province has yet to bring all the stakeholders together around one common vision of development based on cobalt ore.

- **Social corporate responsibility**: This sub-theme was frequently indicated by industry respondents and in particular by the local community, NGOs, and civil society respondents.

There is widespread agreement that mining companies do not follow the local development agenda or are simply slow to implement it. There is a strong perception among respondents that low state participation and commitment, coupled with the fragility of mining contracts, as noted in the Lutundula report in Chapter 5 of this research, are the main components of such an attitude of mining companies. Mining companies are under the constant pressure of "getting as much as possible from the ground before things fall apart" and are reluctant to fulfil their CSR.

- **Business climate improvement**: Respondents had indicated in many instances that the business improvement, although the improvement was recently noticeable, business harassment is still present. The DRC still ranked 184th country out of 190 in terms of ease of doing business. The Lualaba Province is one of the most affected due to its volume of production of minerals in general and the cobalt in particular (Industrial and artisanal).
- **Creation and development of infrastructure**: Respondents broadly agreed that there is no adequate infrastructure in the Lualaba Province. There is a consensual agreement among respondents that the infrastructures of the Kolwezi town are being restored in terms of bridges and access roads. But looking at the map of Lualaba Province in Section 6.2.1 of this research, almost 90% of the road network has yet been built. Other towns like Mutshatsha, Dilolo, and Kasaji have not benefited from adequate roads apart from being located on the national road which is a major access to Zambia and Angola. Respondents also agreed that electricity in the Lualaba Province still needs local development and not only for domestic use but also for industrial uses. Hydroelectricity is being developed in the Lualaba Province and it is mainly supported by mining companies that are willing to increase their respective production volumes on the international market and, likely, the hydropower that will be available will mainly benefit the operating companies. Respondents fear that the remaining energy is not sufficient for local development.
- **Need for the local manufacturing industry**: when asked about the lack of local supply and the fact that mining companies buy most of their consumables outside the province and the country, respondents said that there was no local manufacturing industry. In addition to the feeling of the respondents, it is clear that without adequate power supply, and road infrastructure, it will be almost difficult to develop a reliable manufacturing industry.
- **Access to loans**: Access to loans is considered in the literature as an enabling factor for sustainable development as it is a component of entrepreneurship, and respondents indicated that loans are not easy to access in the Lualaba Province. Institutions such as FPI (Fond de

Promotion de l'Industrie) only grant loans to politically connected entrepreneurs who, in most cases, have relatives in the institution. There is also strong feedback that loans given to entrepreneurs are not fully repaid to the lending institution. This is an unfortunate situation because by comparing with the case study of the USA and Chile, as discussed in Section 4.3.5, it is clear that for the case of the USA, access loans were given to R&D and SMEs at the early stage of development of their economy. This access to loans has had a direct positive impact on infrastructure and skills development. Peru also formulated policies such as the Canon Law that was intended to support R&D and SMEs to support the local content development.

- **Need of a development vision**: Respondents widely agreed that at the provincial level, there is an urgent need to formulate a development vision in general and a development vision based on the cobalt potential. Respondents had a strong impression that local government structures do not work as a whole, that priorities are dispersed, and that there is no unity behind a single development vision. The case study in Chapter 4 has largely explained how countries such as the USA, Australia, South Africa, and Peru were able to transcend their development vision into strategies for sustainable development. In addition, it has been explained in Chapter 4 that the development process must imperatively include components such as stakeholder engagement and participation, and compliance with mining laws.

6.6 Main challenges for local downstream beneficiation strategy

The main challenges for a sustainable downstream beneficiation strategy were compiled based on the main drivers that respondents addressed and recognized as relevant as summarized in Table 6.10

- **Lack of effectiveness of legal texts**

As indicated by respondents, there is a strong perception that in the mining sector of the DRC in general and the Lualaba Province in particular, that legal texts are not applied although the DRC is a member of the EITI since 2002 (Jansson et al. 2019). Transparency in the local mining sector is weak.

- **Corruption**

Concerning the challenge of corruption in the mining sector and the illegal aspect of artisanal mining, it is worth mentioning that at the time the researcher is writing this report, the head of the mining division of the Ministry of Mines in the Lualaba Province has been suspended for handing out illegal documents to artisanal miners who sell stolen cobalt minerals from industrial mining areas. The national Minister of Mines issued the decision under the following

reference: CAB.MIN/MINES/01/00186/2021 of April 7, 2021. This example was chosen in this discussion to highlight the urgency of implementing best practices in the mining industry in the Lualaba Province. Corruption in the mining sector in the DRC in general and the Lualaba Province, in particular, has had implications to the extent that de Schoutheete et al. (2021) indicated that all foreign mining companies that are willing to invest in DRC should seek commercial and legal guidance from the UK Bribery Act and US Foreign Corrupt Practices Act.

- **Lack of a participative and collaborative approach within stakeholders**

The challenge represented by a lack of a collaborative or participative approach can also be illustrated by the 2018 Mining Code which indicated that 0.3% of the company's annual turnover should be distributed to local communities. This is a serious commitment to participate in the local development of local communities, but due to the prevailing weakness of institutions and corruption, there is no operational implementation of this legal disposition. There is a win-win relationship that must be established among all relevant players of the industry.

- **Lack of infrastructure and public spending not oriented to priority projects**

In terms of infrastructure, the issue is due to poor management of public spending despite high revenues from the mining sector of the province. In the Lualaba Province, there is a lack of educational and health care systems except for mining companies that build medical facilities for their employees. There is no existing policy in terms of education and health care at the provincial level. The small infrastructure built is subject to strong media coverage, certainly fuelled by the political ambitions of local authorities to step for another term.

- **Lack of willingness to support the local content development**

Respondents indicated that the weak engagement and participation of the State is part of the problem of not promoting the local content, while respondents also indicated that mining companies also contribute less to the development of the local content. While the reasons for the weak commitment of the State and local authorities as they have been discussed, the lack of willingness of mining companies is tributary to the opacity of the tax system and political uncertainty, which is a difficult component to assess, but the tax regime is deemed to be above the international standard. The unwillingness of mining companies is a matter of debate in

which a collaborative approach must be formulated. This poses a major challenge in developing a viable strategy for the province.

- **Pregnant women and child labour**

Respondents noted that child and pregnant women labour is on the rise, and there is a strong perception that this will continue to increase if local authorities do not urgently take adequate measures, particularly in the artisanal cobalt sector, but also in terms of public spending, which should be oriented towards the development of the basic needs of the citizens. This particular challenge needs immediate action from the local government and must be integrated into the development strategy of the province.

- **Value sharing from cobalt mineral rent**

The challenge of value sharing is directly linked to indicators of good governance, which are connected to indicators of ease of doing business, as well as political will. Behind the concept of value sharing hides a vision of development that needs to be formulated and supported.

6.7 Summary

This chapter focused on the presentation and discussion of the primary data collected in the form of close-ended and open-ended questionnaires. Perceptions of respondents were analysed and translated into sub-themes, aggregates (combined sub-themes), and constructs using respectively qualitative data analysis techniques and exploratory factor analysis tools.

It is noticeable that the development based on cobalt resources in the DRC suffers from weaknesses due to the weak commitment and participation of the government in the vision which is shown by the absence of a solid national development plan including beneficiation, which creates a breakdown of the mechanism of improving the understanding of the cobalt mining value chain. Consequently, the communities are affected by low socio-economy as the local content is low and the valuation is also low due to the absence of a solid national development plan.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter makes conclusions and suggestions based on the research findings which are respectively aligned to the aim of the study, research objectives, research question, and the research propositions.

The research was conducted to address the problem of countries (regions) with abundant mineral resources that fail to grow economically. Although there was a debate from the International Panel of Growth that concluded that going downstream is not an automatic process, this study aimed at exploring the feasibility of the downstream implementation in the Lualaba Province of DRC.

Case studies from countries such as the USA, Australia, Chile, Peru, South Africa, and Ghana were conducted based on three main keys gathered in the value chain, linkages, and policies, in order to pave the way for the DRC to improve its vision of resource-based development through downstream beneficiation, based on its enormous cobalt ore resources in Lualaba province.

The USA has been successful in resource-based development through the integration of the key aspects based on the value chain, linkages and policies to develop the economy from natural resources. Similarly, mineral resources in Australia have been seen as the main trigger for economic growth, but the concepts of resource-based development have evolved over time. Chile, Peru, Ghana, and South Africa are committed to stimulating the economy through a downstream beneficiation strategy. However, each country faces certain challenges in successfully transforming its mineral resources into an economic driver.

Findings from successful countries' case studies mentioned above were used in a comparative approach in order to develop the downstream beneficiation strategy that must be applied to the economy of the Lualaba province as a case study. The investigation led to the conclusion that the DRC needs to strengthen first its upstream (Local content) beneficiation strategy in Lualaba province. This paved the way for in-depth research propositions supplemented by open-ended and closed-ended questionnaires in order to identify the comprehensive approaches necessary for the province of Lualaba in its leading position of cobalt ore producer to stimulate the economy of the DRC.

Proposition 1: The first proposition of this research has been largely confirmed by the research findings. There is a broad consensus among respondents to this study that the DRC government in general and the government of the Lualaba Province have low operational commitment and involvement in the cobalt mineral sector. Respondents feel that the State's commitment and involvement is the cornerstone that needs to be urgently implemented in order to achieve a viable development strategy for the Lualaba Province.

Proposition 2: Respondents appeared to have a partial understanding of the basic definition of the mining value chain. They largely acknowledged an incomplete definition of the cobalt mining value chain but seemed to understand the economic benefits of going downstream with the cobalt mineral. Proposition 1 results appeared to have influenced respondents' perception of their understanding of Proposition 2.

Proposition 3: This proposition, largely supported by the results of this research, highlighted the basic problems that the local government must face before undertaking any downstream beneficiation. Respondents confirmed that the lack of enabling factors, the lack of a local procurement framework, and the lack of upstream linkages (local manufacturing) are prerequisites for viable cobalt downstream beneficiation. Respondents referred to Proposition 1 in several instances as the main component that should trigger the local development.

Proposition 4: This proposition is strongly supported by the research's results. In many instances of this study, respondents stated that there was a lack of development vision not only at the provincial but also at the national level. The literature review in Chapter 2 and case studies examples in Chapter 4 provided sufficient and detailed information on the importance of having a resource-based development vision. The case studies also provided information on the need to link Proposition 1 (stakeholder engagement and participation) and Proposition 4 (development vision).

7.2 Conclusion

The key research question in Section 1.5 was answered by effectively achieving the objectives assigned to the development of a downstream beneficiation strategy. Based on the information gathered in Chapter 2 and the case study discussed in Chapter 4, it can be concluded that the mining sector can make a significant contribution to a country's economic growth.

The theory of economic linkage has been established as a context for existing mechanisms of resource-based development. Specific and successful case studies were conducted in very

similar historical and economic contexts, such as Peru and Chile. Data collected from the respondents and the results of this study largely confirmed the approach of this study.

Thus, the theory of economic linkage emerges as an approach that can be used to counter the resource curse theory formulated by authors such as Sachs and Warner (1995a) and (1997). This supports the overarching objective of this study of downstream beneficiation of cobalt minerals in Lualaba Province, namely to contribute to economic growth at the provincial and national levels.

The primary data of respondents led the researcher to identify the key drivers that constitute the pillars for the implementation of a downstream beneficiation strategy for the economic development in Lualaba Province as follows: access to education, investment in research and development, local content development, local supply chain integrability in the global supply chain, compliance with the legal framework, incentives of legal texts, participative and collaborative approach, stakeholders engagement and participation, CSR, improvement of the business climate, creation of spatial and upstream linkages, creation of enabling factors such as loans and credit, and more importantly, respondents indicated the need to formulate a development vision that should encompass all of the key drivers listed.

The current situation of the mineral sector of the DRC and the main challenges in formulating successful downstream beneficiation of the cobalt mining value chain in the Lualaba Province have been identified as follows: lack of effective legal texts, poor compliance with the existing legal framework, corruption, lack of a participative and collaborative approach among stakeholders, lack of or obsolete infrastructure, lack of willingness to fund the local content development, rent-seeking behaviour, opacity of the tax system, child and pregnant women labour, artisanal mining, and lack of value sharing of the cobalt mineral rent.

Thus, many challenges lie upstream of the mining value chain; although respondents to this study acknowledged that the mining sector in Lualaba Province is a promising one. The potential benefit of implementing the downstream value chain strategy for cobalt mining in Lualaba province is purely speculative at this stage of the research and needs to be corroborated by further in-depth economic analysis, using the current study as a premise.

Based on the survey conducted through an analysis of close-ended and open-ended questionnaires with different categories of actors, it was found that the government bears a great deal of responsibility for the situation in the DRC being declared a resource-curse. The government shows great insufficiency in effectively playing its regulatory role of promoting

actions worthy of making the cobalt mining resources of Lualaba Province an engine of economic recovery in its vision of resource-based development. Therefore, the upstream beneficiation of cobalt ore faces many challenges to enable the mining industry to have social and economic impact. Similarly, the shrinkage of the cobalt mineral value chain has been a disadvantage in terms of quality, job creation, linkages between stakeholders and global competitiveness. Stakeholder linkages were weakened by an ineffective communication system which affected the ability to respond to the needs of relevant stakeholders. For example, a mining company's desire to satisfy the local community could be somehow hijacked by SMEs who, through lack of communication, would provide the local community with what is not expected. This prevents the government from carrying out its plan according to the predefined roadmap.

Additionally, mining policy has been subject to dynamic change since colonial times in order to implement approaches that enhance resource-based development. However, infrastructural and structural challenges have been an obstacle for the DRC to move forward on the vision of resource-based development, as a sound mining policy has proven necessary to promote a win-win economic system. Thus, the government is basically working to increase energy capacity that meets its objective of expanding industrial mining, developing roads and railways, and building strong institutions that ensure accountability of stakeholders, support the tax system and eradicate corruption and unrest.

Mining companies have not been incentivized to work with local SMEs to promote downstream beneficiation in the cobalt value chain due to several challenges encountered, such as the lack of framework conditions allowing SMEs to operate competitively on a global scale, which includes an SME-friendly legal, regulatory and administrative environment, SME access to finance, SME support institutional structure, availability of appropriate skills and support infrastructure, integrated into national development framework. Similarly, Lualaba province faces a significant hurdle in developing strong linkages with the cobalt chain. Given the current shortages of domestic capital, technology and national skills, the DRC is highly dependent on foreign direct investment to develop its mining sector, which can seriously compromise the development of linkages. Thus, the framework conditions are not yet in place for mining companies in Lualaba Province to develop downstream because there is no local manufacturing industry, no adequate infrastructure and not enough electricity.

7.3 Recommendation

This research has several limitations, the most important of which is access to mining companies. This affected the sample size that constituted the primary data (quantitative and qualitative). Likewise, the objective was to reach a large number of stakeholders of various categories as respondents, but the protocol established for meeting certain high-profile stakeholders was subject to numerous restrictions. Thus, the number of stakeholders selected as respondents was small, but an efficient data processing methodology was put in place to make the results more reliable. However, a high number of stakeholders as respondents are recommended to increase the reliability of the results.

The geological settings of cobalt deposits in the Lualaba Province, and in the DRC in general, are associated with copper deposits and in order to produce a certain amount of cobalt to sustain downstream beneficiation, a certain amount of copper must first be produced. The results of this research indicated in many instances that before embarking on a downstream beneficiation strategy, there are main challenges that need to be addressed upstream of the cobalt mining value chain, the most important being stakeholder engagement and participation, and other spatial linkages such as the power supply that can enable the local manufacturing industry to develop and sustain the linkages necessary to go downstream in the future.

In general, for the implementation of downstream beneficiation strategy in Lualaba province, it is recommended that the DRC:

- Strengthen government commitment and participation;
- Better understand the cobalt mining value chain;
- Identify local content strength; and
- Implement an operational national development plan based on cobalt.

Furthermore, the state should review mining policy and ensure that the mining code is enforceable to eradicate the incivility (child and female abuse) and skills shortages linkages, to drive taxation appropriate to resource-based development and to promote the integration of local industry into the global supply chain. Preferential sourcing policies to local suppliers and distributors should be incorporated into mining agreements and company policy. Local sourcing should be accompanied by skills development and, ideally, the identification of additional economic activities, to reduce community dependency on the mine.

The DRC government and Lualaba Province are responsible for formulating a clear vision that supports the development of a cobalt-based strategy for global demand. Thus, it is

recommended to awaken the spirit of the community with different media actions, including forums, conferences, leaflets, posters and trainings to enable them to understand the benefits of cobalt-based components in job creation for the local community as well as the transmission social local programs. Such media actions might involve the formulation of a precise vision on how to develop a cobalt-based strategy with regards to the global demand. For the community should not be left behind in the resource-based development plan to prevent resistance from occurring due to lack of understanding.

The DRC government should improve local content by reviewing the requirements and objectives of the mining and SME code, the technical requirements of the industry, providing open and transparent procurement procedures to avoid opportunities for corruption and cronyism. In addition, there is a need to understand the associated costs and challenges such as potential loss of business profits resulting in reduced revenue, inflation, and corruption.

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APPENDIX A: Letter and Questionnaires

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Ethics Clearance Number (Pending)

Mobile: +243 996610888
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E-mail: pmukonki@tfm.cmoc.com

Dear Sir/Madam

Re: Permission to conduct research in your organization.

My name is Mukonki May Patrick.

I am a Mining Engineer employed in the industry in DRC

I am studying for a Master degree in the field of Minerals economics at the University of the Witwatersrand. I am seeking permission to do research in your organization

I am conducting research on *"Development of a Downstream Beneficiation Strategy in an underdeveloped Country: Case Study of the Lualaba Province in the Democratic Republic of Congo"*. This research aims at filling the gap between the high cobalt geological potential and the low human development of the Lualaba Province. Preliminary investigations in this research suggested that there is a lack of a comprehensive, inclusive approach between relevant stakeholders of the local industry. The core concepts behind this study is to understand how the vision of the resource-based development that has been formulated by the DRC government under the so-called "*Plan Stratégique de development du secteur Minier (2016-2021)*", which in our opinion may help, if well managed, to generate economic multipliers and more employment for the province.

Beside this approach, the research seeks at designing a strategy to promote local content in terms of procurement and entrepreneurship on the upstream side of the local mining industry, in order to eventually define the strategy at linking the local procurement to the global supply chain of the mining industry. The researcher has chosen your organization as a major stakeholder of the local mining industry because of its high volume of production of cobalt and also because of the volume of its fiscal and remarkable social contribution to the local economy.

The research will entail collecting data from company's Social, external relations, Accounting and finance departments, and eventually, their relevant departments representatives.

I will invite individuals from your organisation to participate in this study and If they agree, they will be asked to answer questionnaires (approximately 20 minutes) and to be interviewed (approximately 15 minutes). Data collection will be conducted during working hours and participants responses will eventually be audio recorded.

Participants will be asked to give their written or verbal consent before the research begins. Their responses will be treated confidentially, and identities (their names and the name of the organisation) will be anonymous unless otherwise expressly indicated. Individual privacy will be maintained in all published and written data resulting from the study.

The results will be communicated using the research dissertation, once completed.

The research participants will not be advantaged or disadvantaged in any way. They will be reassured that they can withdraw their permission at any time during this project without any penalty. There are no foreseeable risks in participating in this study. The participants will not be paid for this study.

All research data will be, preserved anonymously for reuse by other researchers.

I therefore request permission in writing to conduct my research at your organisation. The permission letter should be on your organization's headed paper, signed and dated, and specifically referring to myself by name and the title of my study.

Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,
Mukonki May Patrick
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Prof. Hudson Mtegha
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SECTION A: Demographic Information of Respondents

(Please tick in the corresponding box)

A1: Operating sector in the industry	
Mining	1
Academic	2
NGOs	3
Civil Society	4

Public sector (local government and institutions)	5
Subcontractor	6
Other (specify)	7

A2: Number of years in your organisation	
0-2years	1
2-5 years	2
6-10 years	3
11 years and more	4

A3: Level of Education	
Secondary school	1
Technical Institute	2
Undergraduate	3
Postgraduate	4

SECTION B: Open – Ended Questionnaire

1. What is your understanding on what is meant by “extractive sector”? (T1)

2. What is your perception on the contribution of the extractive sector on the economy of the Lualaba Province? (T2)

3. Do you think that the National and local government are playing their role as expected? (Comment your answer). (T3)

4. Do you have the impression that the government understand the strategic aspect of the cobalt as a mineral? Provide a short explanation. (T4)

5. Do you think that the artisanal mining is the solution for eradicating poverty in the province of Lualaba? Please comment. (T5)

6. How do you analyse the phenomenon of children and pregnant women's labour in artisanal mining area of Lualaba Province? What do you suggest to eradicate it? (T6)

7. What is your view in terms of relationship between the extractive sector and the educational and health system? do you think that mining companies established in the Lualaba Province are doing enough? What would you recommend? (T7)

8. In your opinion, what are the type and quality of relationship between the State and mining companies operating in the region? (business climate, ease at doing businesses) (T8)

9. Is the mining code of 2018 incentivizing enough for investing into the Lualaba Province? (T9)

10. Is the mining code of 2018 promoting investments in the Lualaba Province? (T10)

11. Do you think that the civil society is associated enough in the process of communities' development of the province? Do you think that mining companies are impacting positively local communities? What would you recommend? (T11)

12. Most mining companies that are operating in the Lualaba Province are importing goods from other countries, what is your opinion in order to have those goods being sourced locally? Comment your answer. (T12)

13. What is your opinion on the idea of developing local skills in order to create more local employment rather than sourcing foreign skills? Do you think that it is the duty of the Government, Universities, and mining companies operating in the province or both? Elaborate on your answer (suggest a strategy). (T13)

14. Why the manufacturing sector of the Lualaba Province is not developed as we can see in other countries? Do you think that is because the government is not promoting the local manufacturing industry or because local peoples lack sense of entrepreneurship? (T14)

15. The DRC government created the "Entreprise Générale du Cobalt" in the Lualaba Province, do you think that that company should also looking at manufacturing cobalt-based components? For instance, components for batteries of electrical vehicles? What will be your core recommendations regarding this? (T15)

16. As a representative of a mining company operating in the Lualaba Province, would you recommend to your Board of Directors that your company invest in a "trust fund" in order to support local communities of your jurisdiction access to decent education and healthcare system at international standard? (T16)

17. As a representative of a mining company operating in the region, do you think that local subcontractors are providing required goods and services? (T17)

18. Do you think that, if that is the case, your company (as the company representative) will invest in a training program (via a trust fund or similar convention) to support local

subcontractors in order to help take them to an international standard level? Would you recommend that to your Board of directors? (Please elaborate on your answer) (T18)

SECTION C: Closed – Ended Questionnaire

1	2	3	4	5
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

	QUESTION	SCALE				
Q1	Does the mine employs members of the local community?	1	2	3	4	5
Q2	Does the mine employs local skilled peoples?	1	2	3	4	5
Q3	Does the mine employs enough local peoples in general?	1	2	3	4	5
Q4	Does the community feel the impact of the mining activity in its area in terms of job creation?	1	2	3	4	5

Q5	Does the community think that fabricating cobalt-based components can create more jobs for the local community?	1	2	3	4	5
Q6	Social local programmes of mining companies have been well communicated to the local community	1	2	3	4	5
Q7	Does local communities around the mining activity understand what is meant by social programmes?	1	2	3	4	5
Q8	The mine supports existing social programmes?	1	2	3	4	5
Q9	Does the mine management promote communication with local communities?	1	2	3	4	5
Q10	Does the mine provide enough infrastructure to the local community?	1	2	3	4	5
Q11	Does the mine promote health and education for local communities in an effective manner?	1	2	3	4	5
Q12	The community is aware on the uses and criticality of the cobalt in the global industry?	1	2	3	4	5
Q13	Is the community aware enough on what is involved in the production of cobalt?	1	2	3	4	5
Q14	Is the community aware on the fact that before producing cobalt copper must be extracted first?	1	2	3	4	5
Q15	Does Small and Medium size enterprises (SMEs) have access to materials or by-products from mine operating in the Lualaba Province? (especially tailings)	1	2	3	4	5
Q16	Are SMEs aware on what type of standard of goods and services are they expected to provide?	1	2	3	4	5
Q17	Does mines willing to promote local SMEs in order to make them competitive enough at global level?	1	2	3	4	5
Q18	Does mines willing to work together with SMEs in order to source more goods and services locally?	1	2	3	4	5
Q19	Mining companies are willing to work together with local SMEs in order to promote downstream beneficiation of the cobalt value chain?	1	2	3	4	5
Q20	Do you think that the government doesn't doing enough at promoting local manufacturing and cobalt downstream beneficiation?	1	2	3	4	5
Q21	Do you think that as a government, more still to be done regarding the mining code of 2018 to promote investments of small, medium and large-scale mining companies?	1	2	3	4	5
Q22	Do you think that the government of the Lualaba Province can help promote local manufacturing of cobalt-based components?	1	2	3	4	5

Q23	Do you think that the DRC government in general and the government of the Lualaba Province in particular have formulated a clear vision on how to develop a cobalt-based strategy with regards to the global demand?	1	2	3	4	5

SECTION D: Summary of respondent's answers

	Question	Mean	Skewness	Range	Agree and strongly agree (%)	Neutral (%)	Disagree and strongly disagree (%)
Q1	Does the mine employ members of the local community?	1.65	0.777	2.00	66.7	2.0	31.4
Q2	Does the mine employ local skilled peoples?	1.39	1.519	2.00	72.5	15.7	11.8
Q3	Does the mine employ enough local peoples in general?	2.35	-0.760	2.00	23.5	17.6	58.8

Q4	Does the community feel the impact of the mining activity in its area in terms of job creation	2.14	-0.285	2.00	39.2	7.8	52.9
Q5	Does the community think that fabricating cobalt-based components can create more jobs for the local community?	2.08	-0.161	2.00	41.2	9.8	49.0
Q6	Have social local programs of mining companies been well communicated to the local community?	2.51	-1.221	2.00	23.5	2.0	74.5
Q7	Do local communities around mining activities understand what is meant by social programs?	1.94	0.121	2.00	52.9		47.1
Q8	Does the mine support existing social programs?	1.84	0.314	2.00	45.1	25.5	29.4
Q9	Does the mine management promote communication with local communities?	2.75	-2.301	2.00	11.7	2.0	86.3
Q10	Does the mine provide enough infrastructures to the local community?	2.69	-1.940	2.00	13.7	3.9	82.4
Q11	Does the mine promote health and education for local communities in an effective manner?	2.51	-1.218	2.00	21.6	5.9	72.5

	Question	Mean	skewness	Range	Agree and strongly agree (%)	Neutral (%)	Disagree and strongly disagree (%)
Q12	Is the community aware on the use and criticality of the cobalt in the global industry?	2.73	-2.092	2.00	7.8	11.8	80.4
Q13	Is the community aware enough on what is involved in the production of cobalt?	2.82	-2.940	2.00	5.9	5.9	88.2

Q14	Is the community aware of the fact that before producing cobalt, copper must be extracted first?	2.75	-2.301	2.00	11.8	2.0	86.3
Q15	Does SMEs have access to materials or by-products from mines operating in the Lualaba Province? (Especially tailings?)	2.82	-2.988	2.00	7.8	2.0	90.2
Q16	Are SMEs aware on what type of standards of goods and services they are expected to provide?	2.00	0.030	2.00	48.1	5.9	46.0
Q17	Does mines willing to promote local SMEs in order to make them competitive at global level?	2.63	-1.654	2.00	15.7	5.9	78.4
Q18	Does mines willing to work together with SMEs in order to source goods and services locally?	2.51	-1.199	2.00	17.6	13.7	68.6
Q19	Are Mining companies willing to work together with local SMEs in order to promote downstream beneficiation of the cobalt value chain?	2.69	-1.945	2.00	15.7		84.3
Q20	Do you think that the government doesn't do enough to promote local manufacturing and cobalt downstream beneficiation?	1.55	1.040	2.00	70.6	3.9	25.5
Q21	Do you think that as a government, more still to be done regarding the mining code of 2018 to promote investments of SMEs and large-scale mining companies?	2.82	-2.940	2.00	5.9	5.9	88.2

SECTION E: Summarizing results of unrotated factors analysis matrix using Principal Component Analysis method (PCA) with cut-off value above 0.5

	Component							
	F1	F2	F3	F4	F5	F6	F7	F8
Q1		0.578	0.534					
Q2								
Q3	0.817							
Q4	0.675							
Q5		0.657						
Q6		0.713						
Q7			0.683					
Q8	0.546	0.588						
Q9								
Q10	0.567							
Q11	0.691							
Q12			0.533					
Q13	0.505							
Q14	0.672							
Q15	0.700							
Q16						0.581		
Q17	0.525							
Q18				0.515				
Q19	0.567			0.533				
Q20						0.711		
Q21								
Q22	0.612							
Q23		0.513					0.562	

SECTION F: The components matrix of factor loadings after applying the Varimax rotation method

Rotated Component Matrix[a]								
	Component							
	F1	F2	F3	F4	F5	F6	F7	F8
Q1				0.859				
Q2				0.600				
Q3	0.772							
Q4	0.784							
Q5					0.695			
Q6					0.698			
Q7				0.626				
Q8				0.595				
Q9			0.646					
Q10	0.681							
Q11	0.836							
Q12						0.748		
Q13			0.623					
Q14			0.793					
Q15			0.702					
Q16								0.796
Q17		0.661						
Q18						0.746		
Q19		0.861						
Q20								
Q21							0.804	
Q22		0.671						
Q23					0.811			

APPENDIX B: Purpose of Each question

SECTION A: Open-ended questions

Question	Purpose of the question
T1	This question was asked to clarify the understanding of respondents on the mining value chain with regards to upstream and downstream beneficiation
T2	This question aims at assessing the understanding of public spending and also, should highlight issues such as transparency, good governance and strength of institutions and eventually the prevailing corruption in the public sector
T3	Similarly, to question 2, this question was meant to draw attention of respondents on the stakeholder's engagement, especially regarding the government, expectations here are focused on how the local government should play his role in terms of engagement to develop the province
T4	The purpose of this question is more related to the understanding that has the local authorities in terms of exhaustibility of mineral resources, and the limited time window that the local government has in terms of harnessing the cobalt geological potential in order to promote economic development of the province
T5	The uncontrolled artisanal cobalt sector triggered in the past an oversupply of cobalt on the global market that led partially to its price drop. The idea behind this question is to verify if respondents were aware of the necessity to have a formal economy linked to the artisanal sector of the cobalt.
T6	This question is in relationship with question 5 with the aim to provide orientation to respondents regarding strengthening formalization of the artisanal sector
T7	The purpose of this question was to measure the technological and resource and development linkage and what policy the stakeholders of the sector should develop together
T8	The purpose of this question was to determine the potential willingness of stakeholders such as investors at engaging in the downstream beneficiation and promoting local content
T9	This question was asked with the expectation at assessing the prevailing legal framework in the sector and to be able later to formulate recommendations

T10	This question was asked to assess the attractiveness of the mining sector of the Lualaba Province
T11	The question aims at assessing the level of inclusivity, participation and vision ‘s ownership of all relevant stakeholders of the industry
T12	It is widely accepted that DRC in general and the Lualaba Province in particular are importing goods and services. There is a strong perception that promoting local content should create more employment but a strategy should then be implemented.
T13	This question was addressed in order to gather information regarding developing a collaborative strategy between the mineral sector and the public sector. What should be done in terms of R&D? to improve the local content?
T14	The manufacturing sector of the DRC and the Lualaba Province is almost inexistent. What are the root causes? What can be done? What should be the roles of stakeholders? What strategy should be developed?
T15	This question was addressed with the aim at determining how far the Local government can engage him in terms of downstream beneficiation. The question equally addressed the need at developing a vision around the cobalt mineral potential.
T16	This was to assess the level of willingness of mining companies to go beyond the CSR
T17	This question addresses the question of competitiveness and incorporation of local subcontractors in the global supply chain.
T18	The question was to assess if mining companies, as major stakeholder is willing to collaborate to implement a strategy at developing local content

SECTION B: Sub-themes collated form respondents

Question	Mining	Ministry of Mines	Civil society	Academic	Local community	Subcontractor	NGO	total respondents	Total participants	Themes & Sub themes
T1	MVC=8	MVC=5	MVC=7	MVC=9	MVC=5	MVC=7	MVC=6	**MVC=47**	51	Low understanding of the mining value chain concept
T2	RYT=7	RYT=5	RYT=8	RYT=9	RYT=6	RYT=5	RYT=6	**RYT=46**	51	very low impact of Mining royalties on the local economy
	PRS=3	PRS=2	PRS=8	PRS=6	PRS=3	PRS=10	PRS=1	**PRS=33**	51	cobalt industry is a promising sector
	LEM=9	LEM=5	LEM=8	LEM=10	LEM=6	LEM=7	LEM=6	**LEM=51**	51	Local employment opportunities are weak
T3	SUD=7	SUD=4	SUD=2	SUD=8	SUD=4	SUD=7	SUD=2	**SUD=34**	51	sustainable development is not promoted
	MIC=4	MIC=2	MIC=4	MIC=7	MIC=3	MIC=3	MIC=5	**MIC=28**	51	Mining code is not enforced enough
	LI=6	LI=4	LI=7	LI=9	LI=2	LI=1	LI=1	**LI=30**	51	Local institutions are weak and unsupportive
	DPR=7	DPR=5	DPR=8	DPR=7	DPR=4	DPR=7	DPR=6	**DPR=44**	51	Lack of appropriate development programs based on cobalt
T4	PRA=1	PRA=3	PRA=7	PRA=9	PRA=6	PRA=5	PRA=1	**PRA=32**	51	political and regulatory authorities
	MRM=5	MRM=5	MRM=7	MRM=8	MRM=5	MRM=4	MRM=6	**MRM=40**	51	Mineral resources management of cobalt is weak
	DWB=8	DWB=5	DWB=7	DWB=10	DWB=6	DWB=7	DWB=6	**DWB=49**	51	Lack of a downstream beneficiation strategy of the cobalt
T5	SSM=5	SSM=4	SSM=8	SSM=5	SSM=4	SSM=2	SSM=1	**SSM=29**	51	most of small-scale mines operates in illegal areas
	MSR=7	MSR=2	MSR=6	MSR=6	MSR=3	MSR=4	MSR=3	**MSR=31**	51	mining sector regulations are ineffective

Question	Mining	Ministry of Mines	Civil society	Academic	Local community	Subcontractor	NGO	total respondents	Total participants	Themes & Sub themes
T6	SCN=7	SCN=5	SCN=1	SCN=5	SCN=3	SCN=4	SCN=1	**SCN=26**	51	poor social conditions are triggering child and pregnant women labour
	SOP=7	SOP=4	SOP=7	SOP=7	SOP=2	SOP=1	SOP=1	**SOP=29**	51	The cobalt mining sector should consider to integrate the artisanal sector into a strategic & operational plans that include the local downstream beneficiation stage
T7	ES=2	ES=3	ES=2	ES=2	ES=2	ES=1	ES=1	**ES=13**	51	educational programs should be oriented toward the cobalt industry
	MCP=2	MCP=5	MCP=4	MCP=5	MCP=3	MCP=2	MCP=3	**MCP=24**	51	Mining companies
	SDP=5	SDP=5	SDP=7	SDP=9	SDP=5	SDP=4	SDP=1	**SDP=36**	51	weak support of social development programs by mining companies

Question	Mining	Ministry of Mines	Civil society	Academic	Local community	Subcontractor	NGO	total respondents	Total participants	Themes & Sub themes
T8	BC=9	BC=2	BC=8	BC=8	BC=4	BC=6	BC=6	**BC=43**	51	Business climate is permanently associated to political uncertainty
T9	TSR=9	TSR=5	TSR=8	TSR=10	TSR=6	TSR=7	TSR=6	**TSR=51**	51	Lack of technical structures of law enforcement regarding the mining code
	BHV=6	BHV=3	BHV=2	BHV=8	BHV=3	BHV=2	BHV=2	**BHV=26**	51	rent seeking behaviour
T10	INV=5	INV=5	INV=7	INV=3	INV=3	INV=2	INV=3	**INV=28**	51	lack of investments promotion
T11	CIS=4	CIS=3	CIS=6	CIS=4	CIS=6	CIS=3	CIS=1	**CIS=27**	51	behaviour of the civil society actors
	LOA=2	LOA=3	LOA=6	LOA=4	LOA=5	LOA=3	LOA=2	**LOA=25**	51	local authorities are under the authority of National government who doesn't support civil society because of self-interests in the mining sector
T12	LCO=9	LCO=2	LCO=8	LCO=7	LCO=6	LCO=7	LCO=2	**LCO=41**	51	Viability of local content is weak because the local economy is outward oriented (high imports)
	DV=3	DV=3	DV=4	DV=2	DV=1	DV=2	DV=2	**DV=17**	51	Development vision must be formulated
	LMS=9	LMS=2	LMS=8	LMS=10	LMS=3	LMS=6	LMS=5	**LMS=43**	51	local manufacturing sector

Question	Mining	Ministry of Mines	Civil society	Academic	Local community	Subcontractor	NGO	total respondents	Total participants	Themes & Sub themes
T13	RD=4	RD=2	RD=6	RD=4	RD=2	RD=1	RD=3	**RD=22**	51	Mining business representatives and local authorities must adopt a common development vision
	HUB=3	HUB=1	HUB=2	HUB=1	HUB=2	HUB=2	HUB=2	**HUB=13**	51	Development hubs must be created
	SKL=9	SKL=2	SKL=1	SKL=10	SKL=1	SKL=7	SKL=1	**SKL=31**	51	skills development
	SKE=9	SKE=2	SKE=1	SKE=7	SKE=5	SKE=2	SKE=3	**SKE=29**	51	skills exchange programs
T14	LMF=5	LMF=1	LMF=1	LMF=6	LMF=3	LMF=1	LMF=1	**LMF=18**	51	Local manufacturing requirements
T15	CBC=1	CBC=2	CBC=3	CBC=2	CBC=1	CBC=2	CBC=3	**CBC=14**	51	Cobalt-based components should be fabricated locally
	DWB=9	DWB=2	DWB=1	DWB=4	DWB=2	DWB=3	DWB=1	**DWB=22**	51	Downstream beneficiation companies
	AI=2	AI=4	AI=7	AI=8	AI=1	AI=2	AI=1	**AI=25**	51	Automotive industry (electrical vehicles) is a sustainable opportunity for the local economy
	AM=8	AM=2	AM=7	AM=5	AM=2	AM=1	AM=2	**AM=27**	51	Artisanal mining must be included into the downstream strategy
T16	FLC=6	FLC=5	FLC=5	FLC=6	FLC=3	FLC=1	FLC=2	**FLC=28**	51	Willingness to fund local content
	INS=8	INS=5	INS=3	INS=4	INS=2	INS=4	INS=6	**INS=32**	51	International standard education and healthcare is required

T17	SLC=2	SLC=5	SLC=2	SLC=3	SLC=6	SLC=7	SLC=6	**SLC=31**	51	integrability of the local supply chain to the global supply chain must be considered when elaborating skills development plan
T18	TRN=3	TRN=5	TRN=2	TRN=5	TRN=6	TRN=1	TRN=2	**TRN=24**	51	Training & competitiveness of SMEs

Table 6. 11: explains the abbreviations used in the table 6.16a, 6.16b, 6.16c and 6.16d above

Themes & Sub themes	Code
Low understanding of the mining value chain concept	MVC
very low impact of Mining royalties on the local economy	RYT
cobalt industry is a promising sector	PRS
Local employment opportunities are weak	LEM
sustainable development is not promoted	SUD
Mining code is not enforced enough	MIC
Local institutions are weak and unsupportive	LI
Lack of appropriate development programs based on cobalt	DPR
political and regulatory authorities	PRA
Mineral resources management of cobalt is weak	MRM
Lack of a downstream beneficiation strategy for the cobalt	DWB
most of small-scale mines operates in illegal areas	SSM
mining sector regulations are ineffective	MSR
poor social conditions are triggering children and pregnant women labour	SCN
The cobalt mining sector should consider to integrate the artisanal sector into a strategic and operational plan that include a local downstream beneficiation stage	SOP
educational programs should be oriented toward the cobalt industry	ES
Mining companies	MCP

weak support of social development programs by mining companies	SDP
Business climate is permanently associated to political uncertainty	BC
Lack of technical structures of law enforcement regarding abiding to the mining code	TSR
rent seeking behaviour	BHV
lack of investments promotion	INV
behaviour of the civil society actors	CIS
local authorities are under the authority of the national government who doesn't support civil society because of self-interests in the mining sector	LOA
Viability of local content is weak because the local economy is outward oriented (high imports)	LCO
Development vision must be formulated	DV
local manufacturing sector	LMS
Mining business representatives and local authorities must adopt a common development vision	RD
Development hubs must be created	HUB
skills development	SKL
skills exchange programs	SKE
Local manufacturing requirements	LMF
Cobalt-based components should be fabricated locally	CBC
Downstream beneficiation companies	DWB
Automotive industry (electrical vehicles) is a long-term opportunity for the local economy	AI
Artisanal mining must be included into the downstream strategy	AM
Willingness to fund local content	FLC
International standard education and healthcare is required	INS
integrability of the local supply chain to the global supply chain must be considered when elaborating	SLC

skills development plan	
Training & competitiveness of SMEs	TRN

APPENDIX C: Frequency Tables (Close-Ended Questionnaire)

Q1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	25	49.0	49.0	49.0
	2	9	17.6	17.6	66.7
	3	1	2.0	2.0	68.6
	4	7	13.7	13.7	82.4
	5	9	17.6	17.6	100.0
	Total	51	100.0	100.0	

Q2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	19	37.3	37.3	37.3
	2	18	35.3	35.3	72.5
	3	8	15.7	15.7	88.2
	4	4	7.8	7.8	96.1
	5	2	3.9	3.9	100.0
	Total	51	100.0	100.0	

Q3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	13.7	13.7	13.7

	2	5	9.8	9.8	23.5
	3	9	17.6	17.6	41.2
	4	23	45.1	45.1	86.3
	5	7	13.7	13.7	100.0
	Total	51	100.0	100.0	

Q4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	19.6	19.6	19.6
	2	10	19.6	19.6	39.2
	3	4	7.8	7.8	47.1
	4	17	33.3	33.3	80.4
	5	10	19.6	19.6	100.0
	Total	51	100.0	100.0	

Q5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	16	31.4	31.4	31.4
	2	5	9.8	9.8	41.2
	3	5	9.8	9.8	51.0
	4	3	5.9	5.9	56.9
	5	22	43.1	43.1	100.0
	Total	51	100.0	100.0	

Q6					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	3.9	3.9	3.9
	2	10	19.6	19.6	23.5
	3	1	2.0	2.0	25.5
	4	17	33.3	33.3	58.8
	5	21	41.2	41.2	100.0
	Total	51	100.0	100.0	
Q7					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	29.4	29.4	29.4
	2	12	23.5	23.5	52.9
	4	15	29.4	29.4	82.4
	5	9	17.6	17.6	100.0
	Total	51	100.0	100.0	
Q8					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	29.4	29.4	29.4
	2	8	15.7	15.7	45.1
	3	13	25.5	25.5	70.6
	4	5	9.8	9.8	80.4
	5	10	19.6	19.6	100.0

	Total	51	100.0	100.0	

Q9					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	5.9	5.9	5.9
	2	3	5.9	5.9	11.8
	3	1	2.0	2.0	13.7
	4	18	35.3	35.3	49.0
	5	26	51.0	51.0	100.0
	Total	51	100.0	100.0	
Q10					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	6	11.8	11.8	13.7
	3	2	3.9	3.9	17.6
	4	10	19.6	19.6	37.3
	5	32	62.7	62.7	100.0
	Total	51	100.0	100.0	
Q11					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	7.8	7.8	7.8

	2	7	13.7	13.7	21.6
	3	3	5.9	5.9	27.5
	4	11	21.6	21.6	49.0
	5	26	51.0	51.0	100.0
	Total	51	100.0	100.0	

Q12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	3	5.9	5.9	7.8
	3	6	11.8	11.8	19.6
	4	20	39.2	39.2	58.8
	5	21	41.2	41.2	100.0
	Total	51	100.0	100.0	

Q13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	5.9	5.9	5.9
	3	3	5.9	5.9	11.8
	4	16	31.4	31.4	43.1
	5	29	56.9	56.9	100.0
	Total	51	100.0	100.0	

Q14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	5	9.8	9.8	11.8
	3	1	2.0	2.0	13.7
	4	12	23.5	23.5	37.3
	5	32	62.7	62.7	100.0
	Total	51	100.0	100.0	
Q15					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	3	5.9	5.9	7.8
	3	1	2.0	2.0	9.8
	4	10	19.6	19.6	29.4
	5	36	70.6	70.6	100.0
	Total	51	100.0	100.0	
Q16					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	17	33.3	33.3	33.3
	2	7	13.7	13.7	47.1
	3	3	5.9	5.9	52.9
	4	14	27.5	27.5	80.4
	5	10	19.6	19.6	100.0
	Total	51	100.0	100.0	

Q17					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	7	13.7	13.7	15.7
	3	3	5.9	5.9	21.6
	4	19	37.3	37.3	58.8
	5	21	41.2	41.2	100.0
	Total	51	100.0	100.0	
Q18					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	8	15.7	15.7	17.6
	3	7	13.7	13.7	31.4
	4	14	27.5	27.5	58.8
	5	21	41.2	41.2	100.0
	Total	51	100.0	100.0	
Q19					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	9.8	9.8	9.8
	2	3	5.9	5.9	15.7

	4	20	39.2	39.2	54.9
	5	23	45.1	45.1	100.0
	Total	51	100.0	100.0	

Q20

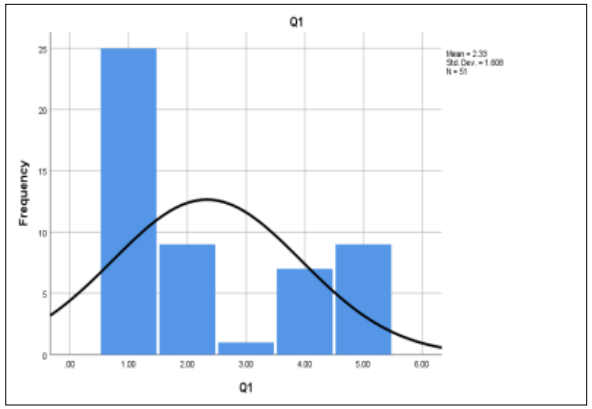
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	23	45.1	45.1	45.1
	2	13	25.5	25.5	70.6
	3	2	3.9	3.9	74.5
	4	6	11.8	11.8	86.3
	5	7	13.7	13.7	100.0
	Total	51	100.0	100.0	

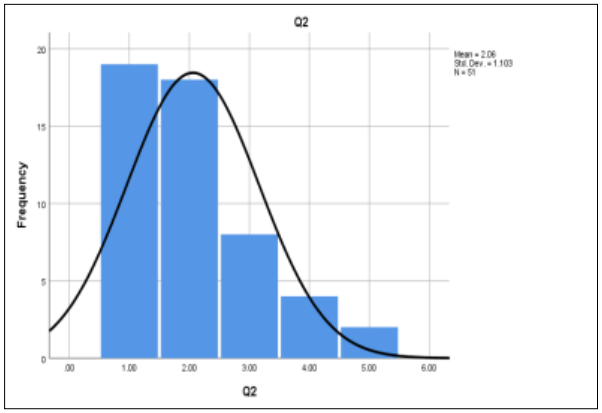
Q21

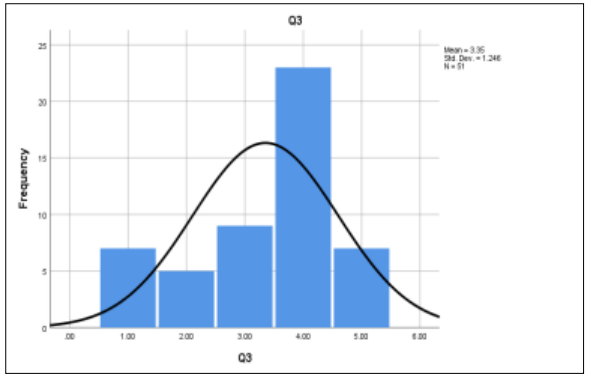
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	2	3.9	3.9	5.9
	3	3	5.9	5.9	11.8
	4	19	37.3	37.3	49.0
	5	26	51.0	51.0	100.0
	Total	51	100.0	100.0	

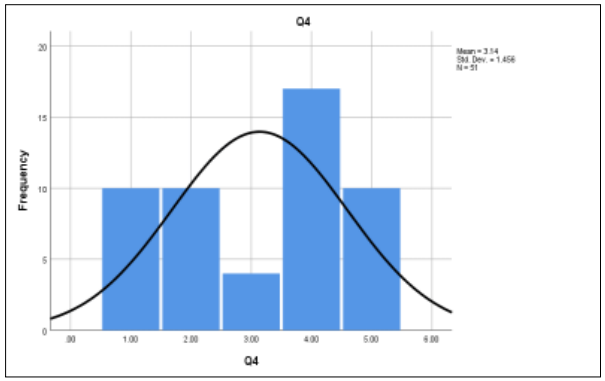
Q22					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	11.8	11.8	11.8
	2	6	11.8	11.8	23.5
	3	2	3.9	3.9	27.5
	4	15	29.4	29.4	56.9
	5	22	43.1	43.1	100.0
	Total	51	100.0	100.0	
Q23					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	2.0	2.0	2.0
	2	3	5.9	5.9	7.8
	3	5	9.8	9.8	17.6
	4	14	27.5	27.5	45.1
	5	28	54.9	54.9	100.0
	Total	51	100.0	100.0	

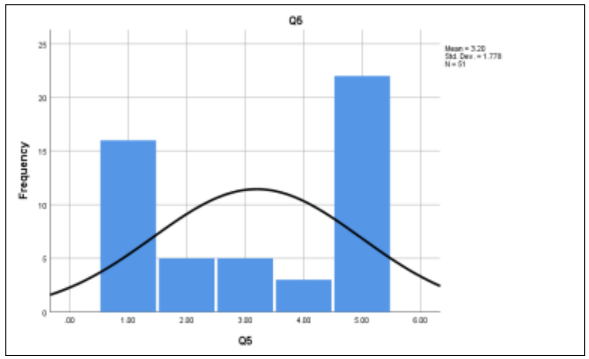
APPENDIX D: Histograms and Distribution curves (Close-Ended Questionnaire)

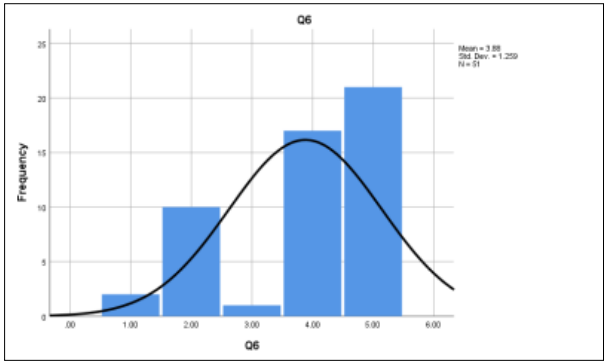









Q6
Mean = 3.20
Std. Dev. = 1.778
N = 51
Frequency
Q5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Std. Dev. = 1.259
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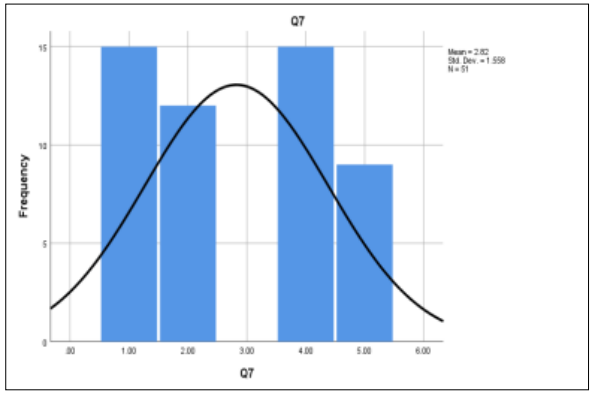
Frequency
Q6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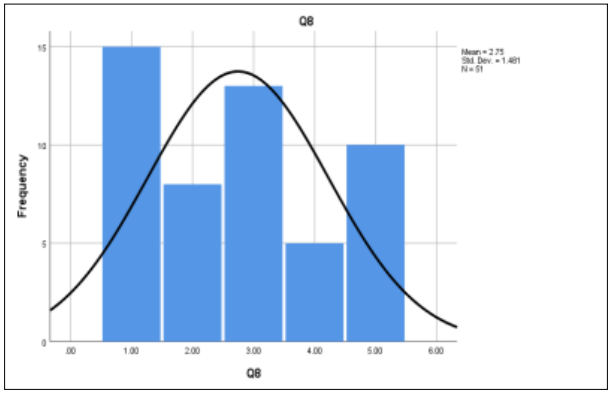
Mean = 2.82
Std. Dev. = 1.558
N = 51
Frequency
Q7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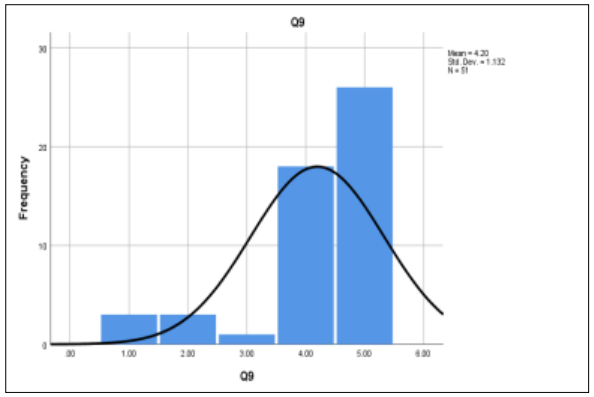
Mean = 2.75
Std. Dev. = 1.481
N = 51
Frequency
Q8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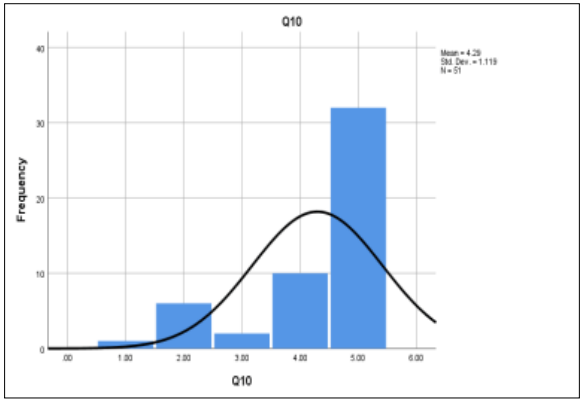
Std. Dev. = 1.132
N = 51
Frequency
Q9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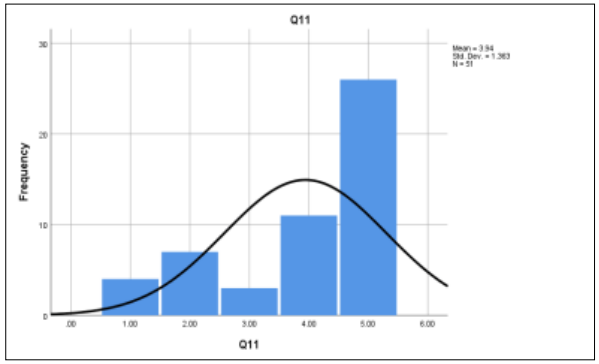
Frequency
Q10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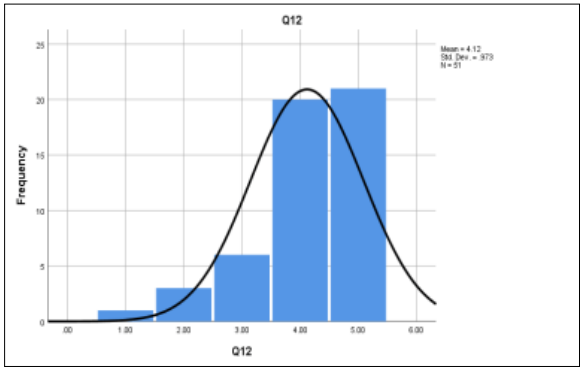
Std. Dev. = 1.363
N = 51
Frequency
Q11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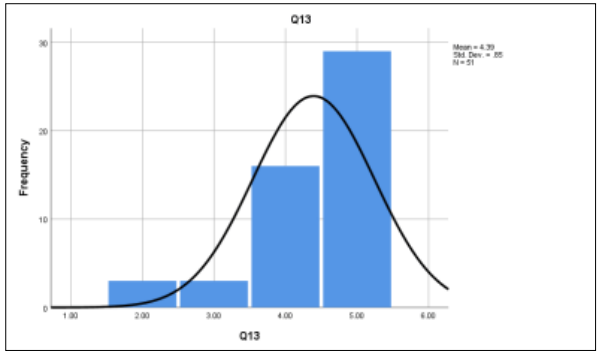
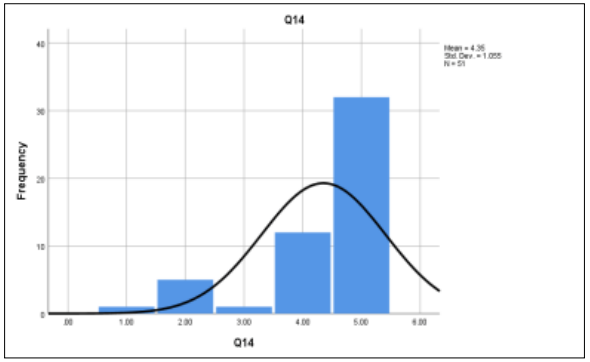
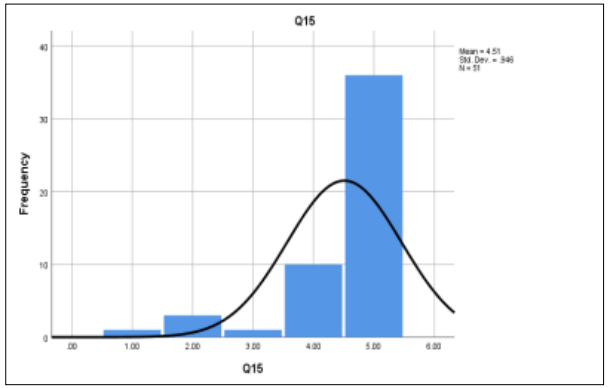
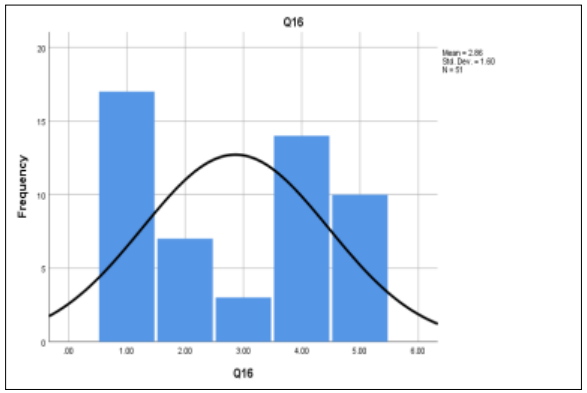
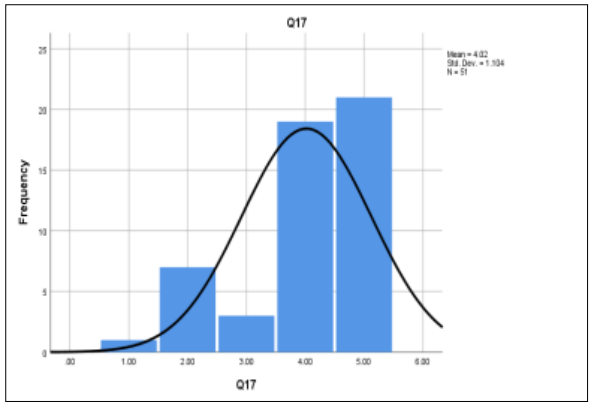
Std. Dev. = .973
N = 51
Frequency
Q12

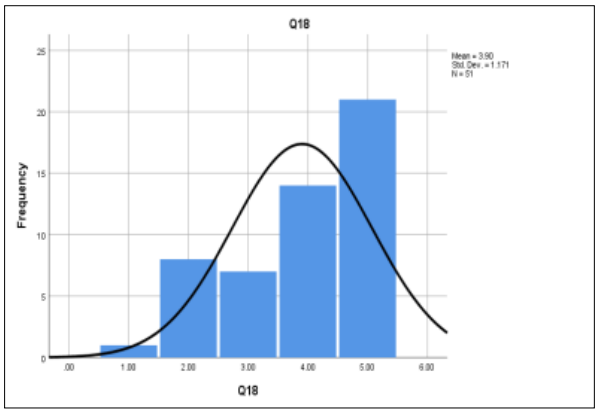

Q13
Frequency
Q13

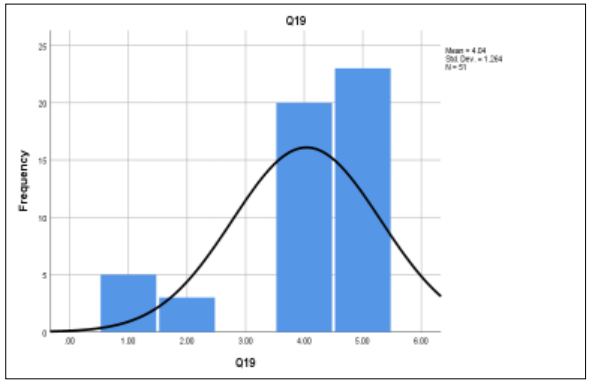

Q14
Frequency
Q14

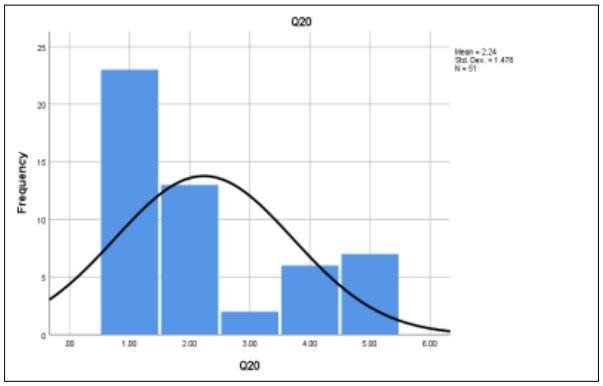

Q15
Frequency
Q15

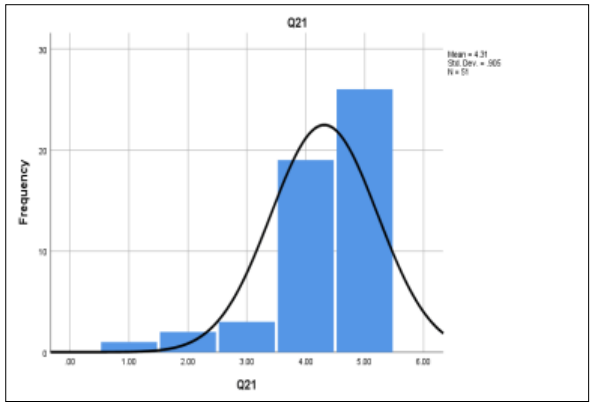

Q16
Frequency
Q16

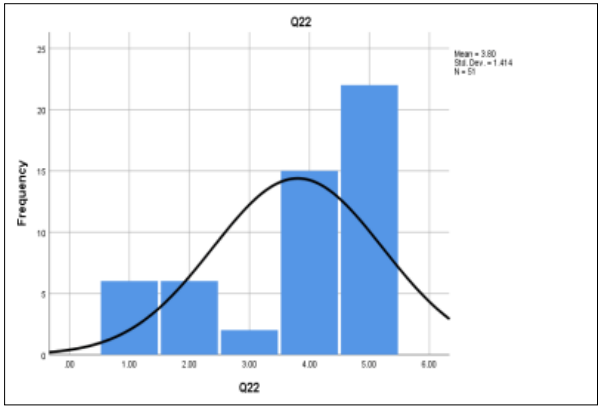

Q17
Mean = 4.02
Std. Dev. = 1.104
N = 51
Frequency
Q17

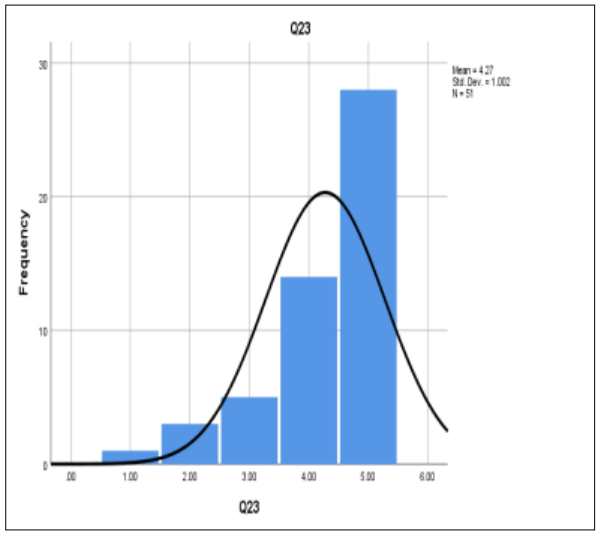

Q18
Mean = 3.90
Std. Dev. = 1.171
N = 51
Frequency
Q18


Q19
Mean = 4.04
Std. Dev. = 1.264
N = 51
Frequency
Q19


Q20
Mean = 2.24
Std. Dev. = 1.478
N = 51
Frequency
Q20


Q21
Mean = 4.31
Std. Dev. = .905
N = 51
Frequency
Q21


Q22
Mean = 3.80
Std. Dev. = 1.414
N = 51
Frequency
Q22


Q23
Mean = 4.27
Std. Dev. = 1.002
N = 51
Frequency
Q23

APPENDIX E: Descriptive statistics (Close-Ended Questionnaire)

Question	Valid	Mean	Median	Std. Deviation	Skewness	Kurtosis	Range
Q1	51	2.3333	1.7647[a]	1.60831	0.719	-1.205	4.00
Q2	51	2.0588	1.8649[a]	1.10294	0.997	0.417	4.00
Q3	51	3.3529	3.5625[a]	1.24617	-0.715	-0.505	4.00
Q4	51	3.1373	3.3333[a]	1.45629	-0.248	-1.408	4.00
Q5	51	3.1961	3.5000[a]	1.77786	-0.175	-1.797	4.00
Q6	51	3.8824	4.2105[a]	1.25932	-0.896	-0.526	4.00
Q7	51	2.8235	2.6667[a]	1.55828	0.108	-1.651	4.00
Q8	51	2.7451	2.6190[a]	1.48112	0.267	-1.256	4.00
Q9	51	4.1961	4.4318[a]	1.13172	-1.695	2.252	4.00
Q10	51	4.2941	4.5476[a]	1.11882	-1.509	1.094	4.00
Q11	51	3.9412	4.3243[a]	1.36252	-1.025	-0.351	4.00
Q12	51	4.1176	4.2683[a]	0.97256	-1.194	1.270	4.00
Q13	51	4.3922	4.5111[a]	0.85037	-1.476	1.721	3.00
Q14	51	4.3529	4.5682[a]	1.05496	-1.723	2.069	4.00
Q15	51	4.5098	4.6739[a]	0.94599	-2.242	4.660	4.00
Q16	51	2.8627	3.0000[a]	1.60025	0.020	-1.674	4.00
Q17	51	4.0196	4.2500[a]	1.10436	-1.060	0.181	4.00
Q18	51	3.9020	4.1429[a]	1.17055	-0.737	-0.657	4.00

Q19	51	4.0392	4.3488[a]	1.26429	-1.498	1.207	4.00
Q20	51	2.2353	1.7778[a]	1.47768	0.892	-0.722	4.00
Q21	51	4.3137	4.4444[a]	0.90532	-1.687	3.283	4.00
Q22	51	3.8039	4.2162[a]	1.41449	-0.962	-0.483	4.00
Q23	51	4.2745	4.4524[a]	1.00157	-1.458	1.658	4.00

APPENDIX F: Factor Analysis

```
RELIABILITY
  /VARIABLES=Q3 Q4 Q10 Q11
  /SCALE ('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE
SCALE CORR
  /SUMMARY=TOTAL.
```

Reliability

Notes		
Output Created		08-APR-2021 13:31:11
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=**Q3 Q4 Q10 Q11** /SCALE ('ALL VARIABLES') ALL /MODEL=ALPHA

		/STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02

Scale: ALL

VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	100.0
	Excluded[a]	0	0.0
	Total	51	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.841	0.842	4

Item Statistics

	Mean	Std. Deviation	N
Q3	3.3529	1.24617	51
Q4	3.1373	1.45629	51
Q10	4.2941	1.11882	51
Q11	3.9412	1.36252	51

Inter-Item Correlation Matrix

	Q3	Q4	Q10	Q11
Q3	**1.000**	0.568	0.570	0.731
Q4	0.568	**1.000**	0.453	0.659

Q10	0.570	0.453	**1.000**	0.445
Q11	0.731	0.659	0.445	**1.000**

```
RELIABILITY
  /VARIABLES=Q17 Q19 Q22
  /SCALE ('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE CORR
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		08-APR-2021 13:33:56
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=**Q17 Q19 Q22** /SCALE ('ALL VARIABLES') ALL /MODEL=ALPHA

		/STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	100.0
	Excluded[a]	0	0.0
	Total	51	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.731	**0.735**	**3**

Item Statistics

	Mean	Std. Deviation	N
Q17	4.0196	1.10436	51
Q19	4.0392	1.26429	51
Q22	3.8039	1.41449	51

Inter-Item Correlation Matrix

	Q17	Q19	Q22
Q17	**1.000**	0.558	0.310
Q19	0.558	**1.000**	0.575
Q22	0.310	0.575	**1.000**

```
RELIABILITY
  /VARIABLES=Q9 Q13 Q14 Q15
  /SCALE ('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE CORR
  /SUMMARY=TOTAL.
```

Reliability		
Notes		
Output Created		08-APR-2021 13:35:38
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=**Q9 Q13 Q14 Q15** /SCALE ('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00

	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	100.0
	Excluded[a]	0	0.0
	Total	51	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.735	**0.741**	**4**

Item Statistics

	Mean	Std. Deviation	N
Q9	4.1961	1.13172	51
Q13	4.3922	0.85037	51
Q14	4.3529	1.05496	51
Q15	4.5098	0.94599	51

Inter-Item Correlation Matrix

	Q9	Q13	Q14	Q15
Q9	**1.000**	0.126	0.427	0.297
Q13	0.126	**1.000**	0.467	0.467
Q14	0.427	0.467	**1.000**	0.718
Q15	0.297	0.467	0.718	**1.000**

```
RELIABILITY
  /VARIABLES= Q5 Q6 Q23
  /SCALE ('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE CORR
  /SUMMARY=TOTAL.
```

Reliability		
Notes		
Output Created		08-APR-2021 13:38:04
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=**Q5 Q6 Q23** /SCALE ('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.

Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	100.0
	Excluded[a]	0	0.0
	Total	51	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.637	**0.659**	3

Item Statistics

	Mean	Std. Deviation	N
Q5	3.1961	1.77786	51
Q6	3.8824	1.25932	51
Q23	4.2745	1.00157	51

Inter-Item Correlation Matrix

	Q5	Q6	Q23
Q5	**1.000**	0.466	0.351
Q6	0.466	**1.000**	0.359
Q23	0.351	0.359	**1.000**

```
RELIABILITY
  /VARIABLES= Q1 Q2 Q7 Q8
```

```
/SCALE ('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE CORR
/SUMMARY=TOTAL.
```

Reliability		
Notes		
Output Created		08-APR-2021 13:37:01
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=**Q1 Q2 Q7 Q8** /SCALE ('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.

Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	100.0
	Excluded[a]	0	0.0
	Total	51	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.708	**0.712**	4

Item Statistics

	Mean	Std. Deviation	N
Q1	2.3333	1.60831	51
Q2	2.0588	1.10294	51
Q7	2.8235	1.55828	51
Q8	2.7451	1.48112	51

Inter-Item Correlation Matrix

	Q1	Q2	Q7	Q8
Q1	**1.000**	0.541	0.431	0.574
Q2	0.541	**1.000**	0.204	0.364
Q7	0.431	0.204	**1.000**	0.179

Q8	0.574	0.364	0.179	**1.000**

```
RELIABILITY
  /VARIABLES=Q12 Q18
  /SCALE ('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
CORR
  /SUMMARY=TOTAL.
```

Reliability		
Notes		
Output Created		08-APR-2021 13:38:54
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY /VARIABLES=**Q12 Q18** /SCALE ('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	100.0
	Excluded[a]	0	0.0
	Total	51	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.613	0.620	2

Item Statistics

	Mean	Std. Deviation	N
Q12	4.1176	0.97256	51
Q18	3.9020	1.17055	51

Inter-Item Correlation Matrix

	Q12	Q18

Q12	**1.000**	0.450
Q18	0.450	**1.000**

Table 6. 12: Summarizing results of unrotated factors analysis matrix using Principal Component Analysis method (PCA) with threshold value greater than 0.5.

	Component							
	F1	F2	F3	F4	F5	F6	F7	F8
Q1		0.578	0.534					

Q2								
Q3	0.817							
Q4	0.675							
Q5		0.657						
Q6		0.713						
Q7			0.683					
Q8	0.546	0.588						
Q9								
Q10	0.567							
Q11	0.691							
Q12			0.533					
Q13	0.505							
Q14	0.672							
Q15	0.700							
Q16						0.581		
Q17	0.525							
Q18				0.515				
Q19	0.567			0.533				
Q20						0.711		
Q21								
Q22	0.612							
Q23		0.513					0.562	

Table 6. 13: The components matrix of factor loadings after applying the Varimax rotation method

Rotated Component Matrix[a]								
	Component							
	F1	F2	F3	F4	F5	F6	F7	F8
Q1				0.859				
Q2				0.600				
Q3	0.772							
Q4	0.784							
Q5					0.695			
Q6					0.698			
Q7				0.626				
Q8				0.595				
Q9			0.646					
Q10	0.681							
Q11	0.836							
Q12						0.748		
Q13			0.623					
Q14			0.793					
Q15			0.702					
Q16								0.796
Q17		0.661						
Q18						0.746		
Q19		0.861						
Q20								
Q21							0.804	

Q22		0.671						
Q23					0.811			

```
FACTOR
  /VARIABLES Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21
Q23
  /MISSING LISTWISE
  /ANALYSIS Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21
Q23
  /PRINT INITIAL CORRELATION SIG DET KMO EXTRACTION
  /PLOT EIGEN
  /CRITERIA MINEIGEN (1) ITERATE (100)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		08-APR-2021 13:06:25
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES **Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23** /MISSING LISTWISE /ANALYSIS **Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23** /PRINT INITIAL CORRELATION SIG DET KMO EXTRACTION

		/PLOT EIGEN /CRITERIA MINEIGEN (1) ITERATE (100) /**EXTRACTION PC** /**ROTATION NOROTATE** /**METHOD=CORRELATION**.
Resources	Processor Time	00:00:00.16
	Elapsed Time	00:00:00.15
	Maximum Memory Required	63504 (62.016K) bytes

Correlation Matrix[a]																								
correlation		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23
	Q1	**1.00**	0.54	0.15	0.23	0.25	0.14	0.43	0.57	-0.01	0.27	0.14	0.19	0.11	-0.01	0.10	0.13	0.01	0.02	-0.03	0.00	-0.16	0.09	0.13
	Q2	0.54	**1.00**	0.25	0.38	0.16	-0.11	0.20	0.36	0.07	0.21	0.15	0.22	0.12	0.22	0.26	0.31	0.15	0.14	0.10	-0.27	0.24	0.10	0.11
	Q3	0.15	0.25	**1.00**	0.57	0.21	-0.22	0.23	0.37	0.21	0.57	0.73	0.10	0.28	0.57	0.52	0.14	0.43	0.38	0.33	-0.22	0.15	0.38	0.02
	Q4	0.23	0.38	0.57	**1.00**	0.05	-0.27	0.17	0.34	0.08	0.45	0.66	0.06	0.21	0.41	0.41	0.16	0.22	0.07	0.21	-0.13	0.19	0.29	0.04
	Q5	0.25	0.16	0.21	0.05	**1.00**	0.47	-0.15	0.53	0.12	0.19	0.13	-0.07	0.23	0.20	0.20	0.19	0.03	-0.04	0.21	-0.04	0.40	0.31	0.35
	Q6	0.14	-0.11	-0.22	-0.27	0.47	**1.00**	-0.16	0.21	0.00	0.01	-0.17	-0.15	-0.20	-0.28	-0.22	-0.11	-0.19	-0.39	-0.03	0.03	-0.02	0.02	0.36
	Q7	0.43	0.20	0.23	0.17	-0.15	-0.16	**1.00**	0.18	0.09	0.21	0.15	0.16	0.04	-0.08	-0.10	-0.05	-0.08	0.28	0.03	-0.07	-0.26	-0.08	0.01
	Q8	0.57	0.36	0.37	0.34	0.53	0.21	0.18	**1.00**	-0.10	0.31	0.29	0.04	0.22	0.15	0.12	0.28	0.13	0.07	0.43	-0.16	0.14	0.33	0.09
	Q9	-0.01	0.07	0.21	0.08	0.12	0.00	0.09	-0.10	**1.00**	0.06	0.15	-0.18	0.13	0.43	0.30	-0.12	0.27	0.00	0.22	-0.08	-0.06	0.27	0.00
	Q10	0.27	0.21	0.57	0.45	0.19	0.01	0.21	0.31	0.06	**1.00**	0.44	-0.12	0.19	0.30	0.35	0.03	0.24	0.07	0.20	-0.12	-0.09	0.28	0.05
	Q11	0.14	0.15	0.73	0.66	0.13	-0.17	0.15	0.29	0.15	0.44	**1.00**	-0.01	0.33	0.43	0.46	0.07	0.23	0.15	0.21	-0.04	0.16	0.36	0.04
	Q12	0.19	0.22	0.10	0.06	-0.07	-0.15	0.16	0.04	-0.18	-0.12	-0.01	**1.00**	0.16	0.02	-0.04	0.18	0.13	0.45	-0.09	-0.05	-0.07	0.02	0.13
	Q13	0.11	0.12	0.28	0.21	0.23	-0.20	0.04	0.22	0.13	0.19	0.33	0.16	**1.00**	0.47	0.47	0.23	0.08	0.04	0.15	-0.23	0.15	0.28	-0.13
	Q14	-0.01	0.22	0.57	0.41	0.20	-0.28	-0.08	0.15	0.43	0.30	0.43	0.02	0.47	**1.00**	0.72	0.17	0.29	0.06	0.18	-0.12	0.13	0.34	0.06
	Q15	0.10	0.26	0.52	0.41	0.20	-0.22	-0.10	0.12	0.30	0.35	0.46	-0.04	0.47	0.72	**1.00**	0.15	0.30	0.12	0.23	-0.26	0.28	0.38	0.14
	Q16	0.13	0.31	0.14	0.16	0.19	-0.11	-0.05	0.28	-0.12	0.03	0.07	0.18	0.23	0.17	0.15	**1.00**	0.19	0.20	0.25	0.16	0.09	0.11	-0.01
	Q17	0.01	0.15	0.43	0.22	0.03	-0.19	-0.08	0.13	0.27	0.24	0.23	0.13	0.08	0.29	0.30	0.19	**1.00**	0.48	0.56	-0.19	0.13	0.31	-0.13
	Q18	0.02	0.14	0.38	0.07	-0.04	-0.39	0.28	0.07	0.00	0.07	0.15	0.45	0.04	0.06	0.12	0.20	0.48	**1.00**	0.39	-0.15	0.09	0.24	-0.08
	Q19	-0.03	0.10	0.33	0.21	0.21	-0.03	0.03	0.43	0.22	0.20	0.21	-0.09	0.15	0.18	0.23	0.25	0.56	0.39	**1.00**	-0.36	0.27	0.57	-0.07
	Q20	0.00	-0.27	-0.22	-0.13	-0.04	0.03	-0.07	-0.16	-0.08	-0.12	-0.04	-0.05	-0.23	-0.12	-0.26	0.16	-0.19	-0.15	-0.36	**1.00**	-0.33	-0.28	0.06
	Q21	-0.16	0.24	0.15	0.19	0.40	-0.02	-0.26	0.14	-0.06	-0.09	0.16	-0.07	0.15	0.13	0.28	0.09	0.13	0.09	0.27	-0.33	**1.00**	0.16	0.17
	Q22	0.09	0.10	0.38	0.29	0.31	0.02	-0.08	0.33	0.27	0.28	0.36	0.02	0.28	0.34	0.38	0.11	0.31	0.24	0.57	-0.28	0.16	**1.00**	-0.13

	Q23	0.13	0.11	0.02	0.04	0.35	0.36	0.01	0.09	0.00	0.05	0.04	0.13	-0.13	0.06	0.14	-0.01	-0.13	-0.08	-0.07	0.06	0.17	-0.13	**1.00**

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.612**
Bartlett's Test of Sphericity	Approx. Chi-Square	529.108
	Df	253
	Sig.	0.000

Communalities		
	Initial	Extraction
Q1	1.000	0.811
Q2	1.000	0.634
Q3	1.000	0.810
Q4	1.000	0.717
Q5	1.000	0.775
Q6	1.000	0.777
Q7	1.000	0.700
Q8	1.000	0.814
Q9	1.000	0.783
Q10	1.000	0.622
Q11	1.000	0.752
Q12	1.000	0.664
Q13	1.000	0.636
Q14	1.000	0.819
Q15	1.000	0.753
Q16	1.000	0.740
Q17	1.000	0.663
Q18	1.000	0.816

Q19	1.000	0.806
Q20	1.000	0.819
Q21	1.000	0.797
Q22	1.000	0.611
Q23	1.000	0.814
Extraction Method: Principal Component Analysis.		

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.482	23.836	23.836	5.482	23.836	23.836
2	2.411	10.481	34.317	2.411	10.481	34.317
3	2.213	9.622	43.939	2.213	9.622	43.939
4	1.871	8.135	52.075	1.871	8.135	52.075
5	1.535	6.672	58.747	1.535	6.672	58.747
6	1.244	5.410	64.157	1.244	5.410	64.157
7	1.201	5.220	69.377	1.201	5.220	69.377
8	1.177	5.115	74.493	1.177	5.115	74.493
9	0.979	4.255	78.748			
10	0.746	3.245	81.993			
11	0.675	2.933	84.926			
12	0.575	2.498	87.424			
13	0.503	2.186	89.610			
14	0.464	2.019	91.629			
15	0.419	1.820	93.449			

16	0.372	1.617	95.066			
17	0.254	1.103	96.169			
18	0.221	0.962	97.131			
19	0.184	0.800	97.932			
20	0.159	0.692	98.624			
21	0.112	0.489	99.112			
22	0.111	0.483	99.596			
23	0.093	0.404	100.000			

Extraction Method: Principal Component Analysis.


Scree Plot
Eigenvalue
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Component Number

	Component							
	1	2	3	4	5	6	7	8
Q1	0.313	0.578	0.534	-0.086	-0.087	-0.048	0.015	-0.276
Q2	0.473	0.291	0.357	0.090	0.277	-0.287	-0.038	-0.172
Q3	0.817	-0.118	0.087	-0.181	-0.102	0.031	0.074	0.266
Q4	0.675	-0.011	0.161	-0.309	0.080	-0.025	-0.223	0.289
Q5	0.369	0.657	-0.373	0.175	0.058	0.122	0.135	-0.026
Q6	-0.215	0.713	-0.331	0.075	-0.269	0.032	0.181	0.020
Q7	0.163	0.059	0.683	-0.162	-0.315	-0.245	0.097	-0.093
Q8	0.546	0.588	0.153	0.189	-0.158	0.144	-0.251	-0.052
Q9	0.298	-0.183	-0.307	-0.210	-0.290	-0.108	0.498	-0.422
Q10	0.567	0.137	0.100	-0.350	-0.319	0.079	-0.077	0.187
Q11	0.691	-0.065	0.018	-0.375	-0.031	0.094	-0.092	0.334
Q12	0.115	-0.062	0.533	0.313	0.390	-0.041	0.333	-0.014
Q13	0.505	-0.068	-0.089	-0.100	0.321	0.038	-0.198	-0.463
Q14	0.672	-0.211	-0.257	-0.323	0.261	0.066	0.196	-0.206
Q15	0.700	-0.135	-0.281	-0.238	0.276	-0.095	0.116	-0.102
Q16	0.310	0.097	0.164	0.310	0.386	0.581	-0.083	-0.135
Q17	0.525	-0.345	-0.033	0.373	-0.206	0.142	0.239	0.092
Q18	0.374	-0.378	0.390	0.515	-0.047	0.010	0.285	0.179
Q19	0.567	-0.092	-0.192	0.533	-0.382	0.077	-0.062	0.011
Q20	-0.356	0.069	0.129	-0.298	0.103	0.711	0.225	0.129
Q21	0.311	0.107	-0.417	0.352	0.388	-0.334	-0.195	0.301
Q22	0.612	-0.035	-0.262	0.220	-0.286	0.095	-0.056	-0.157
Q23	0.043	0.513	-0.105	-0.078	0.256	-0.172	0.562	0.349
Extraction Method: Principal Component Analysis.								

a. 8 components extracted.

```
FACTOR
  /VARIABLES Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22
Q23
  /MISSING LISTWISE
  /ANALYSIS Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22
Q23
  /PRINT INITIAL CORRELATION SIG DET KMO EXTRACTION ROTATION
  /FORMAT BLANK (0.5)
  /PLOT EIGEN
  /CRITERIA FACTORS (8) ITERATE (100)
  /EXTRACTION PC
  /CRITERIA ITERATE (100)
  /ROTATION VARIMAX
  /SAVE REG(ALL)
  /METHOD=CORRELATION.
```

Factor Analysis		
Notes		
Output Created		08-APR-2021 13:15:46
Comments		
Input	Data	C:\Users\Mr patrick Mukonki\Desktop\9.spss\SPSS_Results\Industry dataset. Sav

	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N	51
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 /MISSING LISTWISE /ANALYSIS Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 /PRINT INITIAL CORRELATION SIG DET KMO EXTRACTION ROTATION /FORMAT BLANK(0.5) /PLOT EIGEN /CRITERIA FACTORS(8) ITERATE(100) /EXTRACTION PC /CRITERIA ITERATE(100) /ROTATION VARIMAX

		/SAVE REG(ALL) /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.25
	Elapsed Time	00:00:00.22
	Maximum Memory Required	67864 (66.273K) bytes
Variables Created	FAC1_3	Component score 1
	FAC2_3	Component score 2
	FAC3_3	Component score 3
	FAC4_3	Component score 4
	FAC5_3	Component score 5
	FAC6_3	Component score 6
	FAC7_3	Component score 7
	FAC8_3	Component score 8

Component Matrix[a]

	Component							
	1	2	3	4	5	6	7	8
Q1		0.578	0.534					
Q2								
Q3	0.817							
Q4	0.675							
Q5		0.657						
Q6		0.713						
Q7			0.683					
Q8	0.546	0.588						

Q9								
Q10	0.567							
Q11	0.691							
Q12			0.533					
Q13	0.505							
Q14	0.672							
Q15	0.700							
Q16						0.581		
Q17	0.525							
Q18				0.515				
Q19	0.567			0.533				
Q20						0.711		
Q21								
Q22	0.612							
Q23		0.513					0.562	

Extraction Method: Principal Component Analysis.

a. 8 components extracted.

Rotated Component Matrixa

	Rotated Component Matrix							
	1	2	3	4	5	6	7	8
Q1				0.859				
Q2				0.600				
Q3	0.772							
Q4	0.784							
Q5					0.695			
Q6					0.698			
Q7				0.626				

Q8				0.595				
Q9			0.646					
Q10	0.681							
Q11	0.836							
Q12						0.748		
Q13			0.623					
Q14			0.793					
Q15			0.702					
Q16								0.796
Q17		0.661						
Q18						0.746		
Q19		0.861						
Q20								
Q21							0.804	
Q22		0.671						
Q23					0.811			
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.								