FINAL REPORT:

Scoping study for a nonrenewable resources, climate change and environmental programme in Southern Africa

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Acronyms

AfDB AFOLU AMB ARD ASM CAIT CC CCBA CDM CDP CFM CH4 CIF CO CO2 CO2 COP CRU CSOS CSR DEDP DFID DFID DFID DFID DFID DFID DFID SA DI EAD EHS EI EIA EIS EITI EMA EPPCA ERP ESCOM ESIA ESMPS ETS EUTS FDI GBP GCCA GEF	African Development Bank Agriculture Forestry and Other Land Use Acid Mine Drainage Acid Rock Drainage Artisanal and Small-scale Mining Climate Analysis Indicator Tool Climate Change Climate Change Climate, Community and Biodiversity Alliance Standards Clean Development Mechanism Carbon Disclosure Project Portos e Caminhos de Ferro de Mocambique Methane Climate Investment Fund Carbon Monoxide Carbon Dioxide Cooperation of Parties Commodities Research Unit Civil Society Organizations Corporate Social Responsibility Department of Economic Development and Planning The Department for International Development The Department of International Development The Department of International Development The Department affairs Department Environmental Affairs Department Environmental Impact Assessment Environmental Impact Statement Extractive Industry Environmental Management Act Environmental Management Act Environmental and Social Impact Assessment Environmental and Social Impact Assessment Environmental and Social Impact Assessment Environmental and Social Impact Assessment Environmental Affairs Department Electricity Supply Cooperation of Malawi Environmental and Social Impact Assessment Environmental Affairs Department Environmental Affairs Department Environmental Affairs Department Environmental Affairs Department Environmental Affairs Department Environmental Affairs Department Envir	
GHG GIIMC	Green House Gas Grupo Inter-Institucional para Mudanças Climáticas (Climate	Change
GRI ICMM IFC INDC	Global Reporting Initiative The International Council on Mining and Metals The International Finance Cooperation Intended Nationally Determined Contribution	
IPCC	Intergovernmental Panel for Climate Change	



IPIECA	The international Petroleum Industry Environmental Conservation Association	
IUCN	International Union for Conservation of Nature	
KCM	Kangola Copper Mines	
LCI	Life Cycle Inventory	
LCIA	Life Cycle Impact Assessment	
	Least Developed Country	
LDCF	Least Developed Country Fund	
LSM	Large Scale Mining	
MCM	Mopani Coal Mine	
MDAs	Mineral Development Agreements	
MDGS	Malawi Growth Development Strategy	
METS	Misenge Environmental and Technical Services Limited	
MGC	Matola Gas Company	
MICOA	The Ministry for the Coordination Of Environmental Affairs	
MONREAM	Ministry of Natural Resources. Energy and Mining	
MOUs	Memorandum of Understandings	
MP	Monitoring Plan	
MRVs	Monitoring, Reporting and Verifications	
NAMA	National Appropriate Mitigation Action	
NAMAs	National Appropriate Mitigation Actions	
NAPA	National Adaptation Programmes of Action	
NCCAMS	National Climate Change Adaptation and Mitigation Strategy	
NDFIA	National Directorate for Environmental Impact Assessment	
NEP	National Environmental Policy	
NEPAD	The New Partnership for Africa's Development	
NGO	Non-Governmental Organizations	
NMVOC	Non Methane Volatile Organic Compounds	
NOX	Nitrous Oxides	
PAG	Potentially Acid Generating	
PARPA	Plan For the Reduction of Extreme Poverty (Mozambique)	
PDD	Project Design Document	
PPCR	Pilot Programme On Climate Change	
PRSP	Poverty Reduction Strategy Paper	
RAK	Ras al Khaimah	
REDD+	Reducing Emissions from Deforestation and Forest Degradation	
REFs	Rare Farth Flements	
ROMPCO	Republic of Mozambigue Pipeline Investment Company	
SA	South Africa	
SADC	Southern Africa Development Community	
SCCF	Special Climate Change Fund	
SE4ALL	Sustainable Energy for All	
SHE	Safety, Health and Environment	
SI	Statutory Instrument	
SNIGEE	National Greenhouse Gases Inventory System	
SO ₂	Sulphur Dioxide	
SOX	Sulphur Oxides	
TCF	Trillion Cubic Feet	
TNA	Technology Needs Assessment Project	
TROs	Terms of References	
UK	United Kinadom	
UNDP	United Nations Development Programme	
UNFCCC	United Nations Framework Convention on Climate Change	
UNISDR	United Nations International Strategy for Disaster Reduction	
USD	United States Dollar	



USGS	United States Geological Survey
VCS	Verified Carbon Standard
WB	World Bank
WBCSD/WRI	World Business Council For Sustainable Development/ World
	Resources Institute
WHO	World Health Organization
WRI	World Resources Institute
ZCCM	Zambia Consolidated Copper Mines
ZCCM-HI	Zambia Consolidated Copper Mines Investment Holdings
ZEITI	Zambia Extractive Industries Transparency Initiative
ZEMA	Zambia Environmental Management Agency
ZESCO	Zambia Energy Supply Cooperation
ZIMEC	Zambia International Mining and Energy Conference and Exhibition



SECTION 1

Introduction

1.1 Context and Objectives of the Scoping Study

DFID commissioned a scoping study to assess the Extractive Industry (EI) sector's environmental and climate change impacts, status and prospects of GHG emissions, and how both impacts and GHG emissions could be mitigated in the sector. The analysis included a review of national and global policy, legal and institutional landscape that could inform a voluntary compliance mechanism that the EI sector could adopt. The study was conducted in Zambia, Malawi and Mozambique.

The effects of climate change have become significant challenges to sustainable development in developing countries. In Southern Africa where this study focused, the impacts are likely to be substantial due to the reliance on climate-sensitive resources such as rain-fed agriculture for economic growth, trade and food security. East and Southern Africa are expected to experience compounded effects of climate change because of their high poverty levels, weak infrastructure, poor management of natural resources and dependence on agriculture.

When looking at 'future climate' scenarios, the impacts of climate change on the extractives industry are different from those that might be expected in other sectors. Recently, the sector has become more aware of risks associated with the exploitation of mineral and energy resources. Increased temperatures, changes in precipitation, sea level rise, flooding and extreme weather events may become additional stressors with the potential to exacerbate existing risks. Major companies have increased their perception of the potential risks associated with their activities on the environment and on the local communities that could lead to liabilities and reputational consequences.

The most significant impacts will likely be as a result of the increasing public perception that extractive industries are key contributors to climate change and thus requiring new processes and technologies for reducing GHG emissions during industrial activities (i.e. electricity generation, transport, etc.).

DFID proposed the objectives below as guidance towards the conducting of the scoping study;

- 1. To perform a high level analysis of the current and potential impacts of environmental degradation due to extractives activities to the extractive industry value chain with specific focus on climate change related risks and the associated vulnerability of the mining sector.
- 2. To perform a high level analysis of potential emissions of GHG from current and future oil, gas and mining operations in the region. Future oil and gas emission would only be based on estimates of reserves of minerals, oil and gas.
- 3. To perform a high level analysis of the current legislative framework with a specific focus of the present commitments/pledges related to climate change mitigation and adaptation;



- 4. To perform a high level identification of the suitable measures aimed at mitigating the GHG emissions of the Oil& Gas and Mining Industries and of the needed policy and actions to reduce the potential vulnerability of the sector to climate change effects;
- 5. To scope the possibility of a (voluntary) compliance framework on environmental standards with a specific focus on GHG emissions reduction and the potential for introducing such a framework in various extractives areas in Southern Africa; and to scope the capacity of government agencies to enforce compliance.
- 6. To scope the possibility for the introduction of a support mechanism on a voluntary or compulsory basis (inspired by the Clean Development Mechanism, the Emission Trading Schemes, etc.) for countries in the region that will produce oil and gas as a first step, to be extended to the other mining industry sectors if successful.
- 7. To scope the present climate finance landscape at regional level and the appetite of the private sector operating in the extractive sector in the region to implement carbon offset projects: Would they be interested in implementing carbon offset projects? Would the private sector in the extractive sector in the region envisage being carbon neutral?
- 8. If the answer to at least some of the above scoping questions is positive, the consultants are asked to scope if it would make sense for a donor like DFID to engage in this space, the risks and opportunities and whether engaging in this space could ultimately assist in poverty reduction in Southern Africa.
 - To scope if DFID should get involved in this space:
 - What would be the results DFID could realistically achieve?
 - What are the feasible options of a possible programme of interventions?
 - What kind of financial investment would be needed?

For ease of analysis, objectives 2 and 4 have been combined and objectives 5, 6 and 7 have been consolidated given that they speak to a common purpose.

1.1.1 Key Analytical Findings

Key analytical findings are detailed in sections 3 and 4 of the report with this analysis converting to recommendations in section 5.

Among the key analytical findings at the individual country levels are that in **Malawi** the **environmental impacts** from mining have centred on **uranium contamination** but that the country's only large uranium mine is under care and maintenance due to low uranium prices. One of the **major environmental impacts** associated with copper mining in **Zambia** have been the **SO**₂ **emissions from smelters leaking into communities**. However, there are now four major smelters with SO₂ capture efficiency of over 98%. **Mozambique has significant El sector development, particularly for coal mining and oil/gas-both offshore and on-shore** with environmental impacts largely being around **discharge of untreated waste containing heavy metals and hydrocarbons**.

Although the GHG emission levels are low in the countries, both **large mining companies and the relevant government organizations are promoting GHG abatement** through measures such as energy efficiency, deployment of renewable energy (solar, mini hydro, wind, geothermal), and fuel switching from diesel to hydropower, forest management and reafforestation.

Large EI companies view the introduction of new compliance mechanisms as another layer of regulation¹ and would initially resist an enforceable mechanism. In order to introduce any

Expressed by the large mines in both Zambia and Malawi



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form of compliance mechanism, whether enforceable or voluntary, the starting point would be to bring the leaders within the EI industry together to design a voluntary mechanism. A mechanism they would own and may later agree the mechanism be subject to enforcement to ensure all companies comply². Members to the compliance mechanism could agree on a cap and Governments and organizations such as Chamber of Mines could also peg a carbon price in such a compliance system. Government stakeholders, Chambers of Mines and companies consulted showed interest to start with a facilitated event to deliberate on how to design a compliance mechanism. However, unless EI companies can see clear benefits to their participation, it will be difficult to introduce, particularly at the level of country operations

Extractive industries consulted were not aware of impacts on their operations that they could associate with climate change except in relation to the energy situation and their witnessing of extreme weather events in the country. They have also not considered climate change impacts as a serious threat and would like market information in order to plan for climate change impacts.

1.1.2 Recommendations

Through a detailed and robust analytical assessment of the findings a number of recommendations emerged.

Section 5 details these recommendations and the areas that will require support, showing the rationale for the intervention, the nature of the intervention, the principal target group(s), the expected results and required inputs. In summary, the recommendations fall under 5 Pillars:

Emerging pillars for a DFID climate change and environmental Programme in Southern Africa

- 1. Support to development planning, policy and compliance frameworks
- 2. Awareness, sensitization and communication
- 3. Capacity building and institutional strengthening of systems, infrastructure and human resources
- 4. Information development and management
- 5. Facilitating the creation of a compliance mechanism

1.2 Outline of the Report

This Report comprises the following sections

- Context of the Study and Objectives
- Methodology and Approach
- Extractive Industries value chains and current and projected situation in study countries
- Findings on: environmental climate change impacts and related adaptation measures, GHG emissions and abatement measures, and policy/legal and institutional landscape in study countries
- Analysis of existing standards and scoping for a compliance mechanism in Southern Africa
- Recommendations, Potential Interventions and Expected Results

² The fear expressed by some large companies in Zambia is that those connected to politics may end up not honouring any agreed targets



Annexes

1.3 Methodology and Approach

1.3.1 Inception Phase

During the Inception Phase, the survey targeted Zambia, Malawi and Mozambique. It was easy to make appointments in Zambia and Malawi with the stakeholders. The relevant stakeholders dealing with extractive industry were selected accordingly and interviews followed to clearly understand the Extractives Industries (EI) sector.

1.3.2 Data Collection and In-Country Phase

Data collection was done through desk literature review and stakeholder interviews were conducted in line with the objectives. The stakeholder consultations were guided by the tools, developed to meet the objectives stipulated in Section 1.1. The interviews allowed sufficient scope to ensure that stakeholders provide the EI views relevant to their respective organizations and businesses. The summary of the consensus views on various issues were analysed, especially seeking views relating to what support can be given if climate change programmes and compliance mechanisms for the EI sector materialize. The list of stakeholders that informed preparation of the report is listed in Annex 1³.

3

4

Reviewed documents are either provided as footnotes or in References



SECTION 2

The extractive industries value chains and status

This section presents the generic value chains for mining and oil/gas sector. The section further provides assessment and analysis of the EI in selected study sites of the project.

2.1 General Overview of the Value Chains

Knowledge of value chains in the extractive industry provides an understanding of where environmental and climate change impacts occur and help in determining sources of greenhouse gas (GHG) emissions. The value chains assist in guiding what adaptation and GHG abatement measures can be targeted in selected countries. The following sections provide a brief outline of generic mining and oil/gas value chains guiding the analysis on impacts and GHG emissions for the Extractive Industries (EI) sector.

2.1.1 Mining Value Chain

The mining value chain starts with exploration and appraisal of an ore body in potential areas followed by surveying and drilling, to establish both the mineral content and reserves. Developing the mine involves excavation and installing the necessary infrastructure to reach mining location. The next phase is hauling and transporting ore to processing locations. In some shallow ore bodies, mine development and production takes place simultaneously, for instance, open pit mining.

The mineral ore is processed on site or off-site involving crushing the ore, milling and intermittent furnace processes. A smelting phase follows where some base metal refining takes place. In some instances, smelting products are fabricated into products, e.g. Copper ware. Decommissioning of mines is important because some dormant mines still pose environmental impacts and emit GHG emissions, e.g. coalmines.

Critical aspects of the mining value chains, considering environmental and climate change impacts, include:

- 1) Developmental, operational and rehabilitation phases of mining activity
- 2) Supporting the mining activity and creating additional value



Figure 1 Mining Value Chain

(adapted from Wits University Mineral Economics Value Chain Analysis Feb 2011)



Inputs, expected environmental/climate change impacts and GHG emissions vary at different stages in the mining value chains, depending on the mining operation. Methane may be emitted in mining of coal as opposed to base metals. Some smelting processes may generate process GHG while others do not. Certain gas emissions may apply at different stages, for instance, carbon dioxide at the mineral deposit, exploration and appraisal stage. Moreover, the minimum and maximum levels of emissions at different stages vary relative to how the process is implemented at individual mining sites.

This study focused on assessing what impacts and GHG emissions occur at different mining value chains by targeting significant impact and GHG emission sources.



2.1.2 Oil and Gas Value Chain

The oil/gas value chain starts with identifying potential areas because it guides on where to conduct exploration and appraisal. Development and production follows. This component is the *"upstream"* phase.

The *midstream component* consists of infrastructure, for instance transport infrastructure (pipelines, access to roads, rail and ports), and storage facilities critical at various stages in the mining value chains. The midstream links between production and processing facilities, and between processing and final customers. Oil refining and gas processing are required to turn extracted hydrocarbons into usable products. Certain oil and gas products represent the principal feedstock for the petrochemicals industry.

The *downstream component* refers to the processed products that are distributed onwards to wholesale, retail or for direct industrial use.

Figure 2 Oil/Gas Value Chain

(adapted from World Bank, 2009-THE PETROLEUM SECTOR VALUE CHAIN)



The study emphasizes life cycle analysis from upstream, midstream of the oil/gas sector to downstream, although downstream may be difficult to capture because some of the products are exported and consumed in other countries for different uses. Important



environmental/climate change impacts and GHG source points of importance are also indicated in Figure 2.

2.2 Structure of Mining/Oil and Gas Sectors

2.2.1 El Structure in Zambia

A. Mining Sector

Zambia is ranked the seventh largest high quality copper producer in the world, and copper and cobalt contribute about 85% of the state's total mining revenue. In addition, cobalt (often a by-product of copper), lead, zinc and coal are mined. In 2013, production of copper was 739,291 metric tonnes and 1,957 metric tonnes of cobalt⁴ from the four largest mining companies: Konkola Copper Mines; Mopani Copper Mines from the Copperbelt province; Kansanshi and Lumwana from North-Western province, accounting for over 85% of the copper produced. Gold output was 4,984 Kg in 2012 and coal production at Maamba Collieries increased to 148,768 Mt from 121,024 Mt. In 2013, the industry contributed 69% of export earnings, 30% of total government tax revenue and 9% to the GDP.⁵ The copper industry both in the old copperbelt and NW province contributes nearly 150,000 jobs, about 40% of which are direct jobs⁶

I. Future Outlook for Copper Production

The Government is optimistic about the future of copper production in the country and expects copper production to nearly double to 1.5m tonnes by 2018 when pipeline projects comes into production.⁷ The major copper producers have committed high levels of capital investment into the development of copper projects. In 2013, the investment in the mining sector of Zambia was expected to reach USD 15 billion by 2017 due to these new projects.⁸ Since then, **the copper prices have fallen sharply, mainly due to the contraction in the Chinese economy. Copper prices remain 40% below the peak reached in 2011**. Mining companies are used to cyclical shifts in commodity prices and it is highly unlikely that the four major copper companies currently mining in Zambia will close down or sell off their copper assets.

While there are varying degrees of optimism about copper price outlook over the near to long term, a recent economic update on Zambia produced by the World Bank Group projected solid copper production and revenue growth over the next 30 or so years.⁹ However, the analysis does not predict the sort of production levels envisioned by various agencies of the government of Zambia.

The World Bank has more than one scenario in terms of how the copper production may grow in Zambia, but the future growth may depend upon the recovery of the Chinese economy and future copper prices. A future economic scenario analysis will be required to inform possible future growth paths for the copper industry considering both global economic dynamics and local energy and taxation situation.

⁹ http://www.worldbank.org/en/news/press-release/2015/06/17/making-mining-work-for-zambia



⁴ http://www.zambiaeiti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014

⁵ Zambia EITI Reconciliation Report, 2014 http://www.zambiaeiti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014

⁶⁶ http://www.icmm.com/publications/enhancing-minings-contribution-to-zambia

⁷ http://www.zambia-invest.com/mining.

⁸ http://www.zambia-invest.com/mining

On the energy situation, as of 1 September 2015, **companies were cut 30% of the energy provided by the national grid and have choice of either cutting back their operations or import more expensive power that can be available in the region, or have own site generation capacity, all of which will curtail the profitability of mining businesses**.

Since the new legislation was introduced in 2008, the government has attempted to introduce various tax regimes and rates to increase the sector's tax contribution to the government of Zambia.¹⁰Late 2014, government (through the Ministry of Finance) announced the imposition of a consolidated tax that would combine royalties (non-profit) with corporate taxes (profit) at a rate of 20%. This measure led to companies such as Barrick declaring that their Zambian mine (Lumwana) would be decommissioned in March 2015. However, following discussions with industry and in consideration of the falling copper prices, government decided not to implement its new tax regime and have re-instated the 2014 tax regime, with some tax additions (through a sliding scale on profit). **This has created a level of uncertainty to the mining investors.**

B. Oil and Gas

Zambia has been encouraging exploration of its petroleum reserves. It started embracing this vision in the early 1970's because of the rise in price of crude oil on the international markets and the dwindling revenue of the country's copper exports. Historically, the country has had two major exploration programmes by Mobil and Placid Oil undertaken between 1986 and 1991 within the Luangwa Rift Valley. Recent exploration work for petroleum covering parts of North-Western, Western and Eastern Provinces of Zambia, using the Microbial Prospecting for Oil and Gas technique indicated that the Okavango and North Luangwa basins have potential for oil and gas. The Government has tendered the oil blocks for oil and gas prospects by the private sector.¹¹ Details of the companies undertaking oil and gas exploration are provided in Annex 2

2.2.2 El Structure in Malawi

A. Mining

The only large-scale, mining operation to have produced minerals in Malawi is the Kayelekera Uranium Mine, located in Northern Malawi and owned by Paladin Mining Ltd. **The company began operations in 2009 but was put on care and maintenance in 2014 and ceased exploration activity due to the fall in commodity prices in 2015.** The plant was designed to produce 3.3 million pounds of uranium concentrate annually. In 2013/2014, the mine produced less than 2.5 million pounds of uranium concentrate due to closure mid-2014. Poor commodity prices and high operating costs, including significant energy costs (due to the mine not being attached to the national grid) contributed to these decisions.

The Malawian mining industry is at a nascent stage of growth and contribution to GDP in 2014 was less than 1%, and is anticipated to provide the same percentage of GDP contribution for 2015, according to the government's Annual Economic Report, 2015.¹² The growth for the sector declined in 2014 to 7.6% from almost 15% in 2012. This downturn was attributed to lower levels of uranium production. The mining sector in Malawi accounts for

¹² Annual Economic Report, 2014. Ministry of Finance, Planning and Economic Development, 2015



¹⁰ The 2013 Africa Progress Report noted that while Zambia's minerals industry exported a total of US\$10 billion in 2011, Zambia itself collected only US\$240 million in tax mining revenue, which amounts to just 2.4% of the revenue from mineral exports.¹⁰ These statistics would appear to provide the government with sufficient information to seek higher tax revenues from the mining sector. However, the industry has been successful in countering these arguments and so far has avoided various versions of the "windfall tax".

¹¹ http://www.zambiaeiti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014

about 12,000 people in the workforce and revenue generated by the government through the Department of Mines from export sales through the period July 2013-August 2014 was approximately US\$2m¹³.

I. Future outlook for Uranium, Niobium and Rare Earth Prices

Government officials involved in mining sector development are optimistic that by 2020 the country will have two to three new operating mines. The projection will depend on commodity price cycle and the world larger economies' recovery that require minerals for development. The demand for these metals and minerals in the near medium term will affect the timing of project development underway and Kayelekera mine reopening.

Over the longer term, uranium analysts predict solid prospects for nuclear growth up to 2030. The consumers are expected to be concentrated in Russia and China. Both countries use nuclear power and are planning to be key suppliers of nuclear reactors in other countries (predicted to begin by 2020 and continue to 2030).¹⁴

II. Rare Earths

Rare Earth Elements (REEs) are becoming increasingly integrated in new technologies, especially within the clean energy, military, and consumer electronics sectors. As each of these sectors continues to grow, so does the industry's demand for the constituent REEs. While exact projections of demand in future years are difficult to make, analysts have placed the lower and upper bounds for annual growth for total REE demand at 5% and 9% over the next 25 years¹⁵

Given these steady increases in demand, it would appear that **the Mkango Resources Songwe Hill Rare Earth project should be well placed to source funding for development** provided other political risk factors remain manageable.

III. Niobium

Niobium is used as a material in steel manufacturing (as well as in aerospace super alloys). Therefore, the demand for the mineral depends on the robustness of the global economy, which in turn reflects the demand for steel. Steel production therefore is highest in countries with high growth/industrialisation rates including Russia, China and India. Historically, niobium prices are stable and do not rise or fall with demand. ¹⁶ The market for niobium is expected to increase with global trends toward urbanisation and industrialisation.

Apart from future market reaction to the commodity prices, the mining sector (particularly foreign owned operations) has been facing scrutiny from civil society and communities. Much of the concern around the uranium operation appears to be centred on the company's tax contribution to the national government and on the extent of local socio-economic development in the mining area¹⁷. There have also been allegations related to water pollutions caused by discharge of water from uranium operations but this has been found to be unfounded.

In general, communities would like to be compensated for the inconvenience resulting from disruptions of mining exploration and activities in their areas. To that

¹⁷ http://www.actionaid.org.uk/sites/default/files/tax_report_-_an_extractive_affair.pdf



¹³ Annual Economic Report, 2014 as noted above.

¹⁴ http://www.neimagazine.com/opinion/opinionthe-future-of-uranium-higher-prices-to-come-4259437/

¹⁵ http://web.mit.edu/12.000/www/m2016/finalwebsite/problems/ree.html

¹⁶ http://www.slideshare.net/RareEarthsRareMetals/niobium-20435201

end, communities are supported by well-funded NGOs to voice their concerns. The large foreign companies however view that as having negative impact on future investments.

B. Oil and Gas

Malawi is located on the Eastern Branch of the East African Rift System. This system follows the Great Lakes and Malawi is part of this regional area where oil and gas have been discovered (i.e. Uganda). According to some industry analysts, exploration work carried out on Lake Malawi apparently has indicated significant oil and gas potential¹⁸ but there are no figures indicated yet. Under the country's Petroleum Regulations, the country is divided into six blocks for the exploration and production of oil. These were awarded and production sharing agreements were signed in May 2014. However, these have been revoked due to a number of issues¹⁹. Government is reviewing the status of these licenses and is determining whether the original license holders will need to re-apply. Details of the original license holders are included in Annex 2.

With regard to **the development of the oil and gas sector, civil society has been vocal in its concern that oil and gas development is not proceeding within an adequate regulatory environment.**²⁰ There are issues relating to the use of Lake Malawi and the absence of information on the environmental impacts of oil exploration and exploitation. Without proper management, commentators are concerned that these impacts could affect the ecological system of a fresh water body.

Another key issue in the future development of the oil and gas potential of Lake Malawi concerns border demarcation conflicts between Tanzania and Malawi. Three of the oil and gas blocks have been awarded on Lake Malawi in an area under dispute. The border dispute escalated in 2011 when Malawi awarded oil exploration licenses covering the disputed part of the Lake to Surestream Petroleum. The awarding of these rights appeared to aggravate the situation, and Malawi was accused of acting unilaterally before issues related to the boundary area in question were resolved. A mediation effort has been ongoing to resolve boundary disputes and a meeting held in April 2015 indicated that the mediators of the Lake Malawi dispute, former Mozambican president Jacquim Chissano and his South African counterpart Thabo Mbeki, have recommended a resource sharing agreement.

2.2.3 El Structure in Mozambique

A. Extractive Industries Overview

Mozambique has a vast and diverse potential of mineral resources and hydrocarbons. This potential includes reserves of coal, heavy sands, base metals such as iron, vanadium, titanium, tantalite, tourmalines, bentonite, pegmatites, marble, bauxite, graphite, diamonds, gold, precious and semi-precious stones, phosphates, limestone and other minerals. The enormous reserves of natural gas discovered offshore in the Rovuma Basin, added to the known and exploited gas reserves in the Mozambique Basin, **could turn Mozambique into one of the countries with the largest reserves of natural gas in the world**.

Since the beginning of the millennium, the extractive industry sector has registered remarkable growth arising from the interest by the national and international investors in the



¹⁸ http://mininginmalawi.com/2015/04/02/malawis-oil-exploration-licences-and-agreements-should-becancelled-according-attorney-general/

¹⁹ Discussed under political economy

²⁰ http://mininginmalawi.com

mineral resources of Mozambique. A list of the most important initiatives and discoveries is presented in Table 2 of Annex 2.

The rapid growth of Mozambique's extractive sector, driven by coal exports and natural gas discoveries, has led to an influx of capital to support the development of megaprojects. According to the Central Bank of Mozambique, foreign direct investment ("FDI") increased 91% between 2011 and 2012, with megaprojects accounting for over 80% of this growth. Mining is therefore now playing an important role in the Mozambique economy and the country became EITI compliant in 2012 and it appears as though issues around disclosure, transparency and accountability have improved. A new minerals policy and strategy was completed in 2013 and seeks to incorporate objectives related to development and economic diversification.

There is concern in Mozambique that not enough work is being done by the government to add value to mineral products before export. Research is being done by economic and social policy institutions to advance the debate emerging between government and civil society on the concept of an "extractive economy".

B. Mining

The coal reserves in Mozambique are estimated at more than 20 billion tonnes and in the last 10 years, the country has recorded the opening of new mines and the start of the development of new projects in this area, among which the following are significant (KPMG, 2014).

- Moatize Coal Mine: this began production in 2011, and is currently in the final phase of expanding production capacity to 22 Mtpa (coking and thermal coal) with additional investment of USD 2 billion;
- Benga Coal Project: this began production in 2012, benefitting from an initial investment of USD 1.2 billion. According to MIREM, this project has a production level of 2 Mtpa of exported coal. The forecast is that by 2016 production will increase to 20 Mtpa;
- Changara Project (JSPL): this began production in 2013 and has an initial capacity of 2 Mtpa of coal;
- Minas Moatize (Beacon Hill) Projects: Beacon Hill completed the acquisition of MML in December 2010 after taking control of the project management in May 2010, when it centred its activities on the expansion and development of the Minas Moatize Coal Mine. Open cast mining of thermal coal began in 2011;
- Coal Project of Eta Star Moçambique, SA: The viability study and work plan were approved for open cast coal mining, with an installed capacity of about 10 Mtpa of coal. The total investment will be USD 250 million. The employment of about 690 workers is forecast;
- Revuboé Coal Project: the mining concession has been issued, and production is forecast of 4-4.5 Mtpa of coking coal and about 2-2.5 Mtpa of thermal coal;
- Midwest Africa Project in Kokwe: the mining concession has been granted, with reserves of 495 million tonnes. Total investment will be USD 757.69 million and forecast production is 7.2 Mtpa. Located in Moatize district, Tete province, it is envisaged that the project will employ about 1000 workers;
- Ncondezi Coal Project: the mining concession for the project has been granted, and reserves in the order of 4.07 billion tonnes have been identified. The forecast is for production of 7.2 Mtpa of thermal coal and the construction of a thermal power station with the initial capacity to generate 300 MW to 600 MW.

This demonstrates that coal is the major mining activity in Mozambique contributing to national GHG emissions and if affected by climate change will affect the sector's economy.



Other mining activities include heavy Sands Mine at Moma: this began production in 2007, with an installed capacity for 800,000 tonnes of ilmenite a year. In late 2013, expansion work was finished to increase production from 800,000 to 1.2 million tonnes of ilmenite, 75,000 tonnes of zircon and 21,000 tonnes of rutile. Total investment in the project is in the order of USD 700 million. In addition to Moma, there are smaller heavy sands projects at Angoche and Inhassunge.

In addition, artisanal and small scale mining, particularly for gold and precious and semiprecious stones, and ceramic production have undergone an increase in activity over the past ten years. In order to ensure better management of this sub-sector, the Government has designated and reshaped 95 mining pass areas, formalized 57 mining associations, and publicized appropriate and environmentally sound mining techniques among more than 6,000 artisanal and small scale miners. It has channeled technical and social support to the mining operators and communities in the areas designated and dedicated to the production of gold, precious and semi-precious stones and ceramics.

C. Oil & Gas

Hydrocarbons exploration in Mozambique began in the 950s, with drilling of onshore wells. Offshore exploration began in the 1970s and a total of 192 wells have been drilled, 122 of them onshore. The only project currently producing natural gas is Pande and Temane in Inhambane province with capacity of 183 MGJ/year. 95% of the Temani gas produced is exported to the republic of South Africa through ROMPCO gas pipeline 865 Km long, and the remaining percentage is consumed in Mozambique.

These areas were concessioned to international consortia headed by the American company (Anadarko) and ENI (Italy). These companies presented a proposal for the construction of a factory producing liquefied natural gas. This envisages the production of 10 Mtpa in two trains of 5 Mtpa each, in the initial phase, with the possibility of expansion to 20 Mtpa and 50 Mtpa. ENI is developing a floating unit to liquefy natural gas that has recently completed the EIA procedure. The quantity of gas, its piping and production of LNG will contribute to significant GHG emissions from locally based activities. Emissions due to exported gas will be accounted for in the importing countries.



SECTION 3

Findings of the scoping study

This section provides key findings related to assessments in the study countries that include environmental and climate change impacts, greenhouse gas (GHG) emissions and policy/legal; landscapes. The findings are also related to environmental management, climate change adaptation and GHG abatement measures that are being practiced or that can be applied. These findings will further inform the potential in the context of a compliance mechanism that is presented in Section 4.0.

3.1 Assessment of El Impacts and Measures

This sub-section presents environmental and climate change impacts that were confirmed to occur in the study countries. This is in relation to how they have affected the EI sector and how they are managed/adapted to reduce the effect on the sector economy, the environment and communities around the EI operations.

Zambia's main environmental impacts are associated with copper mining and the emissions of SO₂, the degradation and deforestation of land and the water contamination. The situation in Malawi is also dominated by the impacts from the mining sector, with concerns mainly raised over the mining of uranium. In Mozambique, the discharging of untreated industrial waste containing heavy metals was found to be a major issue. Mozambique also has to deal with the challenges presented by the displacement of populations from mining areas.

Environmental impact management measures share similarities across all three countries. In Zambia the SO₂ emissions are being managed through investment in modern smelters, in Malawi uranium contamination is being addressed through stricter and more effective measures to manage spillage from ponds. In Mozambique where waste rock deposits can have environmental impact, all operators who plan exploitation of titanium must have in place detailed plans on how they will treat and deposit the waste. Common across all three countries are management measures related to (i) land degradation – reforestation and forest management; (ii) mine rehabilitation – including regulation and the provision of an Environmental Protection Fund (in Zambia); (iii) water discharge management – including zero discharge through the recycling of waste water; and (iv) policy and legislative frameworks – including ensuring that there are harmonised and non-conflicting policies on environmental management.

Each country has its specific environmental impacts and management measures and these are detailed in the sections below.



3.1.1 Environmental Impacts and Management Measures

A. Zambia-El Environmental Impacts and management measures

The focus in Zambia was on copper mining taking into account the roughly 100 years of copper mining in the country. The major environmental impacts associated with the copper mining include: management of SO_2 emissions, land deforestation and degradation, management of tailings dams and mine dumps-and related impacts on the surrounding environment and water regimes. METS, an environmental services company of ZCCM-IH estimates that over 40 million tonnes of waste affects surrounding areas, land degradation, water contamination including impacts on fishery resources (Kafue River system); gardens are affected by u/g water pollution, and more land is needed to dump waste. Sometimes top soil is washed away and there is erosion, affecting farmlands hence poor cultivation results.

I. SO₂ Emissions

In the previous Mineral Development Agreements between 2000 (after privatization) and 2008 (abolishment of MDAs), companies running the "old mines" on the Copperbelt were allowed to emit SO₂ emissions. When MDAs were abolished, companies were only allowed to emit for a certain period of time and then had to reduce the emissions²¹. Emissions from old smelters had deleterious impacts on forests and Sulphuric acid used to flow into vicinity of mines affecting communities²²

The mines have now constructed acid plants to deal with sulphur dioxide emissions with SO₂ capture efficiency of over $98\%^{23}$. This was a result of a combination of community pressure and legal basis contained in the Environment Management Act standards.

New mines that are being constructed in the North- West Province (the so-called "new Copper belt"), are employing much better technologies to reduce environmental impacts. There are a number of "new" smelters in the country (Nchanga for KCM, MCC Chambishi, Mopani, and Solwezi for First Quantum). They are all equipped with high SO₂ efficient capture systems. The assessment of METS however suggests that the **mines' assertions regarding how well emissions are controlled is somewhat "optimistic"** as the smelters are sometimes smoking. Hence, more needs to be done to control emissions and clean up the old Copperbelt. In addition, some large mining companies are of the view that regulation of the emissions is not applied consistently across the industry. Those **companies with political networks may not be complying** to the same extent as other companies. This allegation was however discounted by the Zambia Environmental Management Agency (ZEMA).

II. Land Clearance

Land clearance is one of the environmental impacts resulting from mining operations. This leads to deforestation at mine sites, resulting in degraded soil quality, lack of trees and flash floods. The deforestation around mines is exacerbated by cutting of trees for charcoal production. Both mining companies and the government confirmed that charcoal production contributes significantly to deforestation around the mines as the market for charcoal is high close to the mines.

²³ Mopani at US\$400million plant with 99.9% SO2 capture efficiency-COM



²¹ Interview with PS of Mines

²² METS- ZCCM-IH Environmental Unit

The large mining companies²⁴ practice forest management by planting trees on site. The practice embraces tree planting involving communities around the mines as part of the CSR. Waste rock rehabilitation e.g. at Lumwana is practiced through re-vegetation efforts that are in place.

KCM is educating communities living along the Kafue River waterways regarding the effect of deforestation on water as the mine would be vulnerable to reduced levels of water in the river for operational reasons.

III. Mine Rehabilitation

Mine rehabilitation is of concern in terms of small and medium scale mining, as the **exit strategy is unclear**. Of concern has been the need for rehabilitation of an old lead mine at Kabwe that is causing water contamination in the vicinity. The World Bank (WB) is assisting government to provide clean water facilities to communities in the area and the WB programme includes income generating activities for communities (related to management of environmental impacts)²⁵.

For all mines, there does not appear to be a closure strategy and communities are affected when mines close. Of major concern in this regard is the quarrying and road construction going on but little attention paid to environmental impacts. Companies rent farmland for mining but farmers receive little in the way of environmental compensation for damages²⁶

Government is of the opinion that there is **too much focus on environmental impacts of Large Scale Mining (LSM) and not enough on Small Scale Mining (SSM)** and yet the cumulative impact of smaller operations can be the same or more than LSM. This category (SSM) however would need skills for proper mining and capital for more efficient and modern equipment.²⁷

The Environmental Protection Fund has been established to provide financial support for mitigating impacts of rehabilitating from mining activity. Companies are required to pay into this fund as up-front costs for rehabilitation. The mines give a certain percentage of money before the mine can be constructed which is a kind of environmental bond. The percentage is based on size of mine, production value, etc. The Fund has been decided upon but other details are being worked on.

IV. Water Discharge

Incidences of water discharge were mentioned for coal operations in the south of the country. Maamba Colliery used to **dump low grade coal resulting in pollutant leaks contaminating soil and water** in the past three decades but now will use that coal for power generation. The company indicated that they have resorted to recycling their water and currently have zero discharge into the water regime.

For the copper mines, e.g. Barrack, the discharge of tailings into the channel is benign and the water quality has been tested by ZEMA and passes the standard requirement.

V. Health and Safety Incidents

PS Mines



²⁴ First Quantum, KCM, Barrick indicated that they have that practice.

²⁵ Interview with PS Mines

Interview with Zambia Development Agency
PS Minoo

There have been **incidents regarding worker health and safety** and people have collapsed in some mines due to hazards. The risks cited by the copper mining companies are related to reagents, hydrocarbons, hazardous waste, dust emissions and possible impacts of water/soil/air and the communities around the mine²⁸.

Barrick has had hydrocarbon spillage from burst pipe resulting in excess of 6000 litres of oil spilling. However, this type of incident has not occurred recently and there is currently very little contamination of soil/water/air. The large companies however keep such substances in contained areas and practice safe handling procedures to minimize the incidents.

On dust, companies conduct dust suppression e.g. Barrick and have milling and crushing facilities in enclosed areas. Communities reside about 20 km away from the Barrick Lumwana mining operations and as such there are no problems related to dust or pollution issues on the communities. In the case of KCM however, communities live very close to the mine. Although there are mitigation measures in place, in the past there was a pipe burst which discharged slurry effluent and affected water quality. Sometimes sulfuric acid has escaped and affected community air quality. These problems have contributed to community dissatisfaction about mine impacts on water and soil quality.

The large mines such as First Quantum have an environmental management system to prevent accidental releases and control of air emissions such as dust²⁹.With regard to the debacle between oil/gas exploration and wild life, the Zambian Wildlife Act will also be revised to harmonize with the Mining, Environment and Wildlife Acts³⁰

In terms of **capacity for Environmental measures**, the ZCCM-IH-METS helps mining companies do EIA/ESMPs and also performs an Environmental Protection Site Audit. Each site has a **closure plan** that must be **reviewed annually and costed** and this technical support is of value to ZEMA in their monitoring and enforcement of the ZEMA ACT³¹.

Below is a summary of the environmental impacts associated with copper mining and the commonly applied management measures (Table 1).



²⁸ First Quantum Sustainability Report 2012; 2013

²⁹ ibid

³⁰ ZEMA Interview

³¹ ZCCM-IH- METS Interview

Table 1 Potential environmental risks and mitigation measures in place for copper mining in Zambia

Category	Potential Risks	Management measures
SO ₂	Destruction to vegetation, health impacts on communities, flow of sulphuric acid into water and soil regimes	Investment into modern smelters with high SO2 capture efficiency (>98%). Additional measures required for the remaining emissions
Land degradation	in degraded soil quality, lack of trees and flash floods	Practicing reforestation and forest management. Need to keep zero cleared land where mining operations are not taking place
Mine Rehabilitation	Water contamination, sink holes	For Large Mining, Environmental Protection Fund to safeguard against abandonment of mines. Similar fund required for Small Scale Mining. Empowering communities to monitor and enforce good mining practice.
Water Discharge	Water contamination	Zero discharge through recycling of waste water. Safeguard through monitoring of run- offs into environment and water regimes. Still need to maintain adequate water flow for the environment.
Biodiversity	Biodiversity disturbance due to mining and tailings	Limit areas of disturbance and control clearance of forests
Reagents	Storage and spill risks due to volumes at remote operations	Correctly size the storage facilities and containment and train employee on handling of reagents, spill prevention and clean-up
Hazardous waste	Disposal risks from hazardous waste due to lack of waste disposal facility	Reduction in volumes of hazardous waste and recycling waste oil
Tailings	Possible seepage, spillage, dust and visual impact	Operational monitoring of tailings dams and re-vegetation of the dams
Hydrocarbons	Spillage of diesel, petrol and oil during handling, storage and transport	Construction of containment facilities for storage Implementation of handling procedures to prevent spills
Water	Dewatering of ground water resources. Pollution of surface and groundwater from accidental releases and seepage	Clean and dirty water separation on sites with containment facilities. Alternative water supply if mine dewatering impacts
Air ³²	Dust emissions from tailings storage areas and haul roads Fibrous material from ore bodies	Vegetate tailings dams slopes, spraying molasses on haul roads Enclosure of milling and crushing facilities
Communities	Health risks posed to communities due to air emissions and accidental discharges	Develop an EMS to prevent accidental releases and control air emissions.
Policy Frameworks	Conflicting policies e.g. from mining, water, environment wild life	Harmonization of policies on aspects of environmental management
Compliance	False reporting of environmental situation and statistics	Deployment of accredited companies to conduct environmental audits in support of the Environmental Management Agencies

Source; First Quantum Sustainability Report 2012; corroborated by Barrick and KCM Interview, stakeholder inputs

Here excludes GHG (CO2 and N2O) that are described above



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B. Malawi-El Environmental Impacts and Management Measures

Below are examples of measures the large mining company, Paladin is employing to mitigate environmental impacts (Table 2).

Category	Potential risks	Management measures
Uranium Contamination	Radioactive contamination in environment and water regimes	Avoid spillage from ponds during flood using containments and/or pumping excess water from ponds. Use independent auditors to verify
Land degradation	deforestation	Reforestation/forest management. Should include reforestation of cleared land due to Charcoal product as part of CSR
Mine Rehabilitation	Degraded land	Largely for ASM and that requires regulation targeted at the ASM. Monitor and enforce regulations for local companies also.
Water discharge	Water contamination	Sound management of resource to sustain operations. Water use and quality standards Maximize reuse/recycle to reduce extraction from natural sources, surface and ground water monitoring
Emissions	Smoke from plants e.g. cement plant	Investment in low emission plant. Dust suppression required at mine and on roads to depot
Biodiversity	Disturbance due to habitat destruction	Conserve using local knowledge, rehabilitate as required
Land Use and management		Land clearance process in place and rehabilitation to avoid and /or restore use, values, biodiversity, ecological, social and cultural heritage.
Policy/Legal	Conflicting policies	Harmonize mining, forestry, tourism, wild life and environmental laws
Compliance	No confirmed environmental statistics and monitoring	Large mines conduct own audits and report to Global Reporting Initiative. Empower Environmental Management Agency (EMA) to perform similar monitoring. This will require additional financial resources for the EMA.

Table 2 Environmental Mitigation Measures Practiced by Paladin in Malawi

On regulation, ASM are not well regulated to comply with any measures³³. The enforcement of mining laws is not strict enough and there is poor harmony of regulatory frameworks among forestry, agriculture, wildlife, mining and tourism; and lack of know-how and specialist skills in mining and industrial processing³⁴

I. Uranium Contamination

The largest concern in Malawi in relation to mining has been cited in in terms of the operation at the Kayelekera Uranium Mine with fear that radioactive material may be contaminating the environment. This has raised issues with communities and NGOs and has become a point of conflict between the mine and the community/NGO constituency. At the time of the field visit however, **the mine was on care and maintenance** but still requiring proper environmental management particularly in relation to potential spillovers from ponds.

³⁴ National Climate Change Investment Plan, 2013



³³ Commissioner of Mines Interview

Mine owner Paladin indicated that the company follows international environmental standards in Australia as well as Malawian legislation. Water quality has passed WHO drinking water standards; rains may result in discharge into river systems but the water quality is monitored regularly and sent to a laboratory in SA for analysis. The government spends up to a week monitoring and taking water samples and analyses the samples using its own laboratory and no harmful contamination has been found³⁵.

П. Land Degradation

Deforestation is also a significant issue particularly around the Kayelekera Mine and there is a slow and steady process of deforestation going on around the mine caused by chopping down of trees by locals for charcoal³⁶. SSM is also resulting in degradation of land and adding to effect of charcoal production is resulting in deforestation, soil erosion and run offs³⁷.

III. **Mine Rehabilitation**

The Department of Mines estimates that there are over 22,000 formal and informal artisanal and small-scale operators (ASM) countrywide, largely mining for gemstones and limestone. Their operations are resulting in environmental degradation as they dig pits and do not rehabilitate them³⁸. Surveys of the current ASM operators are being conducted; the miners will be encouraged to form cooperatives so that they can access government support and be under the formal regulatory framework.

Some large companies do rehabilitate their mining areas as they go through phases of mining. Sometimes there are abuses of anticipated mine closure plans because future timeframes are indicated, but companies (smaller, domestic companies) may abandon a project before the timeframe is reached.

IV. Water Discharge

Inflows from mining operations, apart from that from Kayelekera, have been noticed from a coal mine upstream where coal is washed into rivers from high rains. There is no environmental management plan and because it is locally owned, there is a view by LSM that it is not being regulated³⁹. The run off of the "coal wash" occurs when coal is stored uncovered outside and is subjected to precipitation causing a run off into the river system leading to water pollution⁴⁰.

V. **Other Incidents**

The other issues related to environmental effects relate to the Shayona Cement Plant. The old plant had high smoke levels. The company is replacing that with a new plant and there will be no significant dust emissions thereafter as the plant has a dust suffocating system.

VI. **Regulation and Practice**

The Environmental Affairs Department (EAD) is in charge of monitoring and auditing mining operations but is constrained by financial resources. EAD-EIA depends on EIA fees that companies pay (.003% of project costs and some companies even reduce Project costs) to

⁴⁰ Confirmed by Department of Economic Development and Planning; 2nd National Communication, 2011



³⁵ Interview with Paladin and Global Metals, Chamber of Mines Office. ibid

³⁶

³⁷ Commissioner of Mines and Paladin/Global metals/CoM

³⁸ Environmental Affairs Department- EIA section

³⁹ Com/Paladin/GM

fund monitoring but this part of the system is also weak due to insufficient numbers of staff and inadequate equipment, etc. The EAD-EIA needs equipment for measuring water quality, pollution of all types, noise, etc.⁴¹

The large mining companies such as Paladin and Global Metals are signatories to the Global Reporting Initiative and the companies conduct quarterly audits and produce annual reporting on environmental impacts⁴². Paladin sends quarterly reports to the Environmental Affairs Department. Feedback is limited with very few comments and the responses tend to be reactive – in terms of negative press or angry CSOs, etc.⁴³.

Even government confirmed that the large companies tend to be compliant with Environmental **Management requirements** because they are global and usually listed on international stock exchanges₄₄ Through **pressure from the public and civil society**, (mostly due to a period of intense flooding several years ago), **government has** responded by attending to **the legislative framework** that **aims to harmonize the Water Policy with the Environmental Policy**.⁴⁵

C. Mozambique-El Environmental Impacts and Management Measures

I. Mining Sector

The environmental impact associated with EI in Mozambique is understood to be discharge of untreated waste containing heavy metals and hydrocarbons from the industry. The resettlement of populations displaced from mining areas is also a major issue for local authorities, communities and human rights organizations.

Furthermore, the mining sector of Mozambique shows a number of environmental problems that should be confronted and these include:

- Potential impacts of prospecting and exploration activities
- Effects on landscape and morphology
- Accumulation and spread of solid waste
- Water use and/or pollution Acid Mine Drainage
- Air pollution
- Soil pollution
- Effects on flora and fauna
- Radioactivity and uranium
- Environmental emergencies
- Issues common to industrial establishments in general

The above listed matters, however, are modest in magnitude in comparison with many other countries as the number and extent of environmental liabilities from former activities are limited and the degree of pollution from on-going operations is moderate. Even within the area of artisanal mining, where the impact on topography, the spread of mercury (in certain areas) and problematic social implications are reasons for concern, is less extensive than in many other countries where corresponding activities are taking place. This situation is not the result of any sophisticated public environmental supervision, but rather reflects the inoffensive character of most deposits being exploited.

44 Commissioner of Mines



⁴¹ EAD-EIA

⁴² Com/Paladin/GM

⁴³ ibid

⁴⁵ UNFCCC Focal Point

With specific reference to Mozambique, impacts due to exploration are mainly related to the work carried out by the companies investigating heavy mineral sand deposits, and consist of smaller or larger pits from where material has been taken for the beneficiation tests. Road construction in relation to these latter investigations has had a small impact on the natural environment. In Mozambique few conflicts have occurred regarding land use associated with mining due to the fact that mines have been situated in sparsely populated mountainous areas or in areas of subsistence farming. The only direct conflict we have been informed of during our mission was the complaints received from farmers regarding the use of wood from the forest within the bauxite and gold mining areas.

With the emergence of the proposed large-scale projects for heavy mineral sand exploitation (titanium), the issue of land use has now become a prominent issue. Of particular sensitivity are the exploitations planned within areas immediately inland from the sandy beaches of the sea front where some people argue that the whole of the Mozambican coast line should be reserved for touristic developments and fishing. Furthermore, there are a number of closed-down and abandoned mines in Mozambique, where proper closure and clean-up have never been carried out (not to mention rehabilitation of the ground) leaving on the ground the remnants of beneficiation plants at several places.

It must be noted that mining usually involves the movement of large quantities of material. Thus, overburden and sterile host rock excavated in order to reach the ore body often make up several times the tonnage of the ore being extracted. Waste rock has in Mozambique usually been deposited directly on the surrounding land and tailings have been discharged to nearby rivers. This is a practice that continues at some mines and at all artisanal operations. In addition, the large multinational companies that plan exploitation for titanium, all have detailed plans for how to treat and deposit the waste. Mozambique in general, and particularly the mountainous parts of the country where mining takes place, have a high rate of rainfall and hosts a large number of major rivers. Process water for mining operations are usually taken from minor rivers or even from the mine itself.

The heavy mineral sand deposits in Mozambique (like similar deposits in other countries) exhibit a high gamma radiation originating from thorium (mainly) and uranium in the mineral monazite. This monazite will have to be separated from the concentrate during the treatment of the sand as it is an unwanted ingredient in the product. This is relatively simple due to its low magnetic properties. In this regards Mozambique adheres to the rules regarding radioactivity established by the National Nuclear Regulator in South Africa. These rules accept dilution during deposition of waste as a means of limiting radiation. However, it also requires that workers that will be exposed to elevated radiation be registered for regular health control.

These pollution aspects are common to most other industrial activities. The main concern is related to the movement of vehicles and the potential damage from spills of oil or gasoline. The practice within the Mozambican mining sector regarding these general issues is a reflection of a generally tolerant attitude in the populace and a lack of resources in the Mozambican society as a whole. However, the influence of well-informed major foreign investors, accompanied by higher standards in these issues related to pollution of the environment, promises to have a positive effect on the whole sector.

D. Oil and Gas

The literature review and interviews conducted with operators and stakeholders revealed that the following potential impacts could be associated with the development of an oil and gas project in Mozambique.



Offshore:

- Impact of discharge of treated drill cuttings and residual mud on water quality, offshore benthos and deep-water reef organisms. Types of impacts may include:
 - Toxicity effects on benthos and organisms in the water column and potential contamination effects of high food value organisms e.g. shellfish and fish,
 - Physical inundation (burial and change in sediment grain size) effects on benthic marine organisms;
- Impact of Discharge of Hydrotest Water on Offshore Water Quality and Marine Ecology;
- Noise, Lighting and Vessel Movements on Offshore Marine Ecology;
- Structures modifying habitats on the offshore seabed;
- Impacts on fishing communities because of exclusion zones around project infrastructure and supporting vessels.

Potential typical mitigation measures include:

- Efficient equipment, including ensuring that drill rigs are designed in accordance with GIIP to have an efficient solids control and mud recirculation system, including shakers, mud cleaners, dryers and centrifuges for the treatment of drill cuttings, and water based muds and low toxicity additives should be used whenever possible;
- Marine Mammal Observation Procedures and specific measures (including reducing speeds, using trained spotters. Soft start procedures, etc.) should be developed to help a prompt identification of the presence of mammals in the area and to avoid possible collisions or disturbance;
- Discharging of cuttings and drilling fluids in close proximity to high-relief reefs should be avoided (and thereby reducing the intensity of any impacts), and subsurface discharge alternatives considered (such as a chute) for over-side disposal of treated drill cuttings and residual mud;
- Ongoing monitoring during project construction and comparison to pre-existing baseline conditions.

Nearshore:

Potential typical impacts associated with the nearshore environment include:

- Dredging-induced turbidity on the near shore marine environment (including seagrass, coral reef and associated biological communities) with the potential for increased turbidity, the remobilisation of heavy metals and organic compounds, physical disturbance and sediment deposition;
- Impacts of turbidity generated from the cutting of trenches through coral reef and rock on near shore marine ecology;
- Construction of artificial hard structures on near shore marine ecology (such as jetties and module offloading facilities);
- Project-generated noise on marine organisms in the near shore;
- Discharges from desalination/sewage treatment plants and site storm water runoff on near shore water quality and marine ecology;
- Destruction of local habitats including mangroves and sea grass;
- Impact of security/exclusion zones on fish distributions in the near shore and on fisherman villages located along the coast.



Potential typical mitigations include the following:

- Control turbidity outside of the dredging footprint;
- Constraining the dispersion of material from the dredge area during the dredging operation;
- Monitor benthos communities adjacent to the placement area pre- and post-dredging;
- Reduce the width of any pipeline corridor to as low as practically possible and align the pipeline to avoid as much impact to coral communities;
- Development of an active shoreline management and monitoring programme;
- Ensuring storm water or sewage discharges are in line with all applicable standards and regulations;
- Development of an adequate stakeholder engagement process to keep communities updated and informed of project activities including risks associated to project operations.

From an environmental perspective, regarding typical potential impacts on the onshore environment, the following potential impacts could be associated with the development of a Gas Processing Facility in Mozambique:

- Site clearance and reclamation works (including the removal of habitat and impact on wetlands and ecological services, and invasive species);
- Visual impacts of project facilities and landscape alteration;
- GHG emissions from project construction and operation;
- Impact of project generated noise and air pollution on local communities and biodiversity;
- Surface water impacts on water ecology, quality and flow;
- Groundwater impacts (including over abstraction of water supply wells);
- Biodiversity impacts including displacement, disturbance, habitat loss and mortality;
- Pollution resulting from project waste (including the storage, treatment and disposal of hazardous and non-hazardous waste) and wastewater.

Potential typical mitigations include the following:

- optimising energy efficiency during the design phase and implementing those efficiencies during construction and operations, and monitoring of fugitive emissions;
- Assessment of alternatives (location, project design) and comprehensive planning and design during the pre-construction phase to ensure that the footprint area is minimised and sensitive areas avoided;
- Assessment of project generated emissions compared to baseline survey data of pre-existing ambient conditions;
- Project site management actions (including re-vegetation of temporary-use areas, dust suppression measures, emergency response materials, budded storage areas and secondary containment, site drainage and runoff treatment, water level gauges, erosion and sediment control measures visual inspections and ongoing monitoring);
- Establishment of buffer zones to prevent adverse impacts on adjacent sensitive areas.

3.1.2 Climate Change Impacts and Adaptation Measures

Zambia's main climate change impacts are associated with mining and the low levels of water in the major hydropower dams. Reduced water levels affect mining with regards to their ability to store water, but it is the provision of energy that is the major concern for industry. The mining sector in Zambia has identified concerns regarding the extremes of



weather (sometimes too wet to mine, sometimes to dry) and this situation was also recognised in Malawi. Climate change was a more prominent concern in Malawi, where the effects of flooding and drought in the agriculture sector has a greater effect on the population in general. Flooding and drought also affect hydropower in Malawi – with mining operations installing diesel plants to mitigate the unpredictable supply of energy from hydropower. Mozambique is a country that is at high risk to the adverse effects of climate change. It also has limited resources to put in place adaptation measures.

Climate change adaptation measures across all three countries appear to be driven at the government level through various policies and programmes including the National Adaptation Programme on Action in Zambia and the Malawian Government's work on mainstreaming climate change into the national Growth and Development Strategy as well as their development of the National Adaptation Programmes of Action. In all countries addressing the threat of drought is a major focus of adaptation measures including the pursuit of policies and instruments that (i) strengthen early warning systems; (ii) boosting river water systems; (iii) regional electricity integration; (iv) increased and widespread use of renewable energy solutions; (v) forest management and afforestation programmes around mines (Zambia); and (vi) development of climate resilient infrastructure.

Each country has its specific climate change impacts and adaptation measures and these are detailed below.

A. Zambia- El Climate Change Impacts

For **mining**, power shortage due to low water levels in the major hydropower dams of Kariba has a major climate change impact. This follows a forecasted rainfall pattern that points to possible impacts of climate change. Although indirect, this shortage of hydropower has significantly affected mining companies through load shedding and as of 1 September 2015 many mining companies had their electricity supply cut by 30% by the utility ZESCO Zambia is promoting and encouraging other sources of electricity including coal and other renewable energy sources of power. Zambia has the lowest tariffs in the region and so it is a challenge to promote investment with the low tariff structure in place.

The drought also affects mines through shortage of water but the situation of water supply was not indicated to be as extreme as it is for energy.

Government communicated that water levels are low due to the possible impact of climate change. Mining companies⁴⁶ have a counterargument that this is due to mismanagement of the reservoir and also installation recently of a less efficient hydropower plant. Whether drought or mismanagement, it is true that water levels are reduced and hydropower is affected⁴⁷.



⁴⁶ FQ and KCM-the biggest in tax and employment respectively

⁴⁷ http://mines.org.zm/

Climate variability has also posed new challenges for the sector in Zambia. In March 2015, a prolonged period of drought resulted in lower water levels at the Kariba Dam, a binational facility managed in co-operation with Zimbabwe.Generational capacity was estimated to have decreased temporarily by around 300 MW, prompting power rationing as an interim solution.

Another area of development has been in the proposed upgrades to existing infrastructure. Preeminent in this regard, the Kariba Dam Rehabilitation Project was launched last year. Essential to the facility's continued safe operation, over the next ten years this USD 294 million scheme will reshape the pool under the dam to limit erosion and refurbish the spillways to improve operations and structural stability⁴⁸.

The copper large scale mining (LSM) companies indicated that they have not experienced serious extreme weather related effects such as flooding of open pits or water scarcity and climate change impacts are not explicitly included in risk management strategies. Barrick has however indicated that late rainfall last year affected production due to conditions that were too wet for mining. There is also recognition that there seem to be extremes of weather – either too dry or too wet. These issues (regarding the effects of extreme weather patterns on production) were echoed by interviews with the Paladin Kayelekera Uranium mine in Malawi.

In discussions with the Chamber, it appears that its members are not sufficiently aware of the link between climate change and weather. The Chamber indicated that developing this awareness and adding to the capacity of mining companies to understand these issues and to address them more adequately in their risk management and adaptation strategies requires support.

I. Regulation

Any project that requires an Environmental Impact Assessment is automatically registered with ZEMA. However, interviews with stakeholders indicated that ⁴⁹ ZEMA does very little on-site inspection hence companies are largely self-regulating. **Climate change impacts are not explicitly part of risk management in all LSM operations**, although KCM and Barrick do recognise climate change in their risk management strategies.⁵⁰ ZEMA has not gazetted to regulate climate change impacts⁵¹.

For **oil and gas**, there was unanimity that only exploration is going on, using geophysical surveys and not yet at the level of penetration of land. There are no discussions yet on quantifying possible reserves/resource base, and environmental and climate change impacts being experienced yet.

There is however exploration taking place in the wild life reserves, hence the need to liaise with the Ministry of Tourism to avoid land use conflicts

B. Zambia- El Climate Change Adaptation Measures

The UNFCCC Focal Point developed a National Adaptation Programme on Action (NAPA, 2007) with drought as the major expected hazard for Zambia and the need to:

⁵¹ (see further information in the institutional and regulatory section of this report).



⁴⁸ http://www.hydropower.org/country-profiles/zambia

⁴⁹ Interviews with Barrick, KCM, FQ

⁵⁰ As above.

- strengthen early warning systems,
- boosting the Zambezi River water system to increase its delivery through inter-basin transfer,
- regional electricity integration and
- use of renewable energies as these will ensure that power shortages are alleviated.

The UNFCCC Focal Point needs support for more Research & Development into alternate sources of energy and the establishment of early warning system. NAPA is being discussed with stakeholders to advance these priorities in addition to the themes being considered on Waste Management; Small Hydro; sustainable agriculture and Sustainable Charcoal production. The expectation is to **take development of the actions to bankable feasibility stage**.

The key issue currently is power supply shortage with load shedding currently being implemented to deal with reduced availability of hydro power. Drought is expected to persist next year (Standard Bank article also issued similar forecast), so government is trying to attract investors into the power sector.

Tariffs will change because some energy will need to be purchased from suppliers outside the country. To alleviate the shortage, mines are encouraged to have a back-up energy supply. Private sector contributions to energy supply are allowed and encouraged through electricity sector law. Maamba Collieries will install a coal power plant of 300MW and is planning to offset the carbon emissions through planting of trees. Dangote Company will construct a cement plant in the country and will also install its own coal power station to alleviate the power shortage.

Other initiatives in the country related to climate change adaptation measures include:

- Forest management through afforestation/reforestation programmes around the mines and involving the communities 52.
- Water recycling to ensure that plants have zero discharge into the environment.
- The World Bank initiative supporting restoration of degraded lands in the copper belt working with ZEMA.
- KCM has explicitly recognized CC as a risk and is part of the risk management strategy.

C. Malawi-El Climate Change Impacts and Adaptation Measures

Climate change has a higher profile in Malawi than in Zambia due to flooding and drought affecting the agricultural sector. The Government is working on mainstreaming climate change in its next Growth and Development Strategy⁵³ through the Department of Economic Development and Planning (DEDP)⁵⁴

Floods are known to occur but the Environmental Affairs Department was not aware of any impacts affecting the El sector. The Shayona limestone mine is open pit and shallow but they have had no problems with flooding and there has never been scarcity of water for operations. Incidences of some coalmines flooding e.g. Mchenga Mine were cited and resulted in reduced production. The DEDP also reported air pollution from coal dust caused by high-speed winds that is believed to be increasing especially with cleared forests around

⁵⁴ Malawi has sector-specific policies which have mainstreamed adaptation and mitigation activities, as well as implementation frameworks that foster development and transfer- Malawi INDC 2013 of technology and capacity building



⁵² FQ, KCM, Barrick interviews

⁵³ The Strategy is due for revision.

the mines. Hydropower has also been affected by both droughts and floods along the Shire River. Keyelekera Mine was supplied from own diesel plant. Global Metals is also planning to install its own diesel plant under current conditions.

The main source of Malawi's energy is the Shire River. Hence, energy supply is adversely affected by water deficits or shortages because of either reduced water flows or decreased rainfall and Malawi is addressing that buy diversifying the energy sources and developing climate resilient infrastructure⁵⁵. The National Climate Change Investment Plan has one of its targets for investment as Infrastructure resilience, and of relevance relates to transport and energy. Both have an effect on mining operations in the country and delivery of energy services.

The Government of Malawi developed the National Adaptation Programmes of Action (NAPA) that was officially launched in February 2008, with the aim of addressing immediate and urgent adaptation needs. The Needs were aimed at assisting vulnerable communities and ecosystems to have enhanced resilience to the adverse effects of climate change. The NAPA is now under revision taking into account the Cancun decisions. Malawi has undertaken training for National Adaptation Plan and a revised NAPA was expected by end of September 2015.

Key recommendations relevant to a climate change programme for Malawi emanating from the training is the need to distinguish programmes and expenditure between environment and climate change and that all sectors have separate coding for allocation of budgets. Climate Change will have its own budgets and expenditure to target adaptation measures⁵⁶.

D. Mozambique-El Climate Change Impacts and Adaptation Measures

Mozambique is highly vulnerable to adverse effects of climate change and with few resources to meet the costs of adaptation and mitigation. Mozambique is subject to extreme weather events that can ultimately take the form of drought, flooding, and tropical cyclones, and ranks third among the African countries most exposed to risks from multiple weather-related hazards (UNISDR 2009). The country's economic performance is already highly affected by frequent droughts, floods, and rainfall variability. Droughts and floods are key challenges affecting mining and hydropower supply.

Storm surges pose a huge threat to coastal infrastructure as they can temporarily raise sea level as much as 5 meters. While many of the major coastal cities of Mozambique have infrastructure in place to stem the effects of such an extreme event, many are in need of serious maintenance. Furthermore, Mozambique is subject to three or four cyclones every year. In addition to the extreme wind and rainfall caused by these cyclones, they can exacerbate seawater inundation threats, especially which of storm surge.

3.2 Assessment of EI GHG Emissions and Abatement Measures

This sub-section presents the GHG emissions by country, the sources associated with the El sector, and abatement measures being practiced and those that can be included in the future where applicable. The significance of the GHG sources and the abatement potential of the measures will inform El companies where they can invest to realize the highest return from carbon offsets. The level of GHG emissions companies currently emit will inform participation in a compliance mechanism, based on a threshold of emissions that will qualify companies to be included in the mechanism.

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Summary Report On Public Expenditure Review On Environment And Disaster Risk Management November 2014



⁵⁵ ibid
The main GHG emissions in Zambia relate to the Agriculture, Forestry and other Land Use sectors. Production levels drive GHG emissions in copper mining with **copper production levels expected to double between 2013 and 2018.** The national GHG inventory published in 2014 had GHG emissions data as low although the figures are out of date. The Zambian Environmental Management Agency is currently developing a national GHG inventory to ensure up to date data. The situation in Malawi is similar, with the extractives sector being very small in terms of overall contribution to GHGs and the dominant sector being the Agriculture, Forestry and Other Land Use. However, the largest sectoral increase will be in the energy sector as new coal-based generation capacity comes on-line. The Malawian National Climate Change Investment Plan (2013-2018) identified the lack of technical equipment and expertise as being the barriers to estimations for GHGs in the energy sector. In Mozambique, the official GHG inventory has emission levels as being low. These are considered to be an underestimate as there are now significant coal, oil and gas and aluminium operations in the country. Energy consumption patterns in the energy sector are unavailable for Mozambique.

GHG abatement measures vary across all three countries. In Zambia, although GHG emissions are not significant, companies are reducing consumption of energy audits becoming common. A Climate Change policy is targeting (i) cleaner production measures; (ii) energy efficiency; (iii) alternative energy sources for mining equipment; (iv) use of renewable energy; (v) biomass; and (vi) energy conservation efforts. Malawi currently does not specify GHG mitigation measures specific to the mining sector. The Malawian government is diversifying from a reliance on hydropower and is currently considering geothermal, solar and wind sources. Malawi's National Climate Change Investment Plan of 2013 looks at GHG emission abatement measures by signalling there intent to attract investment for REDD+ and energy saving measures. Mozambique has signalled its intent to participate in the market mechanisms to be established under UNFCCC to allow access to clean technologies in order to mitigate the emissions arising from exploiting, managing and using the natural resources that are available.

Each country has its specific GHG emissions and abatement measures and these are detailed below:

3.2.1 Zambia- GHG Emissions and Abatement Measures

A. EI GHG emissions

I. Mining sector

The driver for GHG emissions in Zambia copper mining will be the production level. In 2013, the production was 739,291 metric tonnes of copper and 1,957 metric tonnes of cobalt⁵⁷. Copper production is expected to reach about 1.5m metric tonnes by 2018 if projects that are in the pipeline come into production.

The national GHG inventory for the 2nd National Communication was based on 2000 activity data and the total emissions were 54 million tonnes CO_2 equivalent (t CO_2 eq) but the emissions due to the mineral production was less than 0.5% including fugitive emissions from coal production. This would omit the fuel consumption that is included in energy consumption but even including energy consumption in the mining sector, the mining share would be below 5%. The Dominant GHG emitting sector in Zambia is the Agriculture, Forestry and other Land Use (AFOLU) sector.

http://www.zambiae iti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014



⁵⁷

These figures give an indication of the share of GHG emissions the mining sector is contributing to the economy. National GHG inventories tend to lag behind in terms of when they are determined and so would not be useful to determine targets for any voluntary or enforced GHG reduction mechanism.

Zambia Environmental Management Agency (ZEMA) that is now tasked with preparation of national GHG inventories to ensure that sectors provide their data timely for that purpose. Currently mining companies concentrate on preparing their own GHG inventories for reporting to head offices and Carbon Disclosure Project or GRI. This is important for their credibility in financial markets and has associated cost benefits⁵⁸.

Below are some estimates of GHG emitted by the large copper mining companies in Zambia.

First Quantum: The GHG inventory produced by First Quantum in 2010 had a total of 150 ktCO₂eq comprising of 133 kt CO_{2eq} (88% of total)⁵⁹ direct emissions. Production has been increasing since 2010 and hence the GHG emissions would be larger by now but not exceeding 200ktCO₂eq.

Direct emissions were largely from use of diesel and other transport equipment using fossil fuels. The company currently reports its emissions to its Board but excluding GHG emissions. That will be included in the future.

Barrick: The most significant source for GHG emissions within Barrick is also fuel consumption used during land clearance and explosives; and transportation of concentrate to the Chambishi smelter (330km away). The GHG emissions from ore processed at Chambishi are however not accounted which is an omission if Chambishi Smelter itself is not accounting for it. The actual GHG emissions for Barrick were not available but considering its production level of 97000 tonnes copper, its GHG emissions would be less than 100 ktCO₂ eq⁶⁰.

Kongola Copper Mines (KCM) in 2013 emitted 132 ktCO₂ eq as direct emissions and another 27kt CO2eq as indirect emissions⁶¹. The major source of emissions is diesel consumed by trucks, dump trucks, utility vehicles for Open pit mines; and trams, scoopers, loaders and conveyor belts for Underground operations. KCM can determine GHG emissions per cost station if required and they monitor fuel consumption by cost centre. Considering that KCM produced about 150kt of copper in 2013/2014, the GHG emissions are about 1tCO2/1 tonne copper produced.

Coal production is about 150,000 tonnes and will increase to 2 million per year. In terms of fugitive emissions, the emissions would be insignificant at 0.100 ktCO_2 eq to 14ktCO_2 eq as only 6.9kg CO2 eq is emitted per each tonne mined.

Working on the estimated copper production for 2015, the GHG emissions from copper production in Zambia would be in the region of 1million t CO_2 eq and can be around 1.5 million tonnes of CO_2 eq by 2018 or remain the same or even lower going by World Bank projected growth of the sector.

⁶¹ KCM Interviews



⁵⁸ First Quantum Env Manager- Head Office Johannesburg

⁵⁹ First Quantum Sustainability Report 2012/13

⁶⁰ Assuming about 1tCO2 eq per tonne of copper mined

The key finding is that the Zambia Mining sector is not a significant GHG emitter. Particularly when compared to the Agriculture, Forestry and Other Land Use sector. This is in part explained by the Mining Sectors use of hydropower for its energy intensive operations. The direct emissions are largely from consumption of diesel and if the mining companies intend to reduce emissions, diesel sources will have to be targeted.

The large mining companies are accounting for their GHG emissions to their head offices and to the Carbon Disclosure Project and GRI but it is not clear whether determination of the GHG emissions is standard across the companies. There is an important element that for national GHG Inventories, GHG emissions are spread across IPCC sectors and do not present life cycle analysis emissions of the mining sector. For instance energy consumption e.g. from diesel would be accounted for under Energy sector and only fugitive (e.g. coal) can be isolated. Process related emissions in EI sector would be presented under mineral /metal production.

It is not possible to compare GHG emissions being produced by the mining companies with those produced for National Communications by UNFCCC Focal Points, because the presentation and dates of the emissions are different. For instance, the GHG emission Inventory for Zambia currently I is for 2nd National Communication and was for years 2000-2004 (although published in 2014). The reason is lack of availability of complete data for recent years. The energy balance is an important source of information that would have been able to capture all the diesel/heavy fuel used by the mining sector-even from exploration to processing, but national energy balances in the study countries are old<2010 and incomplete.

What is important for the future is that Zambia will be introducing coal power station to meet electricity demand in its economy including in the mining sector. The first 300MW will be available in 2016 and will change the GHG inventory of the mining companies. Mining companies that are moving away from using diesel equipment to electricity for mining equipment may not improve on their emissions when the national electricity grid has a significant share of fossil based power. This will best be answered when the grid emission factor is known. For designing any future GHG reduction mechanism, appropriate accounting of GHG emissions for the El sector at both national and corporate level will be imperative.

II. Oil and Gas GHG Emissions

There are no GHG emissions known from the Oil/Gas sector although fuel is being used for the exploration activities. Such figures can only be obtained from the oil/gas exploration companies themselves and there was no opportunity to meet any of them. If an updated energy balance existed these would have been estimated. It is also possible that the Department of Energy is not capturing in detail such fuel consumptions. The source that may be included here is the Indeni Oil Refinery operations in Ndola that refines imported crude oil.

B. GHG Abatement Measures

Although GHG emissions are not significant for Zambia, companies are making efforts to reduce power up to 10-15% of consumption through energy efficiency. These measures are also being encouraged by the Chamber of Mines that collaborates with the utilities (ZESCO, CEC) and the Energy Regulatory Board to support energy efficiency initiatives. ZESCO moves around sectors and performs energy audits at mines to determine opportunities for abetment measures⁶².

⁶² Department of Energy Interview



The Climate Change policy being finalized targets mining companies to include cleaner production measures, energy efficiency, and advises companies to switch from diesel fuel to hydroelectric power for mining equipment. There is already a national Climate Change Response Strategy whose objective is to promote cleaner production and energy efficiency. To address the issue of high prices of diesel and the unavailability of hydropower, the Ministry of Natural Resources is encouraging use of renewable energy, biomass and energy conservation efforts⁶³

The UNFCCC Focal Point has been promoting clean development mechanisms and one of the large copper mines, KCM submitted a proposal to the UNFCCC Focal Point for endorsement but did not go far because of the current carbon market prices that are low. The Focal Point has also brought the mining companies together to discuss renewable energy, energy conservation and Clean Development Mechanisms (e.g. KCM)⁶⁴. There have been no CDM proposals from other large copper corporations but there have been energy efficiency practices and contributions to forest management and other CSR initiatives. Mining companies can mobilise resources for Intended National Determined Contribution (INDC) e.g. under Private sector window of the Green Climate Fund. The INDC was being developed during the Scoping study. The Draft Reports were still to be validated and could not be shared but the major objectives are on Energy Efficiency, Sustainable Agriculture and Sustainable Charcoal Production⁶⁵.

Zambia is also developing Nationally Appropriate Mitigation Actions (NAMAs) that are focusing on sustainable agriculture, small hydropower, integrated waste management and sustainable charcoal production⁶⁶. Of relevance to the EI Sector from both INDC and NAMAs would be energy efficiency and the small hydropower alleviating the power shortage from the large hydropower dams. Both can also reduce anticipated increased GHG emissions from fossil-based power.

There are some good projects already underway at corporation level that can result in **GHG** abatement e.g. LaFarge Cement has come up with a technology to replace coal with sawdust as a CDM project although the project is not yet registered⁶⁷. The Energy Department chairs the CDM Board and indicated that only two registered CDM projects have been registered for the country and none for the mining sector.

Barrack has its diesel trucks go up ramp to attach to electricity in some operations hence avoiding the high diesel prices and also GHG emissions⁶⁸. The company also uses conveyor belt instead of trucks for 78km from crusher to milling plant to try to bring costs and emissions down. KCM has made efforts to reduce its energy demand by 13%. KCM indicated that it voluntarily reduced its power demand from 270MW in 2010 to 230MW in 2014 and 206MW in 2015. The company can determine how efficient each machine is. On the input side, there is an effort to consume less energy through energy efficiency and to focus on renewable energy efforts⁶⁹

With ZESCO having reduced power supply by 30% to the mines, KCM indicated that it was looking at **solar sources** that could supply 100 MW as an alternative power source. The power shortage has prompted the Zambia Development Agency to attract investors for

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⁶³ **UNFCCC Focal Point interviews** ibid

⁶⁴

⁶⁵ **UNFCCC Focal Point interview** 66

Final Proposal September 2014 67

African Carbon Credit Exchange 68

Barrick Interviews 69 KCM interview

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renewable energy, particularly solar and there has been interest from international suppliers e.g. Winch Energy to invest in large solar PV plant (about 400MW).

The Department of Energy is also promoting investment in solar, geothermal, biomass, wind, with solar being the most promising. There is a **bidding Tariff Policy** for such renewable energy projects that is going through approval process by cabinet. Meanwhile there are efforts underway to attract private sector into the power supply area through Authorization letters while the REFIT policy is being approved. Apart from the focus on power, all the **large companies practice reforestation** programmes to re-vegetate land cleared for mining operations and the initiatives is extended to communities as part of the CSR. Reforestation acts as both a mitigation and adaptation option in that it acts as a carbon sink and also rehabilitates the cleared forests/woodlands areas. On regulation of GHG emissions, **Standards for emission control** are in the Regulations that can be built on the foundation of addressing emission from smelters⁷⁰.

3.2.2 Malawi-GHG Emissions and Abatement Measures

A. GHG Emissions

I. Mining Sector

Malawi extractive sector is very small in terms of overall contribution to GHGs. Agriculture is the most significant contributor. The national GHG inventory includes emissions from fuels, coal, carbon (land clearing for pit construction, etc.), cement and fugitive emissions that are due to the mining sector. The 2nd National Communication for Malawi presents data for up to 2000 and for that year, the total national GHG emissions were about 23 million tCO₂ eq. but the mineral industry only contributed 0.06 million tonnes and fugitive emissions from coal was much less at approximately 680 tCO₂ eq. Even considering the fuel combustion (which will also include transport etc.), the emissions were 0.7 million tCO₂ eq. The Intended Nationally Determined Contribution report of 2015, mentions a total GHG inventory of 29 million tCO₂eq projected to reach 42million tCO₂eq by 2040⁷¹. Although the current largest source sector is the AFOLU, the largest sectoral increase is expected in the energy sector as new coal-based generation capacity by independent power producers (IPPs) comes on line to meet immediate energy deficits currently being experienced in Malawi.⁷²

Paladin, the largest mining corporation, computes its own GHG emissions and as part of Global Reporting Initiative (GRI) collects data and report on its GHG inventory yearly. Currently calculations of emissions are based on diesel consumption. Paladin (when operational⁷³) was using 100k litres of fuel per day while Globe Metals (niobium) will be using 200k litres per day for power when its mine starts operating. About 23 tankers daily will go between the port at Dar es Salaam and the mines and that will require accounting for the GHG emissions resulting from transportation of the fuel from the Port as well.

The cement plant is currently producing 650 tonnes/day and will increase to 1,200 tonnes/day of clinker cement and this translates to about $150ktCO_2eq^{74}$ now and will rise to about $290KtCO_2eq$ when the plant is expanded based on process CO_2 emissions. This excludes the trucks (transporting cement from plant to distribution depot 25km away) and the mining equipment that uses diesel fuel at the limestone quarry site. Currently Shayona hires

⁷² ibid

⁷⁴ Assumed 0.810tCO2e/tonne of cement produced



⁷⁰ ZEMA Interview and ZEMA Act, 2011/12

⁷¹ REPUBLIC OF MALAWI: INTENDED NATIONALLY DETERMINED CONTRIBUTION-2015

⁷³ Now under care and maintenance due to low uranium prices

10-15 trucks/day of 25-30 tonne capacity to transport cement to the depot and this will increase to about 35 trucks per day when the plant expansion is complete. The Cement plant is however supplied by hydropower and hence no GHG emissions result from grid power currently.

In the national Climate Change Investment Plan (2013-2018), Malawi indicated under Energy, the Lack of equipment and technical knowhow for estimation of GHGs from the Energy and Transport sectors; and low levels of adoption of alternative sources of energy. Since Mining GHG emissions are largely due to fuel combustion, addressing this capacity will be relevant for the mining sector as well.

B. GHG Abatement Measures

The current National Communication does not specify GHG mitigation measures specific to the mining sector although it mentions coal as a source of fugitive emissions and that transportation of coal to the demand centres would imply high transport emissions. In 2000, Malawi had not exposed its full potential for both mining and oil/gas, hence would not present any mitigation measures for the sector then.

The major mining operation at Kayelekera Uranium Mine is an energy intensive operation and in terms of GHG emissions, these are exacerbated by the use of diesel fired electricity sources. The main fuel for electricity, mining equipment and transport vehicles is diesel. In addition to that explosives are the other sources. The measure practiced at the mine is efficient lighting and conservation of electricity by switching off lights. This in turn reduces diesel consumption. When additional hydropower is introduced and the coal grid power becomes available, the mine has additional opportunities for both fuel switching and energy efficiency to reduce its GHG emissions. How much can be reduced will require determination of the resultant grid emission factor when new power sources are added.

The Government is diversifying from dependence on hydropower, and is considering geothermal, solar and wind sources and currently a World Bank project is mapping potential for geothermal for power generation. There is a solar farm at the airport that provides 800 kilowatt capacity. This was done through a grant from the Japanese to demonstrate functionality and the now cost-effectiveness of the solar technology.⁷⁵

Malawi was working on its INDC at time of visit but mining has not been identified as one of the priority sectors. The INDC priority sectors are agriculture/land use, forestry, energy and waste sectors is included⁷⁶. The NAMA for Malawi was under preparation and was still to be validated. The expected timing for release is October 2015. Malawi released the National Climate Change Investment Plan in 2013⁷⁷ and the intent to attract investment for REDD+ and energy saving is of relevance to the GHG measures. For REDD+, the investment is to increase areas under afforestation, reforestation and increase vegetation cover and that can benefit El companies that are practising forest management. Relevant aspects on energy savings relate to reduction of GHG emissions and reducing impact on energy development. CDM is promoted in Malawi but the only submission has been for cook stoves and none close to mining sector.

3.2.3 Mozambique- GHG Emissions and Abatement Measures

A. GHG Emissions

- 75 Department of Energy Interview
- ⁷⁶ UNFCCC Focal Point Interview

⁷⁷ National Climate Change Investment Plan 2013–2018, 2013



According to WRI latest data, Mozambique emitted 24.89 Mt $CO_{2 eq}$ in 2012 out of which 5.55 MtCO₂eq from energy sector and 0.80 MtCO₂eq by the industrial processes. Based on the last national GHG emission inventory Industrial processes were responsible for the emission of about 51.350 ktCO₂ and 7.110 kt of NMVOC. The CO₂ was emitted exclusively by the mineral's production industry.

In relation to the EI sector for Mozambique current important GHG sources are:

- fugitive CH4 emissions from coal mining and Oil & Gas, which are accounted for separately as fugitive emissions from the energy sector;
- CO2 emissions and PFC emissions from aluminum production from alumina, caused by the consumption of carbon anodes in the process.

The official GHG Inventory⁷⁸ is considered to have underestimated the contribution of El sector now to the national GHG inventory considering that there is a significant coal, oil/gas and aluminum industry operating in Mozambique. Considering that coal production was expected to reach 20 million tonnes in 2015 and 41.8 million tonnes by 2017, the GHG emissions due to fugitive emissions during mining will be 320ktCO₂eq in 2015 and 670tCO₂ eq by 2017⁷⁹. Most of coal is currently exported so there are no significant GHG emissions associated with coal combustion in the country at the moment.

Similarly, based on gas production in 2012 of 154billion cubic feet and a pipeline of 865km, and emission factors there would be more GHG emissions from the oil/gas subsector that are not yet accounted. Over 95% of the gas produced in 2012 was consumed in South Africa hence GHG emissions due to gas combustion will be accounted for in South Africa. The gas industry will expand by introducing LNG starting with 10 mtpa to 20 mtpa, then 50mtpa and the level of GHG emissions will significantly increase beyond the current level. More information is required to compute the GHG emissions e.g. how much of the gas is flared, vented and transported. In the absence of local emission factors, IPCC default values can still be applied.

Production of Aluminium in 2012 was 557000 tonnes⁸⁰ .Taking into consideration process GHG emissions of 1.87 tCO2eq/per tonne⁸¹ (excluding alumina refining), this could have resulted in 1 million tCO2eq. This estimate excludes the effect of grid based electricity. Mozal is based in Mozambique to benefit from cheap hydropower but Mozal has its supply from South Africa via Motraco line. This would incur additional GHG emissions but to account for that will require a grid emission factor associated with Motraco line.

The estimated GHG emissions for the EI sector currently would be about 1.5 million tonnes and is bound to increase with expected expansion on oil/gas subsector. There are considerable mining activities in Mozambique, but the energy consumption patterns in the industry are not available. Emissions reduction potentials, therefore, cannot be assessed, though in all probability there would be sizeable reduction options.

⁸¹ <u>http://aluminium.org.au/climate-change/smelting-greenhouse-performance-</u> PFCs, carbon inputs and fuels. PFC alone 0.4tCO2eq



⁷⁸ National GHG Inventories have used old data before the recent EI operations.

⁷⁹ 0.016tCO2eq/tonne of raw coal mined on average-

⁸⁰ Emissions Reduction Profile Mozambique. Unep Risoe 2013

B. GHG Abatement Measures

Mozambique participated in the CDM but only one project arrived to the registration (involves switching from coal to natural gas at the rotary kiln of a clinker manufacturing plant outside of Maputo, Mozambique. The project participants were the CIMPOR (Portuguese Cement Company) plant owner and Matola Gas Company (MGC)), thus highlighting bottlenecks in the project implementation. These bottlenecks are mainly due to the high registration costs e which limit the financial appealing of the initiative and the fluctuation on carbon prices which added uncertainties to project financial analysis. Furthermore, Mozambique has limited capacity to engage with carbon markets and some of the barriers identified include:

- Low awareness of CDM and emission reduction project opportunities;
- Lack of upfront financing for pre-investment studies of the emission reduction component (baseline and project elaboration, monitoring programme development);
- Low capacity to develop CDM and emission mitigation projects, with a limited number of professionals and institutions having an in-depth understanding of the CDM process.

Mozambique is willing to participate in the market mechanisms to be established under UNFCCC which would allow access to clean technologies in order to mitigate the emissions arising from exploiting, managing and using the natural capital that is available. In 2013, it was estimated that Mozal could implement mitigation measures, which aim to reduce emission potential of 282,000 tCO₂eq/year, although a more detailed investigation is required⁸². Based on the policy actions and programmes outlined within the INDC, the country estimates, on a preliminary basis, the total reduction of about 76.5 MtCO2eq in the period from 2020 to 2030, with 23.0 MtCO2eq by 2024 and 53.4 MtCO2eq from 2025 to 2030.

Extractive activities cover several industry sectors and reduction options related to energy efficiency, as well as change of processes and substitution of materials. Specifically in line with UNFCCC-CDM, the following emission reduction actions could be preliminarily considered as a base for the identification and assessment of the achievable reduction and related potential benefits:

- Abatement of methane from coal mines
- Capture and utilization or destruction of mine methane (excluding coal mines) or nonmine methane
- Methane capture and destruction in non-hydrocarbon mining activities
- Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities
- Leak reduction from a natural gas distribution grid by replacing old cast iron pipes or steel pipes without cathodic protection with polyethylene pipes
- Flare gas recovery in gas treating facilities
- Recovery and utilization of gas from oil fields that would otherwise be flared or vented
- Flare (or vent) reduction and utilization of gas from oil wells as a feedstock
- New grid connected power plants using permeate gas previously flared and/or vented
- Recovery of gas from oil wells that would otherwise be vented or flared and its delivery to specific end-users

⁸² Emissions Reduction Profile Mozambique. Unep Risoe 2013



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All these options have established methodologies under UNFCCC-CDM mechanism but may still require capacity to ensure that the methodologies are applicable to the mine or/and oil/gas situation in the study countries. National GHG inventories submitted to the UNFCCC use estimation, modelling, sectoral averaging or other top-down approaches for compiling emissions data in some given categories. While several categories of emissions from the extractive industry are recorded and reported separately to the UNFCCC, a number of others are not; specifically, according to the instructions on how to measure and report emissions in different sectors provided in the 2006 IPCC Guidelines for National GHG Inventories.

Categories of emissions from mining and oil & gas production which have specific guidelines and methodologies under the 2006 IPCC Guidelines for National GHG, include:

- CO2 and CH4 emissions from the production of iron and steel from iron ore;
- emissions from metallurgical coke production from coal;
- emissions from ferroalloy production from iron and one or more metals such as silicon, manganese, chromium, tungsten etc.

Categories of emissions from the mining and metals industry, which are not recorded separately in national GHG inventories, include emissions from:

- stationary combustion used during mining activities (which are typically included in the "energy" sector);
- emissions from mobile combustion used in the transport of ores and metals by sea, road and rail (which are included in the "transport" sector);
- emissions from electricity used for energy intensive processes, such as electrolytic smelting (which are included either in the "energy" sector if the plant is buying the electricity from the grid, or in the "industry" sector, if the plant produces its own electricity on-site).

3.3 Assessment of the Policy, Legal and Institutional Framework

All three countries have in place legislation, policies and institutional frameworks to address environmental and climate change. The degree to which the legislation and policies are observed and implemented and the capacity of the institutions mandated to oversee the legislative and policy framework vary. Mining companies across all three countries operate under similar legislative frameworks with both Zambia and Malawi in the process of redrafting their respective Acts while Mozambique has recently (2015) completed its 10-year strategic plan for the environment sector. The legislative framework also deals with issues relating to upstream activities in the oil and gas sector. Across all three countries there is legislation in place relating to environmental management with all countries having a Ministry that has responsibility for environmental protection and a regulator that is empowered to enforce all aspects of environmental management legislation. A particular feature in Zambia is a partially state-owned corporation that holds equity shares in all private sector mining operations. This corporation has a responsibility to address environmental legacy issues from older mines.

The climate change policy frameworks and measures exist and are in operation in all three countries. In Zambia, a new legal framework to address climate change issues is under development including a new climate change policy that will be followed by a climate change Act. In Malawi, the existing national environmental policy includes a section on climate change and clean air that has the intention to minimise the adverse impact of climate change and to reduce air pollution and greenhouse gas emissions. Malawi also is developing new climate change legislation. Mozambique adopted a 2013-2025 National Climate Change



Strategy in 2012. This strategy widened the government's approach to climate change in proposing actions that combine measures of adaptation and mitigation with the development of a low carbon economy.

Both environmental and climate change framework, legislation and policy areas can benefit greatly from coordinated and harmonised donor support in all three countries, particularly in support of the notion of "climate-proofing" policies across government and the building of the capacity of the institutions.

The specifics of each country in relation to environmental and climate change policies, legislation and frameworks are detailed below.

3.3.1 Zambia Environmental and Climate Change Framework

This section will outline the current policy, legal and institutional landscape with a focus on management of environmental impacts of mining in Zambia. The section also indicates where weaknesses or gaps exist for donor funding to support the strengthening of these areas. The mining sector in Zambia is administered by the Ministry of Mines, Energy and Water Development.⁸³ The Ministry of Commerce, Trade and Industry oversees the industrial manufacturing sector, including downstream activities of mining.⁸⁴

Mining companies now operate under a common legislative framework regulated primarily by the Mines and Mineral Development Act of 2008. A new draft Act was released in mid-2015. Uranium exploration and mining are regulated by the Mines and Minerals Development (Prospecting, Mining and Milling of Uranium Ores and Other Radioactive Mineral Ores) Regulations of 2008.

The Petroleum (exploration and production) Act of 2008 is the primary instrument to regulate upstream activities in the oil and gas sector. The primary regulator is the Minister of Mines, Energy and Water Development. He/she is responsible for issuing all petroleum rights noted under the provisions of the Act. The Minister's discretion is lessened by the requirement for other bodies to provide input into licensing decisions. *The government intends to revise the Petroleum (Exploration and Production) Act of 2008. Support is required incorporate international standards (IFC, etc.) and other best practise legislative examples in the revision.*

Where bids are submitted in the prescribed form, the Petroleum (Exploration and Production) (General) Regulations, 2011 require the Minister to cause an evaluation of the bids by the Petroleum Technical Committee within thirty days of receiving the bids.

Where a bid is successful, the Petroleum Act gives the successful bidder the discretion to apply to the Minister for a petroleum exploration license. Upon submission of an application, the Technical Committee would subsequently recommend the grant or refusal to grant a Licence to a bidder to the Petroleum Committee. The membership of the Petroleum Committee appears to be up to the discretion of the President, although the Committee is chaired by the principle regulatory, the Ministry of Mines, Energy and Water Development, and a position is held for the Reserve Bank Chairperson.⁸⁵ There is no indication that the regulator representing environmental management is included on the Committee and this should be corrected. Environmental provisions are included that relate to the safe handling

http://www.zambiaeiti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014
https://www.lusakatimes.com/2009/05/21/appointment-of-ministers-on-the-petroleum-committee-in-line-with-act/



⁸³ www.mewd.gov.zm

of equipment, storage and transportation related to processing or sale of petroleum products.⁸⁶

A. Environmental Management and Protection

While a number of government bodies regulating different aspects of the environment (land, water, etc.) have authority for environmental management issues, the most important responsibilities are shared between the Ministry of Lands, Natural Resources and Environmental Protection and the Ministry of Mines, Energy and Water Affairs.⁸⁷

Figure 3 Institutional arrangements for environmental management in Zambia



The Department of Environment and Natural Resources Management under the Ministry of Lands, Natural Resources and Environmental Protection has the mandate to develop policy related to environment, natural resources and pollution control (including emissions from GHG). This Department is the focal point for climate change and for all environmental management matters in Zambia. It also has oversight responsibility for the Zambia Environmental Management Agency.⁸⁸

ZEMA is the central environmental regulator in Zambia empowered to enforce all aspects of environmental management legislation.

An important actor regarding mines in Zambia is the partially state-owned (87, 6%) corporation ZCCM – Investment Holdings Plc. This company holds state equity shares of all private sector mines. The company also has the responsibility to address environmental legacy issues from the older mines previously under its ownership. In 2014, the environmental department within ZCCM-Investments Holdings has been transformed into a



⁸⁶ http://www.zambialii.org/zm/legislation/consolidated-act/435

⁸⁷ www.ministryoflands.gov.zm

⁸⁸ www.zema.org.zm

fully owned subsidiary with the name Misenge Environmental and Technical Services Ltd (METS).⁸⁹

In 1990 the Environmental Protection and Pollution Control Act (EPPCA) was passed. It established the Environmental Council of Zambia. In 2011 this was replaced by the Environmental Management Act and the introduction of the Zambian Environmental Management Authority. Capacity in ZEMA is limited in that it only has offices in four areas of the country – it cannot cover the whole country with the present level of resources (Lusaka, Livingstone, Chirundu, Ndola). Additional resources and capacity are required by ZEMA for adequate monitoring and enforcement covering all the areas of the country. Many stakeholders interviewed during the course of this study noted that the resources of ZEMA could not be expected to provide adequate monitoring and control of companies' environmental performance, including reporting and follow up of GHG emissions.

Focus is at borders due to the transport of hazardous materials/chemicals. For mining, the ZEMA entry point is the EIA/ESMP requirement. A mining license is awarded and then an EIA follows. The EIA considers mining impacts on land, water, air, soil, wildlife, fisheries, land quality, and fauna. An EIA is required when a bankable feasibility report has been submitted and the company is applying for a mining license. There have been issues around the allowing of exploration in national parks. For example, a copper development in the Zambezi did not receive an approved EIA and mining development was halted (at an advanced stage) due to concerns around the impact of the project on wildlife in the Lower Zambezi area.

As a result of this case, new legislation described below, has been proposed. ⁹⁰ It remains to be seen, however, whether such legislation will address the difficult issue and conflict between EI sector development and eco-tourism.

I. <u>Environmental Management Act, 2011</u>: The Act is based on a number of best practise principles including the precautionary principle, the polluter pays principle, public participation and a sustainable development approach to development of non-renewable resources.

II. <u>Environmental Regulations:</u>

Regulations are still being drafted to bring effect to the 2011 Act. The old regulations (attached to the EPPCA) are still in force, as are regulations from some other pieces of legislation including the following:⁹¹

- The Waste Management Regulations, 1993
- The Water Pollution Control Regulations (1993).
- The Pesticides and Toxic Substances Regulations (1994).
- The Air Pollution Control Regulations (SI 142 of 1996)
- The Environmental Impact Assessment Regulations (SI 28 of 1997)
- The Hazardous Waste Management Regulations (SI of 2001).

Support is required for the development of new regulations, especially those attached to the 2011 Environmental Management Act. The Act provides for international best practise in terms of guiding principles to prevent and control pollution, but without accompanying regulations, these new principles cannot be put into force.

⁹¹ http://resource.sgu.se/produkter/sgurapp/s1422-rapport.pdf



⁸⁹ www.zccm-ih.com.zm/).

⁹⁰ Interview with ZEMA Acting Director, August 28, Lusaka

Wildlife management in Zambia falls under the authority of the Zambia Wildlife Act, 1998. As noted above (with regard to the copper mining prospect in the lower Zambezi that was halted by the Zambia Wildlife Authority) exploration of mineral resources is not forbidden in national parks. The Act specifies that exploitation of mineral resources is not allowed if it will cause large environmental impacts. However, there has been a degree of discretion involved in this determination and due to the issue of the copper mine being allowed to advance considerably in the lower Zambezi before its EIA was rejected, the ZWA is being amended.⁹² As noted above, the **government needs to adopt an across government policy regarding land use** (i.e. different types of land use such as EI sector development or game reserves/national park preservation). An integrated land use plan that is debated and the subject of multi-stakeholder discussions is needed to address these types of conflicts. The start of such process could be a National Forum that would address all environmental aspects of mining in Zambia.

III. Mines and Minerals Development Act, 2008

Environmentally oriented regulations related to mines and minerals can be found in the Mines and Minerals Development Act, 2008. The relevant section is included in PART IX SAFETY, HEALTH AND ENVIRONMENTAL PROTECTION. This section specifies the need consider environmental and human wealth in the granting of mineral rights or mineral processing licences. It notes the requirement to conserve and protect air, water, flora, fauna, fish, scenic attractions and cultural, architectural, historical or geological interests.

This section specifies that the Director of the Geological Survey (the authority that grants licenses on behalf of the Ministry) may specify that environmental impact studies are undertaken, in consultation with ZEMA. It would appear that while the legal framework for mine development has a conditional requirement for EIAs, stronger legislation in this regard is provided by the Environment Act of 2011 (where EIAs are clearly required). **The two Acts should be harmonised and follow the same approach to EIAs for mining projects.**

IV. <u>Relevant Regulations</u>

Two major provisions are related that concern management of pollution from mining activities. One is the Mines and Minerals Environmental Regulations, 1997 that provides the framework for conducting and reviewing environmental impact assessments for the mining sector as well as regulations for auditing project implementation. The second is the Mines and Minerals Environmental Protection Fund Regulations (SI 102 of 1998) which provides the mechanism of setting up and operating an Environmental Protection Fund.

In terms of the Environmental Protection fund, the developer's contribution is based on financial performance of the mine and the previous year's contributions.⁹³ The Fund is primarily to focus on reclamation of orphaned mine sites in the country, but mainly in the copper belt areas. The management and conditions of this Fund has been under discussion at the Chamber of Mines. It appears that governance (currently with the Mines Health and Safety office in Kitwe) of the Fund may benefit from a review and improvement. The use of the Fund has also been questioned (by some stakeholders during fieldwork). *More research into this mechanism is needed, and this topic could also be included in a National Forum on Mining, Climate Change and the Environment, or some such title.*

B. Climate Change Policy Framework

Future regulatory mechanisms that were uncovered during the course of the Zambia field work concerns management of GHG emissions. A new legal framework to address climate change issues includes the development of a new **climate change policy** that is to be

⁹³ http://www.zambiaeiti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014



⁹² Interview with ZEMA A/Director, Lusaka, August 28,

followed by a **new Climate Change Act.** The intention is to mainstream climate change requirements throughout government structures from the national level, down to the regional and local levels of government.⁹⁴

According to the National Focal Point, companies are not legally required to provide GHG data yet. There may be a Statutory Instrument (SI) as a result of the National Climate Change Policy to require data is provided. In terms of National Communication Plan and the INDICE – have complied with mitigation and now must do so for adaptation. The government has three major objectives in terms of climate change mitigation and adaptation: Energy Efficiency/Sustainable Agriculture/Sustainable Charcoal Production.

Throughout the course of the fieldwork, it appeared as though consultations with the mining sector on this new regulatory framework to address climate change impacts either were not undertaken or were in any event, not well attended. Industry is concerned that the process of developing this new legal framework reflects the government's weak approach to stakeholder engagement for any public policy or Act, as cited in the political economy issues section of this Chapter. There is a fear that additional regulatory burden will be placed on the mining industry at a time of increasing costs and lower commodity prices. *This process needs to be managed with better communication channels developed between government and industry*. Again, this could be a topic for National Forum as mentioned above.

I. <u>Environmental Impact Assessments</u>

Before a developer may proceed with plans to develop a mining project, they must receive a written authorization from Zambia Environmental Management Agency (ZEMA). The authorization can only be made after the developer has gone through the Environmental Impact Assessment (EIA) process. In Zambia, mining activities are always considered having a large impact on the environment and a mine developer is required to prepare a "full EIA" which is referred to as an Environmental Impact Statement (EIS).

Oversight of the implementation of the Environmental Management Plan that is part of the EIA process falls under the Mines Ministry Director of Mine Health and Safety in conjunction with ZEMA.

Issues that were raised during the fieldwork for this part of the Study related to the capacity of the ZEMA at various stages of the EIA/EMP processes. Firstly, there were often significant delays in approval of EIAs, and secondly, the ZEMA were not able to monitor implementation of the company EIA/EMPs adequately. Often, ZEMA lacked technical capability in some of the more junior officers of the organisation, and in other cases, it appeared as though there were not sufficient numbers of staff. Resources such as fuel or vehicles, payment for overnight accommodation during site visits, and equipment to carry out monitoring activities appeared to be lacking.⁹⁵ As noted earlier, support is required aimed at increasing ZEMA's technical capacity is needed.

II. <u>Environmental Permitting</u>

ZEMA is currently attempting to rationalise the permitting process for mining operations. As many as 30 permits are required within the current regulatory system. The ones most pertinent to this study include the following:

• Air Pollution Monitoring Permits

⁹⁵ Meetings with three of the big four mining companies, as well as with the ZCCM-IH environmental services company, METS, Lusaka, August 26-28.



⁹⁴ Interview with National Focal Point, August

- Water Effluent Discharge Licenses
- Water Abstraction Licenses
- Pesticides and Toxic Substances Licenses
- Waste Management Licenses
- Building Permits

The water discharge and air pollution standards generally follow the Zambian Effluent Statutory Limits. The developer must report quarterly to ZEMA on its air pollution monitoring, and biannual reports on quantity and quality effluent discharge to water. ZEMA does follow up, particularly when there are irregularities in the data⁹⁶. However according to interviews with mining companies during field work undertaken, the visits from ZEMA are infrequent. The standards related to this aspect of pollution control are included in the Table below:

Air emission (mg/Nm ³)		Water effluent dischar	Water effluent discharge (mg/l)	
Sulphur dioxide	1 000	Suspended solids	100	
Arsenic	0,5	Arsenic, total	0,5	
Cadmium	0,05	Cadmium, total	0,5	
Copper	1	Copper, total	1,5	
Lead	0,2	Lead, total	0,5	
Mercury	0,05	Mercury, total	0,002	
PM10 Smelters	50	Iron, total	2	
PM10 Other	50	pH	6–9 units	

Table 3 Zambian Statutory Effluence Limits⁹⁷

3.3.2 Malawi Environmental and Climate Change Framework

This section will review the current policy, legal and institutional framework that exists to support environmental management of EI sector impacts and mitigation strategies. The section will include the relevant environmental aspects of EI sector legislation, as well as the overarching national environmental policy and legal authority. Specific reference to climate change will be included.

Government has been focused on diversifying the economy away from agriculture to address the over-reliance of the economy on this sector. The Malawi Growth and Development Strategy (2011-2016) (MGDS) and the Economic Recovery Plan 2012 (ERP) have identified mining as one of the priority sectors; and in 2013 Government adopted a Mines and Mineral Policy which highlights the importance of mining to the future growth of the economy and outlines strategies for ensuring the development of the sector.⁹⁸ This policy has led to a new draft amended mining legislation that was released for public comment early in 2015. More on these legislative instruments will be discussed in this section.

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http://www.cepa.org.mw/documents/legislation/Mining/POLICY%20AUDIT%20AND%20INSTITUTIONAL%20AN ALYSIS%20REPORT%20FOR%20MINING%20IN%20MALAWI.pdf



⁹⁶ Interview with ZEMA Z/Director, Lusaka, August 28

⁹⁷ http://resource.sgu.se/produkter/sgurapp/s1422-rapport.pdf

A. Environmental Management and Protection

I. <u>Mining</u>

a) Mines and Minerals Act, 1981

This law set out the requirements related to the exploration and exploitation of minerals including the agencies responsible for oversight, the royalties applied to minerals, and the protection of the environment.⁹⁹ It has been in force since it was promulgated and has not been amended until very recently.

b) Mines and Mineral Policy 2013

The policy notes the following issues with regard to environmental management of environmental impacts of mining: Mining activities cause environmental degradation; need to ensure compliances with the Environmental Management Plan (EMP) during mining and decommissioning; and compliance with international standards in Occupational Health and Safety.

Hence, the policy statement commits government to ensure that companies employ sustainable mining practises in keeping with international standards. The new Draft Amended Mines and Minerals Act, 2015 has followed the spirit of the policy, and goes further in terms of addressing the needs and aspirations of mining affected stakeholders.

c) Draft Amended Mines and Minerals Act 2015

The Mines and Minerals Act of 1981 is being replaced by a substantially amended Act. A draft of this Bill has been released for comment and it is expected that it will be passed by the end of 2015. Underpinning the government's handling of the Mineral Development Agreement negotiations with Palladin and with Globe Metals and Mining (that has led to much of civil society's criticism and issues related to CSR investment) has been an outdated regulatory regime.¹⁰⁰ ActionAid's criticism of the fiscal terms negotiated for Paladin referenced the absence of a good regulatory regime that would specify terms and conditions related to a mining project, thereby lessening the requirement for a negotiated agreement.

The draft includes a much more developed environmental management and CSR component than previously. New provisions include requirements related to mine closure, financial assurances for rehabilitation and the right of the Minerals Commissioner to issue mining specific environmental protection guidelines. A Mineral Resources Board is established with government representation from the environmentally oriented Ministries, including that in charge of parks and wildlife and forestry. Decision-making on mining licenses therefore takes into consideration all environmentally and socially related aspects.

The Act also strengthens consultation requirements for exploration and mining companies and consideration of community interests throughout the mining lifecycle. It is a solid Bill that complies with best international practise.

Importantly, the new legislation sets out a framework that will reduce the need for individually negotiated Mineral Development Agreements between government and mining companies. All mining companies will be subject to the same publicly available law and the issues plaguing both Palladin and Globe Metals and Minerals regarding controversy over their MDAs will no longer be problematic. This transparency should address some civil society concerns around secret negotiations taking place between government and industry without due process or disclosure being followed.

 ⁹⁹ http://www.resourcegovernance.org/training/resource_center/malawi-mines-and-minerals-act-1981
¹⁰⁰ http://tilitonsefund.org/wp-content/uploads/2013/05/Final-report_mining_Tilitonse-_2_.pdf



The principles and spirit of this new mining Bill should be used as a model for the revision of the Petroleum Act and indeed any other resource extraction related legislation. It was drafted by one of the world's best mineral lawyers who follows sustainable development standards set by the World Bank and IFC.

Regulations are required to bring specificity to the new Act and support is required to ensure that *the regulations are based on best international practise and address issues related to the development of responsible mining.* An outreach communications/awareness building "road show" could be launched when the Bill has been passed to ensure that communities and civil society are aware of the new provisions particularly related to community rights/consultation and other aspects of CSR, including environmental management, in the legislation.

II. Oil and Gas

I. Petroleum Exploration and Development Act, 1983

The Act specifies a significant degree of political discretion in the development of these resources. As noted earlier in this report, the entire property in, and control over, petroleum in land in Malawi is vested in the Life President on behalf of the people of Malawi.

The Act includes regulations on environmental protection and specifies safe work practises.¹⁰¹Consideration of granting of a license must take into account conservation and protection of natural resources in or on the land over which the license is sought. It is interesting that this does not take into account exploration on a water base such as Lake Malawi. Again, as in the mining legislation, EIAs are only required at the discretion of the Minister.

There is an urgent need for this legislation to be updated and focus should be addressing weaknesses related to, among others: concentration of power vested in the President's office, not the State (best practise); removing the discretionary aspect of the EIA requirement; and requiring financial assurances for environmental damage (that must be reviewed and updated regularly).

The review of this legislation is particularly important in light of the potential for oil and gas development on Lake Malawi. Specific legislation or regulations related to the extraction of oil and gas in a marine environment should be developed, and best practise guidance from other countries and international standards (IFC, etc.), should be the basis of this legislation.

Given the impacts of EI resource extraction, it is important to ensure that the legislation around minerals, petroleum and other natural resources such as land, forests, water, fisheries and wildlife need to be harmonized. Government should ensure that policies and legislation covering all these areas should be consistent and reflect the values of the people of Malawi. *On the part of government, and perhaps through the coordination of the Chamber of Mines and Energy, an Extractive Industry Charter could be drafted and supported by members of the Chamber.* It would provide guidelines on all aspects of sustainable development of the EI sector, taking into account sustainable use and management of these resources.¹⁰²

http://www.cepa.org.mw/documents/legislation/Mining/POLICY%20AUDIT%20AND%20INSTITUTIONAL%20AN ALYSIS%20REPORT%20FOR%20MINING%20IN%20MALAWI.pdf



¹⁰¹ Part V: Protection of the Environment and Work Practises, Petroleum Act, 1983

¹⁰²

Malawi EITI¹⁰³ П.

The process of becoming an EITI Candidate country has been lengthy as advance work commenced about four years ago. Malawi should be accepted as a candidate country by the end of 2015. The government has announced its commitment and the Secretariat has been set up.

EITI is now a platform for all stakeholder groups to debate mining issues. The SE noted that there is a need to develop an EITI policy/law to ensure compliance and that this is being worked on currently. A legal impediments study is being conducted. Presently, in the absence of this framework, MOUs are signed between companies and EITI. In addition, there is no national local content policy; however, the 2013 Standard does require company reporting on expenditures related to socio-economic development. There is scope to include reporting on environmental management -- this might be included in the ToRs and support is required for the development of an EITI Act. A Local Content Policy would help to ensure best international mining practises in these areas of disclosure and local economic development, respectively.

III. Stand-Alone Environmental Management Legislation

i. Environmental Management Act, 1996: The Act was created to make provision for the protection and management of the environment and the conservation and sustainable utilization of natural resources. Given the many changes in environmental management taking place on the international scene, including the development and updating of many modern environmental standards, processes and safeguards, it is suggested that the environmental management framework be updated and harmonised with other key legislation that also contains environmental provisions.

It is particularly important to establish a strong environmental management framework in light of potential oil and gas development both offshore and under Lake Malawi, as it will be an important and sensitive environment to protect.

In addition, the environmental impacts of uranium mining are also especially sensitive and require a sound environmental framework (including aspects related specifically to uranium waste disposal) to ensure that EI sector development proceeds in a responsible manner. These legislative changes should help to address current civil society and community concerns, in some measure.

The government should consider introducing a Minerals Development Fund to include provision for environmental disasters, clean up of abandoned mines, and to mitigate negative social impacts from mining. Such a Fund could be supported by industry, government and the international donor community.

ii. Key points relevant to El sector environmental management include: Environmental Standards104: The Minister may, on the advice of the council, prescribe environmental quality standards generally and, in particular, for air, water, soil, noise, vibrations, radiation, effluent and solid waste. The Minister may prescribe different environmental quality standards to apply in different areas of Malawi with respect to different segments of the environment and the

Environmental Management Act, 1996, Part VI, 30



¹⁰³ Information for this section was obtained through an interview with the MEITI SE located in the Ministry of Finance, Planning and Economic Development, September 26 2015. 104

Minister may, from time to time, vary such standards. It would be preferable to state definitively the type of environmental standards the country will adopt to manage environmental impacts of project development. The discretionary element listed in the current legislation should be removed so that the application of standards is obligatory.

- *iii. Waste Disposal*¹⁰⁵: Requirements to control the handling, storage, transportation, classification, importation, exportation and destruction of waste; and to monitor any waste disposal site and direct the control of any such site if its continued use as a waste disposal site constitutes or is likely to constitute a hazard to the health of the people living in the vicinity of, or to the environment adjacent to, the site.
- *iv. Protection of the ozone layer*. These legal provisions are included to manage adverse impacts on the ozone layer.
- v. Pollution Control: 106

This section prohibits the discharge of pollution unless according to these legal provisions. The pollutant is required to clean up, remove or dispose of the pollutant according to the manner directed by the Minister. The discharge of effluence, gas or any gaseous substances into the environment is only permissible under a license issued by the Minister subject to conditions according to the Minister.

vi. **EIA/EMP**: The Environmental Impact Assessment is probably the most important mechanism to ensure that potential environmental and social impacts caused by mining activity are identified early on and mitigation strategies are in place to address these impacts. In Malawi, EIAs are required when projects are deemed to have a significant adverse effect on the environment. Since the new draft mineral legislation requires significantly more environmental attention in this regard, there should efforts to harmonise the Environment, amended Mining and Petroleum legislation to ensure consistency and to avoid duplication. Donor support could be offered in this regard.

While the Act specifies that an EIA must be carried for projects deemed by the Minister to require such an assessment, here is no requirement for baseline environmental or social studies, nor is there reference to social impacts in this section. While there is reference to an Environmental Fund in the Act, there are no requirements for companies to post closure bonds, or the use of any other financial reclamation instruments. A technical Committee is called for to assess EIAs and to monitor the progress of mitigation plans. There is no requirement or conditions laid out for a mine closure plan. The only opportunity for public participation in mining development issues is in case where an environmental impact assessment (EIA) is taken for public hearing under the Environment Management Act 1996 (EMA). But the requirement for public hearing to review EIA reports is not mandatory under the EMA.

vii. New EIA Guidelines are currently being prepared to take into account issues that have gained relevance since the drafting of this Act. These include climate change impacts, human health impacts, disease control (HIV/Aids,

¹⁰⁶ Environmental Management Act, 1996, Part VIII, 42



¹⁰⁵ As above,37-39

malaria, other water borne diseases, etc.), social protection, vulnerable peoples, and community development. *Support is needed to ensure that these guidelines provide for specific environmental issues related to El sector development mentioned above.* Specifically, the EIA regulations should require that developers consider their carbon footprints and include mitigation strategies to address these. CSR projects should be subject to climate change mainstreaming.

viii. EIA Guidelines for the EI Sector: Guidelines specific to the mining were developed in 2001 and have not been updated since that time. These should be reviewed in terms of their applicability to current mining projects -- in keeping with new uranium mining, as well as the larger-scale projects in development (niobium and rare earth). There is also need to ensure that EIA guidelines are sufficiently specific to address development of the oil and gas sector. Such sector specific guidelines would complement those governing the overarching EIA/EMP process but include issues that are of concern regarding EI sector development. There are examples of these in other mining jurisdictions.

ix. National Environmental Policy, 2004

In the preface to the NEP, government notes that many sectoral environment and natural resources policies and legislation have been adopted and enacted since 1996 when the Environmental Management Act was promulgated. It was recognised that various gaps in policy, conflicts and duplication within the government's legislative framework have adversely affected effective implementation of the environmental management framework. In addition, new national economic instruments and strategies have been developed and implemented that have significant impacts on environment and natural resource management. This policy should be used as a basis to update the current environmental legislation.

The EMA also provides for environmental auditing of existing operations; as well as preparation of an environmental management plan to cater for mitigation measures to address adverse effects. The key challenge however remains that of implementation due largely to capacity constraints both in terms of human and financial resources on the part of Government. It is important that a reasonable portion of mineral revenues be dedicated to building monitoring capacity.

It is recommended that a National Environmental Fund be established that could be available for capacity building and training related to community and CSO support for environmental monitoring and supported by donors.

B. Climate Change Policy Framework

Importantly, the existing national environmental policy includes a section on **Climate Change/Clean Air.** The objective of this element of the policy is to minimize the adverse impact of climate change and variability to reduce air pollution and greenhouse gas emissions.

The following strategies are outline to accomplish the policy objectives:

• Develop a database on air pollution through the establishment of a sound air quality monitoring system.



- Develop and promote alternative energy sources to fuel wood and technologies in order to reduce the use of fuel wood and enhance carbon sinks.
- Enact a Clean Air Act.
- Develop and enforce regulations regarding air emissions.
- Strengthen the existing national climate/meteorological database and monitoring networks.
- Assess and monitor the potential impact of climate change on the functioning of ecosystems, vegetation patterns and net carbon sinks.
- Use climate data to help guide land-use and economic development decisions.
- Promote adequate regional and international cooperation for the effective exchanges of climate information and control of trans-boundary atmospheric air pollution.
- Reduce gas emissions from the transport sector, and the manufacturing industry.
- Maintain a National Ozone Protection Unit in order to promote use of ozone friendly technologies.
- Enact appropriate legislation to support the mandate of the National Ozone Protection Unit.
- Conduct awareness campaigns on the dangers of uncontrolled bush fires and its management in accordance with the Climate Change

The strategies listed above could form the basis of a donor support programme to realise these policy objectives related to climate change/clear air (and focused on the EI Sector)

Also relevant to this study is the national environmental policy element whose objective is to meet national energy needs with increased efficiency and environmental sustainability.

Guiding Principles include measures to encourage sustainable wood production, lessening reliance on petroleum products as source of energy, accelerating rural electrification and working toward safe and efficient use of local coal resources. The policy element also calls for alternative energy systems to be developed for rural and urban communities that reduce the production of charcoal. Private sector investment into the energy sector is to be promoted.

Strategies to accomplish these objectives include promotion of energy saving and renewable energy technologies as part of an overall objective to reduce reliance on non-renewable resources for energy. There is also a policy element dealing with Mining that supports the sustainable development of mineral resources with minimal impact on the environment.

I. New Climate Change Legislation

A new legislative framework to address climate change issues is being developed. A climate change policy is being completed and will go to Cabinet for approval in the near future. This is to be followed by the creation of a new Climate Change Act.

Many of the elements of the new Climate Change Policy as well as the development of a new Climate Change Act will require support.

Planning Efforts for Climate Change Mitigation/Adaptation

The Government of Malawi with support from its cooperating partners (Norway, DFID, UNDP and Japan) is implementing a comprehensive National Climate Change Programme¹⁰⁷ which aims at mainstreaming and addressing climate change issues in the national development agenda. The programme period is 2013 – 2016.

¹⁰⁷ http://nccpmw.org/index.php/national-climate-change-program



The Programme will enable the Government of Malawi to climate-proof the policies, strategies and plans of the sectors of the economy most directly affected by climate change, in order to create an enabling policy and regulatory environment within which vulnerable communities will be empowered to adapt to these challenges in harmony with the environment. Additional support could either enhance the current range of projects or extend the life of this programme.

C. Key Relevant Institutions

This section will briefly describe the key institutions responsible for environmental protection related to the development of the EI sector.

I. <u>President's Office</u>

The President's Office oversees all affairs of the nation. In terms of the President's role in the EI sector, the current, out-dated mining and petroleum resources legislation provides for a degree of discretion within the President's office that does not reflect modern EI sector legislation. This aspect is being corrected in the amended mining legislation and it is required to be adjusted for petroleum legislation.

II. The Ministry of Natural Resources, Energy and Mining

The Ministry of Natural Resources, Energy and Environment is mandated to provide policy guidance and direction on all matters concerning Malawi's natural resources, energy, and environmental management. The National Climate Change programme is being coordinated by the Environmental Affairs Department in the Ministry of Natural Resources, Energy and Mining (MoNREM). The Ministry of Natural Resources, Energy and Mining is the Lead Coordinating Partner, assuming overall responsibility and accountability of the programme. The Department of Environment Affairs is responsible for facilitating and regulating the EIA process, assisting line agencies on developing and updating of guidelines on EIA practice and maintaining central records of EIA reports.. Under this Department, there is a Technical Committee that is responsible for evaluating EIAs (among other related duties). This Committee reports to the National Council for the Environment. The National Council for the Environment is responsible for advising the Minister on all matters and issues affecting the protection and management of the environment and the conservation and sustainable utilisation of natural resources.¹⁰⁸

During the course of the field work, it was noted that the **capacity of officials** involved at both levels, but particularly **at the technical level of these environmental committees requires** *capacity building and institutional strengthening*.

A number of stakeholder interviews noted the need for additional capacity in the environmental affairs and climate change offices. Additional training and equipment are needed to assist in the monitoring of environmental impacts, including GHG emissions. The interview with the Energy Department Director, indicated the need for resources to update the country's energy balance information that has never been updated in more than 5 years.

The Climate Change office requires additional staff, possibly on secondment from other Ministries to take on short term assignments in the UNFCCC Focal Point office. This short term in and out staffing approach would help to inculcate a culture of mainstreaming climate change across government. Job security provisions are required to ensure seconded individuals have a permanent job in their home ministry to return to.

¹⁰⁸ http://www.saiea.com/dbsa_book/malawi.pdf



III. Ministry of Finance, Planning and Economic Development

The Ministry of Finance, Planning and Economic Development's Economic Affairs Division ¹⁰⁹ is responsible for, among other duties, development of national development plans. It is responsible for ensuring that policy advice is targeted at achieving the strategic objectives as spelled out in the Malawi Growth and Development Strategy (MGDS) namely creating wealth through sustainable economic growth and infrastructure development as means of achieving poverty reduction. The MDGS aims to mainstream climate change throughout all government ministries, departments and programmes. The EI sector has not been included in the country's national planning processes to date but intends to include mining in the next National Growth and Development plan that will be drafted in 2016. *Support to governments will be needed to mainstream plans and strategies relevant to the EI Sector.*

3.3.3 Mozambique Environmental and Climate Change Framework

A. Environmental Management and Protection

The current Constitution of the Republic of Mozambique was adopted on 3 January 2005.tThe Constitution addresses matters relating to environment and quality of life and the right to live in a balanced environment, and the duty of defending it. The onus resides with the State and the municipal authorities in the collaboration of associations for environmental protection, to adopt policies for the defense of the environment and oversight for the rational utilization of all natural resources.

The responsibility resides in the State to promote initiatives f to ensure the ecological balance and the conservation and preservation of the environment aiming at the improvement of citizen's life quality by the adoption of policies aimed at:

- Preventing and controlling pollution and erosion;
- Integrate environmental objectives in sectoral policies;
- Promoting the integration of environmental values in educational policies and programs;
- Ensuring the rational utilization of natural resources while safeguarding their renovation capacity, ecological stability and the rights of future generations;
- Promoting land planning in order to have a correct localization of activities and a balanced socio-economic development."

The Ministry for the Coordination of Environmental Affairs (MICOA), created in 1994, is the competent authority in the environmental area and is the authority delegated to the management of the Fund for the Environment (Decree No. 39/2000 of October 17) with the aim of promoting the activities for the protection and management of the environment, also serving as a contingency fund in case of environmental accidents or damage. In this context, a key role in development activities related to environmental protection and spatial planning is played by the other central and local government agencies, including municipal; such as:

• The National Directorates for Environmental Impact Assessment (DNAIA), Planning (DNP) and Directorate of Infrastructure (DI) of the Ministry of Transport and Communications. competent by law to implement the duties of ministries, particularly regarding technical issues;



- The ministries responsible for electricity (Ministry of Energy), and civil works and engineering (Ministry of Public Works and Housing) through their mandate to grant the required authorizations.
- Municipal departments relevant for granting local level licenses and authorization for economic activities, land use and construction, abstraction and water supply networks and infrastructure.

The National Environmental Management Program was prepared by MICOA in 1996 with the following objectives:

- Set national priorities of environmental actions;
- Establish policy and strategy for environmental management;
- Promote intersectoral coordination;
- Prepare a comprehensive national concept of sustainability; and
- Promote and develop environmental awareness and culture of Mozambique.

The program provides guidance for environmental policy, including proposals for institutional strengthening, environmental legislation and environmental strategy, being up to MICOA its coordination and implementation.

The guiding principles for the actions of MICOA relevant to the Environment sector, is stated in the Environmental Strategic Plan 2005 - 2015, which established the vision of to "Lead the country in promoting a healthy environment, in achieving a high quality of life and a balanced social, environmental and economic development". Specifically, the Plan defines the role of the different actors to ensure their implementation, with the private sector being responsible to:

- Implement mitigation measures for negative impacts on the environment;
- Promote environmental enhancement measures in their area;
- Contribute with resources to the implementation of the actions outlined in the strategic plan;
- Advertise its environmental strategic plan;
- Sponsor compliance with the Millennium Development Goals advocated by the United Nations.

To achieve the above listed objectives, the Government of Mozambique has originated a comprehensive regulatory framework on environmental protection starting with the approval of the Environmental Policy, through Resolution No. 5/95 of August 3, which set forth the legal basis for the use and management of the environment in order to ensure sustainable development of the country, through the implementation of sustainable development and polluter-payer principles, public participation and promotion of cultural heritage, definition and application of evaluation impact assessment procedure. In addition, the Environmental Law, Law No. 20/97, issued on October 1, 1997, regulated matters such as the preservation, protection and improvement of the environment, progress of integrated approach to environmental management, rational use of national natural resources, need for insurance activities involving pollution or environmental degradation, and control pollution.

The Law prohibits pollution in its various forms (Article 9), including the generation, disposal and/or release of any toxic substances and pollutants in the soil and subsoil, water or the atmosphere, and the import of hazardous waste to the country, except in cases covered by specific legislation. To this aim, the Law establishes the necessity of a formal Environmental Impact Assessment (EIA) of the proposed activity, and the environmental license precedes any other legally required licenses.



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The EIA law, approved by Decree No. 45/2004, of September 29, regulates the type, size and location of developments requiring an environmental impact study and details the process of evaluation of environmental impact. It applies to all public and private activities with direct or indirect influence on environmental attributes. The EIA procedure developed in accordance with the international standards is articulated on the following steps:

- i) Screening: Pre-assessment to determine the obligation to carry out an EIA;
- ii) Scoping definition of the matters to be addressed in the EIA;
- iii) Environmental impact assessment and reporting;
- iv) Public consultation;
- v) Review;
- vi) Licensing; and
- vii) Preparation and approval of an environmental management system (management, mitigation, monitoring and enforcement).

The procedures change on the basis of the categories of project to be approved in line with the classification decided by the Provincial Directorates of Environmental Coordination, in collaboration with DNAIA. During the EIA procedure, the project proponent should facilitate the engagement and participation of the relevant stakeholders through consultation and a public hearing.

The Environmental Management Plan is an integral part of the EIA report, thus serving as a promoter of commitment, before public authorities, of the strategy to be adopted to comply with the rules and standards and implement the proposed mitigation measures.

In 2006, MICOA approved two key pieces of legislation establishing guidelines for the preparation of EIA reports and for the public consultation. Thus it gave a remarkable step towards the sustainability of the process, for those who prepare the study and those who lead the local participation process. Even though the EIA procedure has been developed in accordance with the environmental and social standards adopted by the international lenders' and donors (such as IFC), no assessment related to Climate Vulnerability and Risk of the subject location or structure is required within the EIA procedure.

Decree No. 11/2006 of June 15, approved the Regulation on Environmental Inspection which, among others, deals on procedural and administrative arrangements for the supervision of public and private activities (licensing, audits and implementation of mitigation measures), rights and duties of inspectors.

In it there are distinguished two types of environmental inspection, the Regular one held within the framework of the implementation of the business plan MICOA, and the Extraordinary, performed to achieve certain objectives for any public or private activity which could jeopardize the environmental balance.

The Regulation on Environmental Audit process is applicable to any public or private activities that, by their nature, may have a direct or indirect impact on the environment. The Regulation distinguishes (Article 3) between public audits performed by the appropriate state agency, in this case, MICOA; and private audits performed and determined by the entities whose activity is a potential cause of environmental degradation.

The Regulation includes the duty of cooperation on the part of the audited entities (Article 8), particularly in providing documentation and other requested information, and provides free access to facilities and sites to be audited. Article 13 states that environmental auditors are civilly and criminally responsible for the information provided in the environmental audit reports.





B. Extractive Industries Legislative Framework

The Government of Mozambique's approach to the development of the EI sector has evolved within the last decade; initially very focused on the attraction of investment and the economic aspects of mineral development, in the last few years there has been more attention paid to social, labor and environmental aspects of mining. As evidence of this approach, when the coal fields of Tete were tendered several years ago, companies were required to reference the IFC Performance Standards on Social and Environmental Sustainability in their bids.

In this context, the Petroleum Law (Law no. 3/2001, of 21 February 2001) and the Mining Law (Law no. 14/2002, of 26 June 2002) were revised and approved by the Assembly of the Republic, giving origin to Laws nos. 21/2014 and 20/2014, both of 18 August. The key aspects of the revision undertaken are as follows:

- Petroleum Law:
 - Infrastructure Concession Contracts (for liquefaction and production based on fixed and mobile installations);
 - Reconnaissance Concession Contract (the proposal withdraws exclusivity from the holder of the right of reconnaissance prior to signing an exploration and production contract);
 - Burning of natural gas (this will only be approved for safety and environmental reasons, reducing burning for technical or commercial reasons, and eliminating inefficient operations);
 - Establishment of the share of not less than 25% of oil and gas for domestic consumption;
 - Mandatory registration for Oil and Gas companies in Mozambique Stock Exchange.
- Mining Law:
 - Definitions, Licensing, State Participation in the undertakings;
 - Publication of the contracts;
 - Deadline for starting production;
 - Period of validity for mining passes;
 - Transmission of mining rights;
 - Closure of the mine;
 - Principle of providing a guarantee to ensure compliance with the terms and conditions of mining titles;
 - Acquisition of goods and services, and penalties and liabilities for illegal mining activity.

At policies and strategies level the following instruments for the extractive sector have been approved in recent years or are still at the approval stage in the Council of Ministers:

- Mineral Resources Policy and Strategy approved in 2013, to replace the Geology and Mining Policy, which seeks to improve knowledge of the mineral resources in the soil and subsoil, in the inland waters, in the territorial sea, on the continental shelf, and in the Exclusive Economic Zone where, in accordance with international law, the state has sovereign rights and jurisdiction. The Policy also seeks to turn the mineral resources into one of the main factors contributing to industrialization and development, diversification and economic transformation, and improvements in the country's balance of payments;
- Strategy for Training Human Resources for the Mineral Resource Sector from the period between 2010 and 2020, in order to endow the country with skilled and



specialist human resources, responding to the growing demand of the extractive industry for the entire chain of mining and petroleum activity;

- Strategy for the Concession of Areas for Petroleum Operations, approved by Resolution no. 27/2009, of 8 June, the objective of which is to guarantee continued systematic exploration for petroleum in the country's sedimentary basins, encouraging the national private sector to invest in petroleum exploration and production activities, and to promote foreign investment in petroleum exploration and production in the national territory, thus ensuring good and efficient management of the existing areas and potential resources;
- Strategy to Develop the Natural Gas Market which stresses the need to create an integrated system between the market and the natural gas industry;
- Business Social Responsibility Policy for the Mineral Resources Extractive Industry, approved by Resolution no 21/2014, of 16 May, designed with the aim of allowing the extractive industry to be more strategic in its Social Responsibility programmes, and to support the government's targets for sustainable economic growth and long term poverty reduction;
- Natural Gas Master Plan (still being drawn up); in addition to identifying the options for generating revenues the Rovuma Basin natural gas, it lays down the master lines for implementing the respective projects;
- Definition of the tariff methodology for transporting gas along high pressure gas pipelines to monitor and regulate the tariffs for the transport of natural gas and take the measures necessary to guarantee that these are consistent with the methodology adapted;
- Coal Master Plan in addition to an inventory of the coal resources in various parts of the country, this will recommend guidelines for the development of the extractive industry and the use of coal in Mozambique.

C. Climate Change Framework

The body responsible for the implementation of the UN Convention on Climate Change in Mozambique is the Ministry for the Coordination of Environmental Affairs (MICOA) that operates through several policy instruments, including:

- The 1995 National Environment Policy recognized that many key natural resources were under pressure, poverty being one of the factors behind environmental degradation. Building capacity for better environmental management and sustainable development was also part of a number of other sectoral policies.
- The 1995 National Policy on Water, which main objective is to promote the integrated and sustainable management of water resources in Mozambique in order to meet the water needs of the people now and in future
- The 1995 Energy Policy, which aims, on the one hand, to increase the feasibility and access to low cost supply of several forms of energy, and on the other hand, foresees the development of conservation technologies and environmental beneficial use of energy. The policy stipulates also the reduction in the consumption of wooden fuels
- The National Land Policy and its Implementation Strategies approved in 1996 and the Land Law, which ensure that the population have access to the resources and participate in the management of such resources, for their sustainability and socially equitable use;
- The 1996 National Environment Programme, which defines the national environment priorities, establishes policies and environmental strategies for the environment management; it promotes sector co-ordination, elaboration of a global sustainability concept and the development of an environmental conscience and culture in Mozambique;



- The 1997 Environment Frame Law is a tool that guides the national progress in systematically integrating environmental aspects in development. It is also targeted at defining the legal basis for the use and correct management of environment and its components aimed at materializing the country's sustainable development. Within the framework of this law, the National Sustainable Development Council (CNDS) was established to be the consultative body on environmental issues in the country at the level of the Council of Ministers;
- The National Policy on Forest and Wild Life, adopted by the Government in 1997 aimed at the management of forest and wild life resources, underlining the need for their sustainable use;
- The 1997 Environmental Law forms a tool that guides the integration of environmental aspects into development;
- The 1999 Policy on Disaster Management defines as its objective the elimination of poverty and establishment of a contingency plan in view of the recurring occurrence in Mozambique of calamities of different causes and the negative effects of which affect the country's social and economic development;
- The Action Plan for the Reduction of Extreme Poverty for 2001/2005 (known as PARPA) that represents the government's strategic vision for reduction of poverty, the main objectives and the key actions to be pursed. This document which also serves as the Mozambique's Poverty Reduction Strategy Paper (PRSP), is based on the Government Program for the 2000-2004 period, the plans, policies and sectoral strategies developed by the government. It targets an overall reduction in absolute poverty levels from 70% in 1997 to 60% in 2005 or less by the end of the first decade of 2000. The Plan comprises a national multisectoral vision comprehending important policies from basically all sectors, inter alia, environment, agriculture, mining, industry, fisheries, tourism and disaster vulnerability reduction.

The most significant advancement was the adoption of the 2013-2025 National Climate Change Strategy in 2012. Representing a milestone in climate policy, the strategy widened the government's approach to climate change in proposing actions that combine measures of adaptation and mitigation with the development of a low-carbon economy. The strategy provides a policy framework for climate priorities identified at sector, provincial and district levels.

The National Climate Change Strategy aims to reduce vulnerability to climate change and improve the living conditions of the Mozambican people. It proposes climate change adaptation and disaster risk reduction measures and also focuses on mitigation by targeting low carbon development. The National Climate Change Strategy is structured around three core themes: (i) adaptation and climate risk management; (ii) mitigation and low carbon development (iii) cross cutting issues, including institutional and legal reform for climate change, research on climate change, and training and technology transfer.

Covering the period 2013-2025, the implementation is planned in three phases. The first phase (2013-2015) focuses on improving the response of local communities to climate change, reducing poverty, planning adaptation measures, as well as identifying opportunities for the development of low-carbon economy in local communities.

The Strategy also proposes the establishment of a Centre of Knowledge on Climate Change (CGC) within the Ministry of Science and Technology. The primary objective of the centre should be to collect, manage and disseminate scientific knowledge on climate change, providing crucial information for the development of policies and plans.

Furthermore, the National Climate Change Adaptation and Mitigation Strategy (NCCAMS) (MICOA, 2012), set as a national priority "to increase resilience in the communities and the



national economy including the reduction of climate risks, and promote a low-carbon development and the green economy through the integration of adaptation and mitigation in sectorial and local planning".

As a Least Developed Country (LDC) in the UNFCCC, Mozambique elaborated a National Adaptation Programme of Action (NAPA) in 2007, identifying the most vulnerable areas to climate change, and proposing immediate actions to promote adaptation to these urgent issues. The NAPA proposes four adaptation initiatives which include:

- i) strengthening an early warning system;
- ii) developing capacities of agricultural producers to cope with climate change impacts by reducing soil degradation due to inappropriate agricultural practices;
- iii) reducing climate change impacts in coastal zones; and
- iv) improved management of water resources through renewed water infrastructure and water sharing agreements.

The NCCAMS identifies adaptation and the reduction of the climate risk as a national priority and presents eight strategic actions aimed at creating resilience and reducing the climate risk in the communities, ecosystems and national economy. The NCCAMS identifies also a set of key cross cutting actions including (i) institutional and legal reform, (ii) research and systematic observation and (iii) capacity building and technology transfer. These are relevant to achieve a prosperous and climate change resilient Mozambique, with a green economy in all social and economic sectors.

To support the deployment of climate friendly technologies Mozambique is participating in the Second Phase of the Technology Needs Assessment Project (TNA), covering the following sectors: (i) energy and waste, (ii) agriculture and (iii) coastal zones, including infrastructures. This process will result in a Technological Action Plan identifying the needs, including the financial and capacity building needs in those sectors. This information is relevant to identify the necessary means to implement the proposed actions. The end of 2017 will conclude this exercise.

Another relevant source of information is the is the ongoing process for making the National Climate Change Network operational which includes the assessment of the existing institutional and technical capacities and their needs for the implementation of the NCCAMS to formulate and implement the Capacity Building Plan, as included in the NCCAMS.

The Government of Mozambique submitted its Intended Nationally Determined Contribution (INDC) on October 1st 2015; within the INDC, based on the policy actions and programmes outlined above, the country estimates, on a preliminary basis, the total reduction of about 76,5 MtCO2eq in the period from 2020 to 2030, with 23,0 MtCO2eq by 2024 and 53,4 MtCO2eq from 2025 to 2030. These reductions are estimates with a significant level of uncertainty and will be updated with the results from the BUR to be available by early 2018.

However, to achieve this goal, and despite the fact that the Government already has put in place a legal and institutional framework, it is still necessary to mobilize, at the national and international levels, the financial and technological resources needed and also to strengthen the national technical and institutional capacities.

The implementation of the actions referred into the INDC will limit the GHG emissions by sources and the removals by sinks at the same time as they contribute to the increase of the well-being of the Mozambicans through the increase of the access to renewable energy sources and to basic sanitation services to promote the efficient use of the natural assets, reducing the environmental degradation. In this context Mozambique is willing to participate in the market mechanisms to be established which would allow access to clean technologies



in order to mitigate the emissions arising from exploiting, managing and using the natural capital that is available. The Institutional Arrangements established to implement and MRV the Mitigation component of the INDC are those established by the NCCAMS and operationalized by the National System to Monitor and Evaluate Climate Change. The relevant entities are the Climate Change Unit, the Knowledge Management Centre, hosted in the Science Academy of Mozambique, the National Climate Change Network, the GIIMC and the National Greenhouse Gases Inventory System (SNIGEE), already included in the National System to Monitor and Evaluate Climate Change. It is important to note that the implementation of any proposed reduction is conditional on the provision of financial, technological and capacity building from the international community.



SECTION 4

Analysis of existing standards and proposed compliance frameworks

This Section presents an analysis of existing compliance standards and how they are structured. This is followed by a proposal for how a Southern Africa compliance mechanism for the EI sector can be designed as informed by other operating systems globally. The Section concludes by providing a financing situation for climate related projects and what funds are relevant for some of the interventions that are required in such a compliance mechanism.

4.1 Existing Standards

Three existing compliance standards exist, (i) the GHG Mitigation Standards Framework; (ii) the Adaptation Standards Framework; and (iii) the Environmental Standards Framework. Each of these standards covers a different aspect of environment and climate change but all relate directly to the Extractives Industry. The international community has developed a variety of GHG standards. These are designed to streamline measurement and reduction of carbon emissions with the intention that generated carbon credits can be traded. The system is described as a "cap and trade system". A regional based system of this type is intended for Southern Africa. The largest and most influential system of this type has been the European Emissions target with which participating entities, such as extractive sector companies can comply.

The Adaptation Standards Framework is the process of adjustment to climate change impacts that will occur despite efforts to reduce GHG emissions. The main reference for international adaptation efforts is the Cancun Adaptation Framework aimed at enhancing action on adaptation. The measures proposed must take into account the urgent and immediate needs of those developing countries that are particularly vulnerable. Under the Environmental Standards Framework, environmental guidelines and performance indicators have been implemented in order to reduce the environmental impact associated with all industry sectors. In the Extractive Industry, the environmental guidelines and performance indicators normally referred to are those set by various international bodies.

Each of the three existing compliance standards is described below.

4.1.1 GHG Mitigation Standards Framework

A number of carbon standards exits and have been deployed by the International community to streamline measurement and reduction of carbon emissions. Companies adopted such standards in line with their corporate orientation and commitment to certain compliance frameworks.

Standards that include the Clean Development Mechanism (CDM), Verified Carbon Standard (VCS), Gold Standard, Plan Vivo and the Climate, Community and Biodiversity Alliance Standard (CCBA) and Joint Implementation are used in the generation of carbon credits from GHG reductions projects.



The generated carbon credits can be traded (Emission trading) in an established trading systems such as the EU Trading System. Most mining and Oil & Gas companies have mainly entered the relevant Emission trading system (ETS) such as the EU ETS or committed to comply with mandatory GHG monitoring requirements, also applying voluntary flexible mechanisms such as the CDM and the WRI GHG Protocol Corporate Standard. There are also a large number of regional initiatives, including in California¹¹⁰, Quebec¹¹¹, China¹¹² and South Korea¹¹³ that are based on "cap and trade" systems that can inform a regional based mechanism such as the one intended for Southern Africa.

Recommendation: the proposed mechanism for Southern Africa should be developed through Pillar 1 of our proposed Potential Support Areas in Section 5.

Pillar 1: Support to Development Planning, policy and compliance frameworks.

I. Carbon credits trading and taxation compliance systems

The European Emissions Trading System (EU ETS) has been the world's largest and played a major role in the EU's efforts to reduce GHG emissions but is now slowed down by the low carbon prices. A system like the EU-ETS achieves an environmental goal by setting an emission target or cap, that participating entities such as extractive industries companies can comply with. Entities meet their targets either through internal measures, or through buying carbon offsets from others who over-achieve. Compliance is verified and enforced. If the scheme functions well, this leads the environmental target to be achieved in the cheapest manner possible for both sellers and buyers of carbon credits.

In the case of such a "cap and trade" system, a regional/national/provincial body sets a carbon budget/cap of the GHG emission units that are to be emitted in a defined compliance period by the particular sector. The body will issue permits equivalent to the cap to participating entities either free at the start or through an auction. Each entity will receive its share of permits amounting to what the entity is allowed to emit. If a company emits more that its permits, it should either demonstrate that it has reduced emissions equivalent to its additional emissions or buy permits from other entities that have not used all their permits. This becomes a trading system which can be organized through an auction. Companies would be happy joining such a trading system where they start by getting free permits and manage their emissions rather than start buying initial permits through an auction. Some trading system such as Quebec will allow companies preparatory period (e.g. 1 year) to be familiar with the system before enforcement is applied.

In contract to carbon tax, companies would be expected to pay tax on every carbon unit they emit similar to polluter pay principle and hence when introduced companies will start with enforcement and payment immediately. Carbon tax however also allows companies to declare verified GHG emissions reductions they have achieved resulting in less tax payments.

In both 'cap and trading' system and carbon tax, the carbon price and tax should be such that companies will have incentives to reduce emissions through voluntary mechanisms (such as the Certified Emission Reductions generated by CDM) which are normally not part of the ETS as such, but are generated externally.

¹¹³ http://in.reuters.com/article/2015/01/12/southkorea-carbontrading-idINKBN0KL05K20150112



http://www.wsj.com/articles/how-cap-and-trade-is-working-in-california-1411937795

https://icapcarbonaction.com/index.php?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=73 http://www.rsc.org/chemistryworld/2015/10/us-china-emission-trading-scheme-climate-change

Building on the examples of such trading systems such as the EU ETS, the establishment of a regional or national ETS Scheme will involve several actors: Regional Authority; National/provincial authorities; Operators and Verifiers; each of them has specified duties and responsibilities, and they have to create clear and good relationships among each other for the scheme to work properly.

The regional authority (e.g. in large countries like China or more countries such as the Western Climate initiative¹¹⁴)

- Issues provisions relating to allocation of emission allowances or credits by the participating states or provinces, necessary to contribute to preserving the integrity of the internal market and to avoid distortions of competition;
- Implements policies and measures across all target sectors of the covered countries'/provinces' economy and related sectors. Other emissions reductions may be generated from outside the target sector to create a large pool of credits/allowances;
- Adopts regulations on timing, administration and other aspects of auctioning to ensure that it is conducted in an open, transparent, harmonized and nondiscriminatory manner;
- Defines compensative measures for sectors that are affected by carbon leakage;
- Adopts a regulation for the monitoring and reporting of emissions for the activity sectors
- Regulates the verification of emission reports
- Creates and manage a standardized and secured system of registries in the form of standardized electronic databases containing common data elements to track the issue, holding, transfer and cancellation of allowances,
- Monitors public access and confidentiality as appropriate and to ensure that there are no transfers which are incompatible with the obligations resulting from the Kyoto Protocol;
- Designates a Central Administrator to maintain an independent transaction log recording the issue, transfer and cancellation of allowances.

Participating Countries/provinces

- Define National/provincial Allocation Plans (NAPs) for each trading period and approve Monitoring Plan (MP) for each Operator in target sectors, ensure that the reports submitted by operators are properly verified;
- Set out the rules on penalties applicable to infringements of the national/provincial provisions adopted and take all measures necessary to ensure that such rules are implemented.

Operators, apply for the request of emission permits to the Competent Authority, before starting operations; submit the first monitoring plans (MP) and any updated monitoring plans to the competent authority for approval; monitor and report the emissions according to the MP.

Verifiers recognized by an accreditation body globally or regional/nationally perform the following:

¹¹⁴ Western States of USA and Canada participate in the Western Climate Initiative under a joint strategy to reduce emissions.



- Plan and perform verification with an attitude of professional skepticism recognizing that circumstances may exist that cause the information contained in the Annual Emissions Reports to be materially mis-stated
- Address the reliability, credibility and accuracy of monitoring systems and the reported data and information relating to emissions.
- Strategic analysis, risk analysis, verification processes, reporting, and technical review.

II. Methodologies for generating carbon credits

Standards that generate carbon credits/allowances vary and depend on varying methodologies.

The overall approach of these standards though is broadly inspired by the IPCC guidelines on Monitoring, Reporting and Verification (MRVs) but present many differences. The variations have implications for the Companies operating in multiple jurisdictions adding costs and complexity especially linked with methodological consistency and results comparability when included in National emission inventories.

Furthermore, there are widely different technical approaches to resource extraction and processing depending on the type and location of the resources and each has a specific GHG profile. In fact the extractive industry is a highly diversified sector involving several activities (exploration, extraction, sorting, refining, processing, and beneficiation), thus preventing the adoption of a single comprehensive GHG protocol. As a result there is deployment of sub-sector specific standards and methods such as the protocol for the Aluminium Sector which delivers Life Cycle Impact Assessment (LCIA) results for the worldwide aluminium industry. The LCIA is based on the following methodological steps:

- Selection and definition of relevant environmental (or health) impact categories e.g. global warming, acidification, terrestrial toxicity;
- Classification of Life Cycle Inventory (LCI) results according to selected impact categories (e.g. classifying tetrafluoromethane, methane and carbon dioxide emissions as having global warming potential);
- Characterization of LCI results within impact categories by multiplying them with science-based factors and adding them up to category indicator results;
- Normalization: the calculation of the magnitude of the category indicator results relative to some reference information, e.g. category indicator results of other materials.
- Grouping: sorting and ranking of the impact categories;
- Weighting: converting and possibly aggregating indicator results across impact categories using numerical factors based on value-choices; data prior to weighting should remain available;
- Data quality analysis to better understand the reliability of the collection of indicator results, the LCIA profile.

In addition to the mandatory MRV regimes, mining and oil & gas companies are already engaged in voluntary GHG reporting initiatives. These are based on well-established international protocols among which the WBCSD/WRI GHG Protocol Corporate Standard is the most widely used. This standard sets out key principles of relevance, completeness, consistency, transparency and accuracy for corporate GHG inventories which are consistent with IPCC guidelines. It also draws a distinction between various scopes of emissions: direct; indirect from electricity use; and other indirect emissions.



The WBCSD/WRI GHG Protocol Corporate Standard looks into the following environmental topics:

MATERIALS

- Materials used by weight or volume;
- Percentage of materials used that are recycled input materials;

ENERGY

- Direct energy consumption by primary energy source;
- Indirect energy consumption by primary source;
- Energy saved due to conservation and efficiency improvements;
- Initiatives to provide energy-efficient or renewable energy based products and services, and reductions in energy requirements as a result of these initiatives;
- Initiatives to reduce indirect energy consumption and reductions achieved;

WATER

- Total water withdrawal by source;
- Water sources significantly affected by withdrawal of water;
- Percentage and total volume of water recycled and reused;

BIODIVERSITY

- Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas;
- Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas;
- Habitats protected or restored;
- Strategies, current actions, and future plans for managing impacts on biodiversity;
- Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk;

EMISSIONS, EFFLUENTS, AND WASTE

- Total direct and indirect greenhouse gas emissions by weight;
- Other relevant indirect greenhouse gas emissions by weight;
- Initiatives to reduce greenhouse gas emissions and reductions achieved;
- Emissions of ozone-depleting substances by weight;
- NO, SO, and other significant air emissions by type and weight;
- Total water discharge by quality and destination;
- Total weight of waste by type and disposal method;
- Total number and volume of significant spills;
- Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention and percentage of transported waste shipped internationally;
- Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the reporting organization's discharges of water and runoff;

PRODUCTS AND SERVICES

- Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation;
- Percentage of products sold and their packaging materials that are reclaimed by category;


COMPLIANCE

 Monetary value of significant fines and total number of non-monetary sanctions for noncompliance with environmental laws and regulations;

TRANSPORT

 Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce;

OVERALL

• Total environmental protection expenditures and investments by type.

The coverage of this WBCS/WRI GHG Protocol would cover all environmental, climate change adaptation and GHG abatement assessment opportunities in the EI sector.

As an additional case, companies often detail their corporate level engagement on MRV of GHG emissions by applying project level estimations and identifying specific emissions abatement opportunities. This is normally the case where external finance is involved in the development of project including benchmarking with additional performance standards. In such cases GHG accounting is often developed through application of the IFC performance standards which represents the international benchmark for managing environmental impacts of major infrastructure projects in developing countries

This IFC standard specifically states that "For projects that are expected to or currently produce more than 25,000 tonnes of CO2e annually¹¹⁵, the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary as well as indirect emissions associated with the off-site production of energy used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice."

III. Reporting

Voluntary corporate disclosure of GHG emissions and other climate change-related information is increasing not only through the Global Reporting Initiative (GRI) but also via initiatives such as the Carbon Disclosure Project (CDP). The CDP is supported by major investors and requests companies to disclose information on their management of climate change risks and opportunities including governance frameworks, company strategy and emissions reduction initiatives as well as GHG emissions performance via an annual questionnaire. The international mining, oil/gas companies already reporting to CDP or GRI

4.1.2 Adaptation Standards Framework

Climate change adaptation is the process of adjustment to climate change impacts that will occur despite efforts to reduce GHG emissions. Adaptation actions can therefore adjust natural or human systems in response to climatic stimuli or their effects, moderate harm or exploit beneficial opportunities, thus contributing to increase resilience of human settlements, productive assets and infrastructures to climate change.

The Cancun Adaptation Framework has defined the main reference for the international adaptation efforts. The Framework is aimed at enhancing action on adaptation, including through international cooperation, and coherent consideration of matters relating to

¹¹⁵ This is the threshold adopted by the California trading scheme. The Equator principles have a threshold of 100,000tCO2eq annually.



adaptation under the Convention in order to reduce vulnerability and build resilience in developing country Parties.

These measures must take into account the urgent and immediate needs of those developing countries that are particularly vulnerable. Under such framework the Parties are invited to enhance action on adaptation, taking into account their common but differentiated responsibilities and respective capabilities, and specific national and regional development priorities, objectives and circumstances, by undertaking, inter alia, the following:

- Planning, prioritizing and implementing adaptation actions, including projects and programmes, and actions identified in national and subnational adaptation plans and strategies, national adaptation programmes of action of the least developed countries, national communications, technology needs assessments and other relevant national planning documents;
- Impact, vulnerability and adaptation assessments, including assessments of financial needs as well as economic, social and environmental evaluation of adaptation options;
- Strengthening institutional capacities and enabling environments for adaptation, including climate-resilient development and vulnerability reduction practices;
- Building resilience of socio-economic and ecological systems, including through economic diversification and sustainable management of natural resources;
- Enhancing climate change related disaster risk reduction strategies, early warning systems, risk assessment and management, and sharing and transfer mechanisms such as insurance, at the local, national, sub-regional and regional levels, as appropriate;
- Measures to enhance understanding, coordination and cooperation with regard to climate change induced displacement, migration and planned relocation, where appropriate, at the national, regional and international levels;
- Research, development, demonstration, diffusion, deployment and transfer of technologies, practices and processes, and capacity-building for adaptation, with a view to promoting access to technologies, in particular in developing country Parties;
- Strengthening data, information and knowledge systems, education and public awareness;
- Improving climate-related research and systematic observation for climate data collection, archiving, analysis and modelling in order to provide decision makers at the national and regional levels with improved climate-related data and information.

Being used to work in a challenging climate context, most mining and oil & gas companies are already familiar with strategies to identify, prioritize and manage risks and opportunities. In this context mining and oil and gas companies are pursuing a range of adaptive practices to respond to current and potential disruptions tied to climate change. In some cases, these practices are intended to protect the value of existing or potential assets. In others, they are aimed at creating value through technological innovation, new market opportunities, and collaborative initiatives that address the changing needs of companies and communities affected by climate change.

Existing functions in mining and metals companies that are relevant to climate change include risk management policies and procedures, emergency response planning, asset management, capital and long-term planning, environmental health and safety programs, biodiversity management, community engagement, financial and sustainability measurement and reporting, and dealing with uncertainty in decision making. Mainstreaming climate change considerations within these functions will require identifying the right sources of information, tools and resources to leverage within the company. It will also involve



determining key areas of vulnerability or opportunity, the types of information required on changes in climate and the level of detail necessary to start framing responses.

Climate change adaptation elements are generally grouped under the themes of risk and hazard assessment; building resilience at regional, national and installations level; planning, infrastructure and buildings; coastal planning; water security; and legal liability and compensation.

In order to streamline adaptation into the mining and oil & gas sector the following principles should be applied:

- Utilise methods of natural hazard and risk assessment, including the projected effects of climate change to underpin planning, design and development decisions
- Enhance the resilience of geographical areas, regions and human settlements to natural hazards, including the projected effects of climate change
- Achieve an acceptable level of resilience and adaptive capacity to natural hazards and the projected effects of climate change through an integrated approach to infrastructure planning, land use planning and design code regulation
- Adopt an integrated approach to water and land use planning so that extractive settlements and infrastructure can avoid disruptions or limitation to the operability due t to changing weather conditions
- Minimise potential litigation or compensation claims at all levels of government resulting from land use planning decisions affected by climate change where there is potential for a wide array of liability issues to arise by litigation and Legal liability and compensation issues can affect all levels of governments and quasi-autonomous non-government organisations, private industry infrastructure providers, amongst others.

Building on the long-time effort of the international community towards the GHG emission mitigation, and the structured negotiations and talks on emission reduction targets and commitments, governments have developed appropriate structures for managing the definition and implementation of the relevant adaptation targets. Such governments in the region would need support in terms of awareness raising and capacity building to further enact the proposed actions and streamline climate change (CC) requirements into their day to day operation specifically linking CC and CO₂ emission reduction targets into their authorization procedures (especially ESIA).

On the other side adaptation remain mostly uncovered as national strategies on Adaptation are mostly under development or out-dated. The standards for planning, project and infrastructures design as well as Climate Vulnerability and Risk Assessment procedures need to be identified and coded.

On top of this, budgeting and cost guidelines as well as liability and compensation litigation rules need to be properly defined in order to support the inclusion of adaptation parameters into the very early stage of the project development. A key next step is therefore to identify ways to further incorporate, or enhance the treatment of, climate change considerations within existing risk management and planning procedures.

In addition, collaboration between governments, the development sector and the insurance industry will improve risk management and potentially reduce liability and compensation litigation. This is for damages where climate change planning principles and standards need to account for land tenure and property rights. In this context Planning systems, planning instruments and state policies have an important role in minimising risk and liability by determining the appropriate location of land uses, secondary effects of development (e.g.



flooding of downstream or upstream properties) and relevant conditions of development approvals.

In most circumstances adoption of transparent and accountable processes based on bestknown climate science should not expose State, Territory and local governments to liability under planning legislation. The transfer of risk and liability to development proponents and end users is in fact contingent upon the capacity and conviction of State, Territory and local governments to adequately incorporate climate change into planning instruments and authorization procedures.

The 21st Conference of Parties to the UNFCCC to be held in Paris in December 2015 is expected to come up with new decisions on measuring the outcome of actions under countries' emission reduction pledges and adaptation efforts. In fact Nationally Appropriate Mitigation Actions (NAMAs) undertaken in developing countries as well as the submission of the Intended Nationally Determined Contribution (INDC) may bring about further changes in MRV requirements and the adoption of appropriate National Adaptation Strategies which can be assumed as reference framework for proper identification of action to reduce climate related risk. These will bring additional elements to the definition of appropriate mechanism to foster the efforts towards CC agreements implementation more so that NAMAs, National Adaptation Strategies and INDCs are presently under development (or update) by Malawi, Zambia and Mozambique.

Recommendation: Any decisions and actions that emerge as a result on the 21st COP (and subsequent Conference of the Parties) should be incorporated into Pillar 2 of our proposed Potential Support Areas in Section 5.

Pillar 2: Awareness, sensitization and communication.

4.1.3 Environmental Standards Framework

International councils have implemented environmental guidelines and performance indicators in order to reduce the environmental impacts associated with all industry sectors. The achievement of guideline values defined by recognized regulatory frameworks is indicative of Good Industry Practice and become the reference for industries located in those countries where national environmental standards are absent.

With reference to the extractive industry, the environmental guidelines and performance indicators normally referred to are those set by the International Finance Corporation (IFC), the International Council on Mining and Metals (ICMM), the International Petroleum Industry Environmental Conservation Association (IPIECA), and the Equator Principles, all together adopted by financial institutions for valuating and managing environmental and social risks associated with projects.

Environmental impacts associated with extractive activities, either mining or oil & gas, may occur during exploration, development, operation up to decommissioning. Key environmental issues span from water use, water quality, air quality, energy use, wastes, hazardous materials, land use, biodiversity, visual impacts, noise, and vibrations as well as all implication on social and communities.

With reference to water management, all strategies and practices are aimed at reducing surface and groundwater availability, particularly in agricultural potential or arid regions; other objectives are to avoid water source contamination and manage heavy runoff events and flooding typical of tropic environments that could damage the projects assets.



Recommended practices for water management include:

- Treatment of all effluents streams, including storm water run-off from operation areas as well as process effluents;
- Enhance process water reuse and recycling;
- Establish a water balance required by operations, taking into account probable climate events;
- Install efficient oil and grease traps to avoid spillages;
- Manage sanitary wastewater via reuse or routing in surface treatment;
- Plan and build storm water drains, ditches and stream channels to avoid/limit flooding from process areas;
- Reduce erosion through drainage installations and sediment control devices;
- For the mining industry, prevent and control potentially acid generating materials, acid rock drainage and metal leaching to prevent surface and groundwater contamination associated with leaching and tailings.

Effluent discharge guideline values for the quality and quantity of effluents generated by mining and oil & gas installations are defined in EHS General Guidelines, the EHS Guidelines for Mining and the EHS Guidelines for Onshore and Offshore Oil and Gas Development. These guidelines set effluent values for each pollutant discharged from the different processes.

With specific reference to the mining industry, the EHS guidelines define the return period of storm water and flood protection projects: temporary drainage installations should be designed, constructed and maintained for recurrence periods of at least a 25 year/24 hour event, permanent drainage installations should be designed for a 100 year/ 24 hour recurrence period. These thresholds may need to change with evident of climate change.

With reference to air quality and energy use, a recent study commissioned by ICMM on mining industries estimated that the global mining and metals industry makes up around 2% of global emissions. The most significant energy consuming activities are: exploration activities, transport, drilling, excavation, extraction, grinding, crushing, milling, pumping and ventilation processes.

An internationally recognized source about quality emissions values is the WHO Ambient Air Quality Guidelines, which indicates the standard of pollutant concentrations in a defined average period. Moreover, general recommended emissions guideline values are defined in in General EHS Guidelines by IFC, differentiating emissions by fuels (gas, liquid and solid) and by combustion technology (engine, turbine and boiler).

ICMM refer to IFC Performance Standard 3, which expresses that projects emitting more than 25,000 tonnes of CO2 annually have to quantify direct and indirect GHG emissions from the facilities owned and controlled and the quantification of GHG emissions have to be conducted by the client annually. Recently, in 2013 the Equator Principles III require, that an alternative analysis has to be conducted to evaluate less Greenhouse Gas intensive alternatives in case of projects emitting more than 100,000 tonnes of CO2 equivalent annually. The analysis has to include consideration on energy efficiency of alternative fuel or energy sources and of other viable technologies. Moreover, these projects are required to report publicly on an annual basis on GHG emission levels during the operational phase.

Other important environmental issue related to mining is waste, which are generated mainly during the operational phases during movement of large amounts of overburden and creation of tailings and waste rock. Other types of solid waste are leach pad waste, workshop scrap, household and non-process-related industrial waste (oils, chemicals, and



other potentially hazardous wastes). Overburden or waste rock is often disposed in constructed waste rock dumps that need an adequate management to minimize erosion, reduce safety risks including slope failures.

Tailings management strategies aim mainly to mitigate the risk of groundwater and surface contamination, due to the generation of acid rock drainage (ARD) and metals leaching (ML) containing runoff and leachate; other risks are the sedimentation of drainage network and dust generation.

Recommended management measures on tailings and proper routing of Potentially Acid Generating (PAG) materials and ARD include the following elements:

- Evaluating hazards associated with geotechnical stability or hydraulic failure
- Projecting diversion drains, ditches and stream channels to divert water away from the tailings structure considering the probable maximum flood event
- Considering the maximum design earthquake where potential liquefaction risks exist
- Conducting accelerated leaching tests to evaluate the potential for ARD in all formations foreseen to be disturbed or otherwise exposed by the mine
- Limiting exposure of PAG materials by phasing of development and construction and segregating runoff for treatment
- Diverting clean runoff away from PAG materials for sequent treatment to avoid ponding and infiltration
- Controlling placement of PAG materials to provide permanent conditions that avoid contact with oxygen or water, placing it in an anoxic environment or with an impermeable cover
- Neutralizing acid materials blending it with non-PAG or alkaline materials.

Overall, extractive activities alter terrestrial and aquatic habitat in all surrounding areas, because exploration and exploitation activities often require the development of access routes, transportation corridors and temporary camps.

The EHS guidelines identify a number of general mitigation measures to minimize the project footprint and pressure on local environment:

- Siting access routes and facilities in order to avoid impacts to critical terrestrial habitats
- Implementing post-operation restoration, offset of losses or compensation of direct users
- Minimizing the creation of barriers to wildlife movement or threats to migratory species
- Storing topsoil for future site rehabilitation activities
- Removing invasive plant species and replanting native species
- Maintaining natural drainage paths and water body catchment areas
- Protecting stream channel stability and employing appropriate setbacks from riparian zones.

It is important to note that some of what is presented in international guidelines has been adopted in various countries' national legislation for EIA. In particular, recently developed legislation on EIAs tend to embrace aspects of IFC standards. The majority of the significant mining players in the study countries subscribe or are members of ICMM, GRI and CDP. The Equator Principles are widely embraced not only in the mining sector but even power sector. In designing any mechanism for the study countries and the Southern Africa region, only those aspects considered to be important and are missing can be added but at regional level it will then be important to harmonize the environmental Management Acts and that will



be possible through SADC and member states are already harmonizing policies and legislation for various sectors.

4.2 Scoping for Compliance Support Mechanism

In this section we present some insights on how a national or regional Climate Change and Environmental Compliance Mechanism can be formulated and implemented as informed by the previous analysis of the existing standards and compliance mechanisms.

The analysis has also been divided into Carbon offsets, climate change Adaptation and Environmental compliances. A more elaborate analysis is provided for the Carbon offset compliance mechanism, as more lessons are already available.

a) For Environmental compliances, the proposal is that during revision of national laws, applicable aspects of the international standards be incorporated. Government Agencies in charge of environmental management and protection can also stipulate observation of International standards for projects of certain sizes and sensitivity in a similar manner that IFC would apply to projects they are financing. This will require that capacity is built among Government Agencies that are to enforce the international standards. The inclusion of GHG emissions as stipulated in the ICMM/IFC Standards can also be included.

b) For **Adaptation compliance** standards are not well established and more work will be required to develop assessment, monitoring and costing methodologies. Post Paris 2015, this is an area that will require attention to develop methodologies that can facilitate reporting of both impacts and adaptation achievable. Prior to that, reporting on potential Climate Change Impacts and measures to manage them can be achieved through authorization of ESIA procedures. This also hinges on the same government agencies that are in charge of ESIA to have adequate capacity to enforce identification and management of climate change impacts.

There is also an opportunity to include the climate change impacts management within the Climate Change Acts due for development but without creating additional institutions for monitoring and enforcement, since institutions like ZEMA are already being involved in climate change.

c) Carbon Offset Compliance Mechanism. The scoping for carbon-offsets is considered at 3 levels namely: the trading system, standards for generation of carbon credits and reporting

IV. Trading System

Considering how the cap and trading system and carbon tax are implemented, a system that may be more attractive to companies would be the cap and trading system that starts with issuance of free permits. Carbon tax will be repulsive as companies will consider that as yet another taxation regime in countries where tax payers are already disgruntled.



Important elements to establish for a compliance mechanism adopting the cap and trading system are the following:

- Identification of companies that emit a threshold of GHG emissions. The large mining companies and oil/gas companies all emit above 100000tCO2eq that Equator Principles uses as a threshold for reporting. Starting at that level will ensure that all large EI companies are involved. The 25000tCO2eq that other trading systems such as California start from can be introduced later (say 2nd or 3rd compliance period) so that even medium companies can be included in the system in subsequent compliance periods.
- 2. The trading system will best be implemented initially at national level (although harmonization of certain elements such as prices can be done throughout regionbut without coordinating from a single regional authority at first). The regional trading can be enhanced through a joint strategy to reduce GHG emissions say at SADC level similar to the Western Climate Initiative involving western states of USA and Canada.
- 3. The countries will be able to set a carbon budget amounting to what the large El companies are emitting (set base year) and issue similar number of permits allocating initially freely to companies in proportion to their emissions for the chosen base year.
- 4. It will be important to set an ambitious cap and carbon price to incentivise companies to effectively participate. This will avoid the problem of the EUTS that has slowed down due to oversupply of carbon allowances and also the low targets set by participating countries. In that regard, it will be important that governments set a minimum price.
- 5. The governments will set a compliance period and allow companies a first year to familiarize with the requirements of the trading system.
- 6. Create trading platform for further auctioning of permits when companies start trading. National stock exchange platforms can be involved like in the South Korea Trading system but will need to be engaged in good time
- 7. Create a Fund for auctioned permits that can be used to finance infrastructure that can facilitate the mechanisms-e.g. development of simplified methodologies for GHG accounting

Compliance to mechanisms is not new particularly to the international mining companies, oil/gas companies.

Barrick Gold, Africa operating in Zambia has 100% compliance with the Barrick standard at its global operations including at Lumwana in Zambia that has a climate change programme¹¹⁶.

Vedanta, the owners of KCM, have a global sustainability approach and have sustainability units at corporate level for its zinc, copper and aluminium operations globally and at copper mines in Zambia. There is a degree of internal healthy competition between units to be the most environmentally responsible. The company has responded voluntarily to need for measuring and reducing carbon footprint¹¹⁷. The company is also interested in carbon trading and submitted a CDM project that never materialised due to protracted procedures for registering projects and the subsequent low carbon prices that prevailed¹¹⁸. KCM has a unit responsible for climate change mainstreaming throughout the company.

¹¹⁸ KCM and UNFCCC pers communication



¹¹⁶ Barrick Interview

¹¹⁷ KCM Interviews

ZCCM-IH has an environmental policy that mines should subscribe to as partners. There is a focus (on the part of ZCCM-IH) to fix emissions¹¹⁹ and to try not to clear substantial areas of forests¹²⁰.

The advice received from some of the companies is that the global standards need to be tailored to fit the local context. This is what the above proposed trading system is attempting to achieve while applying to all EI companies concerned.

In terms of whether a voluntary or enforceable mechanism should be utilised, in our study the mining houses consulted would be concerned about additional regulation. From both Zambia and Malawi, the companies would not like another layer of bureaucracy. As a result of the current poor economic climate, companies (e.g. Barrick) are reluctant to commit additional investment or spend on alternative energy sources or energy efficient measures.

ZEMA in particular indicated that companies must report on compliance with all environmental standards including GHG twice per year as they do for environmental monitoring. This could be based on an online reporting system and the levels of emissions reported.rganizations like ZEMA can do a site inspection/audit or engage qualified auditors such as METS. ZEMA believes if the mechanism is voluntary, then it will be difficult to ensure compliance. There is however the perspective that organizations such as ZEMA will find it difficult to police the EI companies and would need additional capacity.

Recommendation: Support to legislators, regulators and environmental management bodies should be incorporated into Pillar 3 of our proposed Potential Support Areas in Section 5.

Pillar 3: Capacity building and institutional strengthening of systems, infrastructure and human resources.

The Zambia UNFCCC Focal point is also of the view that when the Climate Change Act comes into effect, the implementation of the newly developed Climate Change Policy may require compulsory provision of data and reporting on GHG emissions.

Recommendation: The provision of accurate data and information to support Climate Change legislation and policy development and enforcement should be incorporated into Pillar 4 of our proposed Potential Support Areas in Section 5.

Pillar 4: Information development and management.

The Shayona Cement Company, a local company in Malawi indicated that they would only account for GHG emissions if it were a legal requirement.

Based on the assessment above, introducing carbon tax would be repulsive. Instead, slowly and incrementally engaging the companies through a cap and trading system- which becomes enforceable in due course - would be the proposed approach for the Southern African compliance mechanism.

V. Methodologies for Generating Carbon Credits

Considering the protracted procedures, high transaction costs and robust institutional framework required at global level, generation of carbon credits to save on permits facilitating trading will require simplified and standardized GHG methodologies. This calls for

¹¹⁹ Mainly SO₂



¹²⁰ METS interviews

development of simpler but credible methodologies for determining emission reductions, monitoring, auditing and reporting mechanisms. The example below on Bilateral Offset Credit Mechanism (BOCM) that Japan is practising has similar approach to simplify methodologies and reducing transaction costs.

The BOCM should be designed and implemented, taking into account the followings: 121

- (1) Ensuring environmental integrity and transparency;
- (2) Maintaining simplicity and practicality;
- (3) Promoting concrete actions for global GHG emission reductions or removals;
- (4) Avoiding uses of any mitigation projects registered under the BOCM for the purpose of any other international climate mitigation mechanisms; and,
- (5) Aiming for concrete contributions to assisting adaptation efforts of developing countries through the BOCM after the BOCM is converted to the tradable credit type mechanism

One way to reduce transaction costs is to have a single verifier conducting validation and verification of the projects at once rather than separate verifiers as required under CDM. Verifiers can also be locally accredited organizations such as ISO certified, METS of Zambia in order to reduce costs of validation and verification. These locally accredited companies would still be guided by credible assessment guidelines.

Under BOCM the key body is a joint committee that has mandate to:

- Provide guidelines for the development of methodologies
- Approve methodologies
- Provide requirements for the accreditation of third party entities
- Provide guidelines for the validation
- Provide monitoring guidelines
- Guidelines for the verification of GHG emission reductions or removals
- Provide common specifications for registries
- Provide formats for PDD (project design document), request for registration of BOCM project, monitoring report, request for verification of emission reductions or removals, etc.

Such a body could be constituted at national level to provide the requisite guidance, under the umbrella of a mandated Government Agency.

Similar uniform methodologies are required for GHG accounting for the EI sector. Currently even for those that account of GHG emissions, it is not clear if they are using similar methods that are transparent and traceable. The fact that the companies already are doing some accounting is a good starting point and they can be coordinated to adopt uniform approaches to their GHG inventory.

As a starting point, companies are to provide data on mining sector and oil/gas production and related resource consumptions (energy, water) and the GHG emissions produced. To make sense for identifying areas of intervention, Life Cycle Analysis emissions per mining operation specifying scope 1, Scope 2 and Scope 3 type emissions will be requested. For useful information of decision-making, companies can report cost of GHG reduction, emission intensity of production that can be benchmarked with other international performances in similar mining operations. What gets measured gets done, so such reporting will motivate companies to achieve their target for own or collective GHG reduction.

¹²¹ http://www.mmechanisms.org/document/20120824_BOCM_seminar_goj.pdf



VI. Institutional Framework

The mandate to establish *'cap and trading'* system at national level falls within government but can be assisted by a committee similar to Joint Committee of BOCM. From the work conducted under this scoping study, EI companies are well coordinated within their umbrella bodies such as Chamber of Mines. There are also indications that even the large mining companies have a sense of loyalty to their Chambers. In Zambia there is already a strong Safety, Health and Environment (SHE) committee working under the Chamber of Mines and companies have to table their environmental statistics within the SHE committee. In that regard, the Chamber would be the best partner of government to deliver a coordinated response to a compliance mechanism on GHG abatement strategies¹²². There is also willingness of the Chambers consulted to lead such an initiative on behalf of their members.

The national environmental management agencies (e.g. ZEMA in Zambia, NEMA¹²³ in Malawi) would be candidates at government level to set caps and enforce the GHG compliance mechanism since they are also mandated to determine GHG inventories for the country. They would however be assisted by Ministries of Finance in establishing feasible carbon prices. In that regard a Joint committee would comprise of key institutions such as ZEMA, Chamber of Mines, Ministry of Finance, Ministries in charge of mines, environment and energy.

The championing of such a mechanism at regional level requires additional exploration. A suggestion was made to consider putting it under the Africa Mining Vision as a platform¹²⁴. Other possibilities are to use a regional body of Chamber of Mines. Advancement from national to regional could be a second step after gaining confidence of the national structures.

VII. Reporting

Whilst reporting could be done to a government agency such as ZEMA, a reporting platform supporting a secure system of registries in the form of interactive databases to track registration, issuance, holding, transfer and cancellation of permits is required

VIII. Gaining Consensus

Stakeholders in private sector and government, that were approached, have a willingness to participate in a compliance mechanism but would rather be involved in further deliberations to create the mechanism. The proposal that was accepted unanimously is to start with a gathering of stakeholders to deliberate on how best to proceed. The deliberations can be motivated by a discussion paper and a more comprehensive Needs Assessment process in terms of what support can be provided to prepare EI entities to effectively participate in the compliance mechanisms.

In engaging with the EI companies, important information should be exposed so they appreciate importance of their participation in a compliance mechanism (see Box insert below on what companies should know and how they will be affected..)¹²⁵

¹²⁵ Business News | Tue Sep 29, 2015 11:02pm BST Related: BUSINESS, G20 :Carney say firms must be more open about carbon footprint



¹²² Also confirmed by Barrick Interview that chairs the CoM SHE Committee.

¹²³ To be formed

¹²⁴ First Quantum

Bank of England Governor Mark Carney said that companies must be more open about their "climate change footprint" to avoid abrupt changes in asset prices that could destabilise markets. The speed at which assets such as coal, oil and gas reserves are repriced to reflect the impact of climate change is vital to reduce potentially "huge" financial risks to British insurers and other investors, "Risks to financial stability will be minimised if the transition begins early and follows a predictable path," Carney told a Lloyd's of London insurance market event. The goal of limiting global temperature rises to two degrees above pre-industrial levels would render the vast majority of fossil fuel reserves "stranded" or unburnable without expensive carbon capture technology, he said.

Carney, who also heads the Financial Stability Board (FSB), which coordinates financial regulation for the Group of 20 economies (G20). FSB agreed to consider recommending to G20 leaders in November 2015 that more should be done to develop consistent, comparable, reliable and clear disclosures by companies on the "carbon intensity" of their assets. Such disclosures would show investors how companies will manage risks from climate change.

"The right information allows sceptics and evangelists alike to back their convictions with their capital," Carney said. "It will reveal how the valuations of companies that produce and use fossil fuels might change over time. "Disclosures would expose the likely cost of doing business, paying for emissions, help smooth price adjustment, and inform policymakers, Carney said. Carbon footprint disclosures differ greatly and the FSB could help forge consistent, global standards. One approach would be to set up an industry-led climate disclosure task force to design and deliver a voluntary standard by firms that produce or emit carbon. The G20, whose member states account for around 85 percent of global emissions, has a unique ability to make this possible," Carney said. Carney said climate change can affect financial stability through the cost of damage to property or trade, compensation claims, and reassessment of asset prices.

He said Britain's environment ministry published a report that found Britain's insurers exposed to all three types of risks in the longer term. Increasing levels of physical risk could present significant challenges to general insurers in particular, Carney said. "Static" disclosure is a necessary first step which could be complemented by governments giving guidance on the possible future course of carbon prices. This could be combined with stress testing to profile the size of the skews from climate change to the returns of various businesses. "You peer into the future, building your defences against a world where extreme events become the norm," Carney said.

4.3 Financial Support

The decisions about how to unlock finance in support of developing countries' low-carbon and climate-resilient development will be a central part of the negotiation under the Conference of Parties which will be held in Paris in December 2015, where the Countries will gather to finalize a new global agreement to tackle climate change.



The two presidents of the two largest economies- USA and China also made it clear that any agreement reached at the climate talks in Paris should be a platform for bolder actions – they want to see an agreement that 'ramps up ambition over time'. This is crucial because countries' published intentions ahead of the Paris meeting are likely to fall short of the emissions reductions needed by 2030 and beyond to limit the global average temperature rise to less than two degrees.

Significantly, the Chinese have committed \$3.1billion (£2 billion) to climate finance for developing countries. This will not, however, be delivered through the UN's Green Climate Fund, which has only raised a tenth of its \$100 billion a year goal, and is intended to help the world's poorest countries adapt to climate change and adopt low emissions economies.

Amongst other measures, the world's biggest polluters have agreed to strictly control public investment for projects that are highly polluting and carbon intensive, both at home and abroad. The US and China also committed to implement new fuel efficiency standards for heavy duty vehicles in 2019, and to develop efficiency standards for buildings and equipment. Obama said that next year, **the US would be finalising standards which will reduce methane emissions in the oil, gas** and landfill sectors: its goal here is to cut methane emissions 40-45% from 2012 levels by 2025¹²⁶

The international community recognizes the need to join forces to avert dangerous climate change impacts and to adapt to unavoidable climate change. This requires mobilizing a wide range of financial resources, public and private, bilateral and multilateral, including alternative sources

In 2013, annual global climate finance flows totaled approximately USD 331 billion, with Public actors and intermediaries contributing USD 137 billion and Private USD 193 billion (CLIMATE POLICY INITIATIVE, 2014).

DFIs raised, managed and distributed the majority of public resources, contributing approximately 38% of overall flows through National (55%), multilateral (34%) and bilateral (11%) institutions with growing commitments from the Clean Technology Fund and the Least Developed Countries Funds (CLIMATE POLICY INITIATIVE, 2014). It must be noted that DFI's are the bigger contributors of climate finance for the extractive and oil & gas sector.

Private actors remain the largest source of global climate finance, and invested USD193 billion (58% of total flows) in 2013. In 2013 Sub-Saharan Africa received 4% of the total climate finance flow in line with the total amount collected in 2012. Figure 4 shows the distribution of climate finance across Mitigation, Adaptation, and REDD+, and suggests that although mitigation projects have received the most support, finance is also being directed to adaptation and REDD projects (Climate Funds Update, 2013) (Figure 4).







Figure 4 Thematic Distribution of Climate Funding (m\$) in Sub Saharan Africa – Year 2013

Of all mitigate finance, 78% went toward renewable energy while public investments in energy efficiency (10%) and sustainable transport (6%) made up most of the remainder.

The Global Environment Facility has been the longest standing source of finance for mitigation in the region and disbursed \$92 million. Actions that can be funded from Climate Funds that can be directly implemented by the Mining and Oil & Gas entities are:

- Industrial energy-efficiency improvements through the installation of more efficient equipment, changes in processes, reduction of heat losses and/or increased waste heat recovery
- Waste heat recovery improvements
- Reduction of GHG emissions resulting from industrial process improvements and cleaner production (e.g. cement, chemicals)
- Carbon capture and storage projects (including enhanced oil/gas recovery)
- Reduction of gas flaring or methane fugitive emissions in the oil and gas industry
- Coal mine methane capture
- Systems for monitoring the emission of greenhouse gases
- Energy audits for energy end-users, including industries systems

Important funds that have been useful for climate change adaptation that are relevant to the current assessment are

- The Least Developed Countries Fund (LDCF) under the Global Environment Facility (GEF for National Adaptation Programme for Action, early warning systems, mainstreaming climate change
- The Global Climate Change Alliance (GCCA) is a European Union initiative that focuses on Least Developed Countries and Small Island Development Statesmainstreaming climate change
- The Special Climate Change Fund (SCCF) and Millennium Development Goal Fund (MDG- Environmental and adaptation mainstreaming
- The Pilot Program on Climate Resilience (PPCR), part of the World Bank's portfolio of Climate Investment Funds (CIFs)- infrastructure resilience, climate resilience in general

The African Development Bank (AfDB) is a major player in climate finance in Sub Saharan Africa being also an implementing partner in the Climate Investment Funds (CIFs) together with the World Bank; the AfDB has proposed a separate "Africa Green Fund," as a way to



deal with the current lack of climate finance on the continent, with some support from a number of African governments and regional institutions such as the African Union. The relationship of such a Fund with the future Global Climate Fund is still unclear. This development warrants reflection in light of the status of climate-related policies, sector strategies and implementation capacities at the AfDB. Although its lending for renewable energy and energy efficiency is increasing. The AfDB is still in the earliest stages of incorporating climate risk into its portfolio as well as of its Climate Risk Management and Adaptation Strategy.

The African Development Bank in partnership with the African Union, NEPAD and UNDP launched the SE4All Africa Hub in 2013, and is actively supporting African partner countries with the development of SE4All Country Action Agendas and Investment Prospectuses to attract financing. El sector may benefit from financing targeted at the energy efficiency goal. At general level a major barrier to investment in climate finance for African countries is the transaction costs of small-scale projects that are often required in the poorest areas and for the benefit of the poorest, most vulnerable population groups, such as women and Indigenous Peoples.

It is an immense challenge to design and implement programs in ways that are financially viable, and can also be scaled-up and replicated. This challenge is further compounded by the poor investment climate in many African countries, the weak capacity of government institutions to manage finance, political instability and governance problems. In this context direct access to climate finance may help reduce the transaction costs associated with projects that presently involve a large number of intermediaries. Direct access, however, demands that national institutions have the capacity to meet fiduciary standards and manage and spend this money well.

The EI entities will require capacity to develop carbon offset and adaptation projects. This can be funded through climate funds. The funds could play a role to reduce the risks and transaction costs associated with developing and implementing carbon-offset and adaptation projects. Accessing the funds will be through development of projects that qualify for the climate funds e.g. adaptation projects for Adaptation Fund. The country governments facilitate access to other funds, such as for GEF.

The provision of a proposed Climate Fund is described in the recommendations detailed in Section 5 below.





Potential support areas

5.1 **Proposed Interventions Areas and Expected Results**

Our team has analysed a number of possible interventions both deduced and proposed by the stakeholders consulted and arrived at a number of pillars under which the DFID Climate Change Programme for the extractive industry could entail.

The team found out that study countries are revising or developing environmental and climate change, energy policies with the consciousness to update the policies and subsequently legislate to capture the contemporary environmental and climate change issues that need to be addressed. The study countries are mainstreaming climate change in their national development plans and strategies that are due for revision. All these offer opportunities to tailor make climate change plans and strategies relevant for the EI sector. It is also an opportunity to persuade key coordinating organizations like the Chamber of Mines and its members to adopt harmonized climate change policies that can facilitate development and implementation of a common compliance mechanism. Support is therefore required to strengthen planning, policy/legal frameworks that embrace the EI sector.

In the consultation with EI companies, it was clear that they understand environmental impacts but cannot separate out what could be considered as climate change impacts. This is an area that is also fuzzy for some government departments. It became clear that some level of awareness building would be helpful to make both government and mining companies capable to define their adaptation measures. Such awareness is also required at the level of the Chamber of Mines. In addition, some government departments cannot clearly articulate what they mean by climate change mainstreaming. A clear distinction will pave way for budgeting for climate change adaptation measures at both government and corporate level.

Capacity building requirements are recognized as necessary. These capacity building measure range from the capability to monitor and audit impacts by Departments of Mines and Environmental Management agencies to accounting for EI sector GHG emissions at both agency and mining houses level. With regard to this aspect, a harmonized accounting –life cycle analysis will be important to impart to the accounting and monitoring organizations. The ability to predict extreme weather events are considered crucial, particularly given the failure to provide hydropower in the study countries, and an early warning system is considered important to inform both mining and energy investment decisions in future. Other important data sets required include updated energy balance, forestry cover assessments around mines which can assist in GHG accounting (both emissions and abatement/reductions) and climate change adaptation measures.

In relation to the above assessment the emerging pillars and targets under which DFID support could be provided are as follows:



Emerging pillars

- 1. Support to development planning, policy and compliance frameworks
- 2. Awareness, sensitization and communication
- 3. Capacity building and institutional strengthening of systems, infrastructure and human resources
- 4. Information development and management
- 5. Facilitating the creation of a compliance mechanism

The areas that will require support towards establishing a compliance mechanism are presented below showing the rationale for the intervention, the nature of the intervention and the principal target group(s), the expected results and required inputs.

1. Support to de	velopment planning, policy and compliance frameworks
Rationale of the Intervention	Important planning that is currently lacking is how the EI sector will perform in the future considering the current slump in commodity prices. This also affects how governments will mainstream climate change for EI sector. There are many recent Environmental Acts that require regulations to be revised. Climate Change policies are being developed and will require legislation to implement the policies. There is an opportunity to capture credible international standards through these revisions and formulations of the legal frameworks, policies, regulations and guidelines that will comprise any compliance framework
Intervention and Principal Target Group(s)	Support scenario analysis on potential future production paths for mining and oil/gas considering global economic dynamics and likely changes in energy situation in the study countries and region. This will inform better future planning for both impacts of climate change and related GHG emissions by the El sector – <i>Government and Private Sector</i> Support the mainstreaming of climate change in National Development Plans with clear inclusion of what is expected from the El sector in form of required adaptation and mitigation plans. This is an opportune time as the NDPs are due for revision - <i>Government and Private Sector</i> Support the development of Climate Change Acts to operationalize the Climate Change Policies/strategies that are being finalized and facilitate/encourage a multi-stakeholder consultative approach to include the El companies who will be subject to regulation under the Acts - <i>Government and Private Sector</i> Support the institutional strengthening needed to implement the Climate Change Policies and Acts - <i>Government and Private Sector</i>
Results Expected	Projected future development of EI sector to guide how a compliance mechanism can be established and its impact into the future in terms of GHG reduction potential and economic impacts on the sector. Laying an important policy/legal/institutional foundation that both government and EI companies can relate to when implementing a compliance mechanism
Inputs Required	Financial resources for a study of global and national dynamics and how that will affect future developments in the EI sector of Southern Africa.



	Financial resources to support the development of appropriate legislative, policy, regulatory components of the compliance framework.						
	Financial support to relevant agencies to incorporate important aspects of the legal framework.						
	Technical assistance in the form of expert knowledge to guide the overall programme of support to development planning, policy development and implementation of the compliance frameworks.						
2. Awareness/sen	sitization/communication						
Rationale of the	The important market information about climate change impacts on the EI sector is not familiar to the companies and some cannot distinguish between environmental and climate change impacts hence for some, climate change impacts are not included in the company risk management practices. Governments also would like to mainstream climate change but often do not have dedicated budgets to deal with climate change.						
Intervention	Even international companies operating in the study countries do account for GHG emissions but not as their deliberate contribution to participate in addressing the climate change problem but rather to satisfy reputational requirements particularly in relation to achieving or retaining good share prices when listed on stock exchanges. The awareness is required so that companies understand that being responsible and reducing GHG emissions will make better business sense ¹²⁷ .						
Intervention and Principal Target Group(s)	Support for the creation and operation of a sustainable National Dialogue Forum that brings together all stakeholders to address environment and climate change issues related to the El Sector – <i>Government, Private</i> <i>Sector and Communities/NGOs.</i>						
Results Expected	 Creation of a platform for stakeholders to engage on how to create and successfully implement a compliance mechanism. Once they understand and appreciate the importance and business advantage of their participation, it is expected that companies will be willing to participate in the Dialogue Forum mechanism in a sustainable, meaningful and contributory way. 						
	Stakeholder engagement mechanisms (workshops, meetings communication tools) to identify and recruit the membership organisations for the Dialogue Forum e.g. Chamber of Mines and Government Ministries						
Required Inputs	Facilitated workshops to initiate the Dialogue Forum in the target countriesFollow up meetings and events with confirmed structures in the DialogueForum						
	Implementation of the Dialogue Forum's Communication Strategy and its associated Awareness Raising and Educational Programmes						
3. Capacity build human resource	ing and institutional strengthening of systems, infrastructure and						
Rationale of the	All stakeholders will be required to have attained the appropriate skills and capacity levels for their particular role in order to facilitate the successful introduction of collective compliance mechanism incorporating CC impacts, GHG accounting and reporting.						
Intervention	The Government agencies responsible for the monitoring and enforcement of a compliance mechanism covering environmental and climate change impacts and GHG emissions, should have the requisite capacity to do so. That is a combination of skills, equipment and systems that work well.						

¹²⁷ Carney's speech says it all



	Within the Corporate sector it is critically important that individuals and companies also have the capacity to assess climate change impacts and that this capacity extends to designing adaptation measures as well as the capacity for GHG accounting and the development of abatement measures at the corporate level.
	Support capacity building of environmental management agencies to monitor/audit and enforce regulatory framework concerning climate change impacts and GHG emissions. Capacity enhancement will also entail providing required systems and equipment for monitoring – <i>Government</i> .
	Support and build capacity for assessment of climate change impacts and related business risks on the EI sector - <i>Private Sector</i>
Intervention and Principal Target Group(s)	Support and build capacity for development and implementation of adaptation measures, including related baselines for climate change adaptation and costing methodologies - <i>Private Sector and Government</i>
	Support and build capacity for abatement costing of GHG mitigation measures that can guide determination of the GHG reduction potential in the EI sector - <i>Private Sector</i> .
	Support and build capacity for development of simplified and standardized baseline and monitoring methodologies for GHG emissions and reduction accounting – <i>Government and Private Sector</i> . ¹²⁸ .
Results Expected	Skilled stakeholders (government and private) that can ensure development and successful implementation of an appropriate compliance mechanism
Required Inputs	Technical assistance provided through training workshops for the critical personnel, supply of required monitoring equipment e.g. for pollution/emissions, noise levels etc.
4. Information deve	elopment and management
	There is a lack of readily available information to assist both governments
	support the development of methodologies that can simplify GHG accounting and reduction.
Rationale of the Intervention	In respect of climate change impacts, early warning of likely climatic events will better assist in designing climate resilient systems and infrastructure
	In the case of GHG emissions and abatement, Africa did not sufficiently utilize or fully benefit from standards such as CDM due to a lack of specialized skills in areas required for methodology and project development. This can be addressed and overcome by simplifying some aspects of effective methodologies to determine standardized emission factors and undertaking benchmarking with already known parameters.
Intervention and Principal Target	Support the development of an early warning system for extreme weather events (droughts and floods) that can better inform planning. This early warning system could be used for example in mine expansion designs and in energy investments - <i>Government and Private Sector</i> . ¹²⁹
Group(s)	Support the development of GHG improvement programmes that will provide high quality and reliable data, which can be consistently used by

Determination of grid emission factors will be one of tools that can be used to determine carbon offsets by all El companies using electricity from the grid <u>www.cdm.unfcc.int</u> This will be vested in the relevant government agencies and coordinated in collaboration with the 128

¹²⁹ Chambers of Mines



	El companies to determine their GHG emissions, and carbon offsets. Data capturing will be across a number of areas including, (i) data capturing along the value chains; (ii) forestry cover assessment around mines to simplify forest management carbon offset projects; (iii) up to date energy balance to show fuels/energy consumed by El sector to assist in computation of GHG emissions - <i>Government and Private Sector</i> .
Results Expected	El sector companies have a level of preparedness and the relevant data to allow them to design and implement climate resilient infrastructure and systems. This will also include a knowledge and awareness around the cost of adapting to climate change by the El sector.
	Uniform simplified and standardized methodologies that can be used in a compliance mechanism to account for emissions against permits and the GHG carbon-offsets.
	Technical Assistance for assessment of existing early warning systems and the introduction of components that are either missing or unsatisfactorily elaborated in the system e.g. a climate change modelling facility
Required Inputs	Financial resources for studies on value chain analysis, grid emissions factors and forest cover, the latter to support carbon sink projects
	Financial resources for establishment and operation of data collection systems such as the one required for energy balances
5. Facilitating the c	reation of a compliance mechanism
	when designing and implementing a new system, such as a compliance mechanism, there will be divergent ideas on how such a mechanism should be designed and implemented. There is the possibility that stakeholders will have vested interests (more of a reality than a possibility in the environmental and climate change arena associated with the EI sector). It can also be the case that certain stakeholders take steps to ensure that the mechanism is never developed.
Rationale of the Intervention	The whole process around environmental impact and climate change, just as in the UNFCCC Conference Parties (COP) arena, requires considerable negotiation skills to reach consensus and agreements. These high-level negotiations skills are critical for a successful compliance mechanism – but are not commonplace within government, private sector and NGOs.
	A cohort of people with high-level negotiation skills in government, business and in community/NGO sectors must be in place to negotiate a fair and robust agreement. These skills mean that there is maturity to the implementation of the agreement through the creation of workable systems and relationships.
Intervention and Principal Target Group(s)	Support to build capacity within government, the private sector and the NGO sector to design and negotiate agreements and reporting requirements on climate change mitigation and adaptation for El sector - <i>Government, Private Sector and Communities/NGOs</i> .
	data reporting, including format and information sharing <i>Government</i> , <i>Private Sector and Communities/NGOs</i> . ¹³⁰
Results Expected	A commonly agreed and jointly owned sustainable, fair and open compliance mechanism
	System that allows management of the compliance mechanism- on permits issued, registration of projects, issued permits and carbon offsets,

¹³⁰ likely to be managed by a coordination institution such as Chamber of Mines



	tracking allowance	issuance, es/permits. ¹³¹	transfer	and	cancellation/expiry	of	the
	Financial designing	resources for a robust com	or customiz	zed tra echanis	ining for negotiation m	skills	and
Inputs Required	Financial and comm	resources ar nissioning of a	nd technica an electron	I assis ic datal	tance for designing, base -	develo	ping
	Financial going ope	resources an erations and n	d technical	assista of the sy	ance for the implemer /stem	ntation	, on-

5.2 Required Resources

In arriving at the total budget important considerations are:

- 1. The number of countries where the initiative will be introduced.
- 2. Timeframe during which the support will be provided

The interventions proposed will be introduced at country level unless a regional forum is established at the outset. Participating countries can also be supported in groups for interventions such as capacity building. From the budget estimates for the inputs under each intervention, the **budget for three countries would be in the region of** \pounds 7,000,000 – \pounds 8,000,000.

The input resource allocations above are based on similar climate change programmes¹³² operating over periods of three years. The proposed programme could be created as a Strategic Climate Compliance Fund from which several interventions consistent with the activities described in the five pillars above could be supported. Using this type of model would allow it to be possible to disburse resources as required rather than commit the full Programme resources at one time. A Fund would allow for other contributors from the Donor community.

The range of budget cost have been estimated from the Strategic Climate Policy Fund that DFID set up to assist South Africa implement its Mitigation component of the National Climate Change Response Policy. The budget was GBP2.1million for a period of 20 months (December 2013 to August 2015) including of costs of a service provider that procured services and also managed the fund and service providers.



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The system could be developed through inclusion of inputs from the Dialogue Forum

Annex 1 Key Stakeholders Consulted in Study Countries

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Annex 2 Detailed El Structure in the Study Countries

A. ZAMBIA

Exploration and Mining Projects

The Four Major Copper Mines in Zambia

Where possible, projections of future production are included although not all companies provide details on future plans. It should be noted that the information provided below only briefly refers to the very recent events regarding power reductions (implemented by the government as of September 1, 2015) and does not take into account the effect of these on operations (production and staff levels) except where noted from information gained from stakeholder interviews.

1. First Quantum Minerals Ltd.

First Quantum was the first foreign entrant into mining in Zambia post-privatisation and when fully operational, its operations account for up to 30% of the government's total tax revenue. More details are provided below on the FQ operations (than the other mines) due to the sheer scale of its activities and its importance to the Zambian economy.

Kansanshi Mine¹³³:

The Kansanshi mine, the largest copper mine in Africa, is 80% owned by Kansanshi Mining PLC, a First Quantum subsidiary. The remaining 20% is owned by ZCCM-IH. The mine is located approximately 10 kilometres north of the town of Solwezi and 180 kilometres to the northwest of the Copper belt town of Chingola.

The mine has undergone several expansions since it began operating in 2005. From an initial production capacity of 110,000 tonnes of copper, Kansanshi is now (as of 2014) capable of producing 340,000 tonnes of copper and more than 120,000 ounces of gold per year. A multi-stage expansion project aims to increase copper output capacity to approximately 400,000 tonnes by 2015.

Mining is carried out in two open pits, Main and Northwest using conventional open pit methods and employing hydraulic excavators and a fleet of haul trucks. Ore treatment is flexible to allow for variation in ore type either through an oxide circuit, a sulphide circuit and a transitional ore "mixed float" circuit with facilities to beneficiate flotation concentrate to final cathode via the HPL circuit.

Sulphide ore is treated via crushing, milling and flotation to produce copper in concentrate. The expansion of the sulphide milling circuit was commissioned in late 2008 to maintain finished copper production as oxide ore is depleted and sulphide ore grades begin to fall as the mining horizon deepens.

Oxide ore is treated via crushing, milling, flotation, leaching and the SX/EW process to produce a sulphidic and gold bearing flotation concentrate as well as electro-won cathode copper.

¹³³ http://www.first-quantum.com/Our-Business/operating-mines/Kansanshi/default.aspx



Gold recovery by gravity was expanded by the addition of four new gravity concentrators in April 2010, thus providing two concentrators per milling train, and increasing gold recovery from all ore types. Gemini tables were installed to treat the gravity concentrates and produce a high-grade concentrate for direct smelting to gold bullion.

The company's plans to expand production capacity include a 60% in overall production capacity from 2012 to 2015; a 130% increase in oxide production capacity; and by 2017, a 90% increase in sulphide production capacity.

Sentinel Mine and Smelter¹³⁴

The Sentinel mine began commissioning within just 30 months of the start of full-scale construction in June 2012. This \$2 billion investment is the biggest single investment in Zambia in recent times and includes a mine that operates with technologically-advanced mining equipment, the largest milling trains in the world and a full-service town with over 1,200 houses. Sentinel's ramp-up will be correlated with available smelter capacity within Zambia. The mine is expected to produce between 150,000 and 200,000 tonnes of copper for the year and employ approximately 1,520 people.

The smelter is considered to be state-of-the-art and will produce near zero SO₂ emissions.¹³⁵ It produced its first anode in December 2014 after a 36-month construction period. When in full operation, the smelter is expected to process annually 1.2 million tonnes of concentrate to produce over 300,000 tonnes of copper metal. It is also expected to produce annually 1.0 million tonnes of sulphuric acid as a by-product which will benefit Kansanshi by allowing the treatment of high acid-consuming oxide ores and the leaching of some mixed ores. The additional acid is expected to optimize the expansion of the oxide leach facilities and allow improved recoveries of leachable minerals in material now classified and treated as mixed ore.

In February 2015, the smelter began the 2-week process to the first introduction of concentrate, full commissioning and ramp-up. Concentrate from both the Kansanshi and Sentinel mines will be treated at the smelter. Since that time, however, the smelter has had difficulty coming up to full capacity due to initial problems with the feedstock into the smelter. Currently, the government is imposing a 30% energy cut for all mines and this may cause a lay-off of some 2000 people at Sentinel. Government declared force majeure on power contracts due to low water levels in the Kariba Dam. The company is currently revising processing plans and outputs due these reductions. All available energy is now going toward acid off-take. Sentinel has graphite that can be gasified and burning waste would produce 100 megawatts. However, this would require a capital investment of \$650m and the company does not believe that Zambia has a sufficiently attractive investment climate for this level of investment at the moment. It is more likely that First Quantum will develop a coal project in Botswana for additional energy source.¹³⁶



¹³⁴ http://www.first-quantum.com/

¹³⁵ Interview with First Quantum, Lusaka, September 25

¹³⁶ As above.

2. Konkola Copper Mines Ltd (KCM)¹³⁷

KCM is a copper mining company owned by Vedanta, an Indian company – 79%, with 21% owned by ZCCM-IH. It has four units of fully integrated operations. It has underground and open pit operations including mining, concentrators, tailings facilities and smelters. Last year it produced 116 000 tonnes of copper (Grade A LME level) which was lower than the previous year. This year (2015) production is ramping up slowly – the company is only producing about 50% of concentrate that the smelter can handle.¹³⁸

About US\$1.5 billion has been invested in the project. The infrastructure upgrade of the project is at the completion phase, and as noted, KCM is now focusing on mine development to support the ramp-up of production. The company has also commissioned a state-of-theart smelter, one of the largest in Africa and one of the top three in the world in terms of sulphur dioxide capture. The company's other investments include three new concentrators, an upgraded refinery and tailings leach plant, and significant upgrades across the mine to reduce its legacy environmental footprint. Over 5,000 jobs were created during the construction phase of this investment.

The Nchanga mining operations are situated in the vicinity of the town of Chingola. Primary copper and cobalt are mined here through both underground and open pits. In Nampundwe, there is an underground pyrite mine and concentrator. These are located in the Central Province of Zambia, approximately 50 kilometres west of Lusaka. The company has already extended the life of various mines in Nchanga, which had 3 to 8 years left in 2004. Through exploration investment KCM has extended the life span of these mines by a further 10 or more years.

3. Barrick Gold Africa¹³⁹

Barrick Gold Corporation is a Canadian company listed on the Toronto TSX stock exchange. It acquired the Lumwana mine from Equinox Minerals Ltd. In 2011, Lumwana is located in Zambia's North-western Province and supports approximately 4,000 direct jobs. The mine is a major driver of the provincial economy, purchasing close to \$400 million in goods and services from Zambian suppliers last year and supporting a range of community projects in education, literacy, health care and training.¹⁴⁰

In 2014 the mine produced 214 million pounds (97,000 tonnes) of copper at costs of \$2.76 per pound. The mine had 3.3 billion pounds of proven and probable copper in reserves as of December 31, 2014. Production is anticipated to be 250-270 million pounds at costs of \$1.90-\$2.15 per pound in 2015. Lumwana ore, which is predominantly sulphide, is treated through a conventional sulphide flotation plant, producing copper concentrate for smelting.

In December, 2014, Barrick announced that the company would initiate procedures to suspend operations at the Lumwana copper mine in Zambia following the passage of legislation that raised the royalty rate on the country's open pit mining operations from six percent to 20 percent. The new taxation regime, which was expected to go into effect on January 1, 2015, eliminated corporate income tax, but imposed a 20 percent gross royalty on revenue without any consideration of profitability. Given these substantial new costs, the company stated it was forced to initiate the process of suspending operations at Lumwana. In a statement to the press, the company noted that despite progress made to reduce costs

¹⁴⁰ http://www.barrick.com/investors/news/news-details/2014/Barrick-to-Suspend-Operations-at-Lumwana-Following-Passage-of-New-Mining-Royalty/default.aspx



¹³⁷ http://kcm.co.zm/our-operations/mining

¹³⁸ Interview with KCM, Lusaka, September 27

¹³⁹ http://www.barrick.com/operations/zambia/lumwana/

and improve efficiency at the mine, the economics of an operation such as Lumwana cannot support a 20 percent gross royalty, particularly in the current copper price environment. ¹⁴¹

Zambian President Edgar Lungu ordered finance and mining ministers to reformat the new royalty regime by April of this year.¹⁴² The government has since pulled back from this so-called "supertax" and has re-instated the tax regime in place in 2014 before changes were announced (with some modifications).

4. Mopani Copper Mines (Glencore)

Mopani Copper Mines PIc is an integrated copper and cobalt producer that is owned by Carlisa Investments Corporation, a joint venture company registered in Zambia comprising Glencore International AG (73.1%), First Quantum Minerals Ltd (16.9%) and ZCCM Investment Holdings (10%). Production in 2014 was about 110,000 tonnes.

Recently, Mopani announced the construction of a new \$320m shaft and associated infrastructure to be constructed at its Synclinorium project. The new shaft will significantly boost production and extend operations well beyond the current depletion dates.¹⁴³. This will lead to securing of about 3 000 jobs which would otherwise have been lost as a result of closure of some mines beginning in 2015. Apart from securing the jobs, the new shaft will provide Mopani with access to some 115 million tonnes of ore.¹⁴⁴

However, Glencore Plc announced early in September 2015 that it will suspend production at Mopani and Katanga mines in Zambia and the Democratic Republic of the Congo respectively for 18 months. During this time the company will build new processing facilities that will lower output costs.

This decision is expected to affect thousands of jobs. Currently, around 20,000 people work at Mopani (9,000 employees and 11,000 contractors). The company has outlined a \$10 billion debt- reduction plan and stated that it proposes to sell about \$2.5 billion in new shares and assets valued at as much as \$2 billion. It will also suspend dividend payments.¹⁴⁵ Talks with government were announced shortly after the press release issued by Glencore about the closure.

Mopani Copper Mines Plc (MCM) has invested over K10 billion (\$5 billion) in its mining and smelting operations in Kitwe and Mufulira. In March, 2014, the company completed a multiyear smelter upgrade project at our Mopani copper mine in Mufulira, Zambia at a cost of US\$500 million.

Since its construction in 1937, the plant had been emitting SO_2 freely into the atmosphere, with a significant effect on local air quality. At the time of the company's acquisition of the Mopani assets in 2000, it committed to upgrading the smelter and addressing the SO_2 emissions.

Phase one was completed in 2007; this involved replacing the existing electric furnace and constructing an acid plant: this stage brought the percentage of emissions captured to 50%. The second phase saw two bigger anode furnaces and twin anode casting wheels installed; it began operations in 2009. The final phase was to install three larger converters, a range of advanced gas handling equipment and a second acid plant. After this was completed, the smelter began ramping up to full production in April 2014.

¹⁴⁵ https://www.lusakatimes.com/2015/09/08/glencore-suspends-operations-at-mopani-and-katanga-mines/



¹⁴¹ As above

¹⁴² http://www.mining.com/barrick-keep-operating-zambia-lumwana-mine/

¹⁴³ http://www.zccm-ih.com.zm/index.php?option=com_content&view=article&id=78&Itemid=79

http://www.reuters.com/article/2015/09/10/zambia-mining-glencore-idUSL5N11G27U20150910

The company states that it now capture 95% of Mopani's sulphur dioxide (SO₂) emissions, contrasting significantly with the situation when the asset was acquired in 2000, with no gas or dust emissions captured.¹⁴⁶

The table below provides an overview of the mining sector in Zambia. Details on smaller producers are consolidated below with the larger companies.

http://www.glencore.com/sustainability/case-studies/p/mopani-smelter-project



¹⁴⁶

Table 1 Mining Sector Overview Sourced from ICCM: Enhancing Mining's Contribution to Zambia, 2014

Mining company	Owner	Type of operation	Location of main facilities	Annual capacity (metric tonnes)
Lumwana Mining Company	Barrick, 100%	Ore and concentrate	Lumwana mine (Malundwe pit)	20,000,000 ore
Kansanshi Mining	First Quantum Minerals, 79.4%, and ZCCM-IH, 20.6%	Ore and concentrate	Kansanshi mine, north of Sotwezi	12,000,000 sulphide ore, 8,400,000 mixed ore, 6,100,000 axide ore
		Metal	Kansanshi high-pressure leach and solvent extraction-electrowinning plant	250,000 copper cathode
Konkola Copper Mines	Vedanta Resources, 79.4%, and ZCCM-IH, 20.6%	Ore and concentrate	Chingola open pit A and Nchanga open pit, Chingola	4,500,000 ore
			Nchanga underground mine, Chingola	2,800,000 ore
			Konkola mine, Chililabombwe	2,400,000 ore
			Fitwaola open pit, Chingola	n/a
			Tailings dams reprocessing, Chingola	n/a
		Metal	Tailings leach plant at Chingola	80,000 copper cathode
			Nchanga copper smelter, Chingola	311,000 copper anode (blister copper), 3,000 copper-cobalt alloy
			Nkana copper refinery, Kitwe	300,000 copper cathode
Mopani Copper Mines	Glencore International AG, 73.1%, First Quantum	Ore and concentrate	Nkana mine, including various underground and open pit operations	5,500,000 ore
	Minerals, 16.9% and ZCCM-III, 10%		Mufulira mine	2,500,000 ore
	2004 11, 10%	Metal	Mufulira in situ leach and solvent extraction-electrowinning plant	17,000 copper cathode
			Mufulira (Isasmelt) smelter	200,000 copper anode
			Mufulira refinery	275,000 copper cathode
			Nkana solvent extraction plant	15,000 copper cathode
			Nkana cobalt plant	2,400 cobalt metal
First Quantum Mining and Operations	First Quantum Minerals, 100%	Metal	Bwana Mkubwa solvent extraction-electrowinning plant, near Ndola	52,000 copper cathode
CNMC Luanshya Copper Mines	NFC Africa Mining, 100%	Ore and concentrate	Baluba underground mine	1,800,000 ore
NFC Africa Mining	China Nonferrous Metal Mining (Group) Company, 85% and ZCCM-IH, 15%	Ore and concentrate	Chambishi mine	900,000 ore
Chambishi Copper Smelting Company	China Nonferrous Metal Mining (Group) Company, 60% and Yunnan Copper Industry (Group), 40%	Metal	Chambishi copper smelter	150,000 copper anode (blister copper)
Sino-Metals Leach Zambia	China Nonferrous Metals Mining (Group) Company, Sino-Africa Mining Investments, NFC Africa Mining and China Hainan Construction Company	Metal	Chambishi	8,000 copper cathode
Chibuluma Mines	Metorex, 85%, and ZCCM-IH, 15%	Ore and concentrate	Chibuluma South mine, 12 kilometres west of Kitwe	600,000 ore
Sable Zinc Kabwe	Metorex, 100%	Metal	Sable copper leach and electrowinning plant at Kabwe	14,000 copper cathode, 600 cobalt carbonate
Albidon	Jinchuan Group Resources Holdings	Ore and concentrate	Munali nickel mine in Mazabuka, about 60 kilometres south of Lusaka	about 1,200,000 ore
Chambishi Metals	Eurasian Natural Resources Corporation, 90% and ZCCM-IH, 10%	Metal	Chambishi cobalt plant	27,000 copper cathode, 3,400 cobalt metal
Lubambe Copper Mine	African Rainbow Minerals, 40%, VALE SA, 40% and ZCCM-IH, 20%	Ore and concentrate	Lubambe underground mine, north of Chililabombwe	2,500,000 ore (commenced operations in latter half of 2012 and ramping up towards full production)



Key Exploration Activities¹⁴⁷

The following represent the key exploration activities that were reported in the Zambia EITI Reconciliation Report, 2013. An update of these activities will be included in the Scoping Study's Final Report, where appropriate.

1. Copper and Cobalt

A number of companies were involved in copper/cobalt exploration activities including Blackthorn Resources Ltd. of Australia. It completed a scoping study of the development of the Kitumba prospect as an open pit mine. Blackthorn also completed a drill programme at the Mumbwa project. Caledonia Mining Corporation of Canada completed a drill programme on the Nama cobalt and copper prospect in the Chililabombwe/Solwezi District in the north of Zambia.

Caledonia planned to mine and mill about 30,000 metric tons per month of ore initially, and to produce cobalt oxide concentrate. Caledonia also agreed to begin copper production in early 2015.

2. Manganese Prospects

Manganese ore is produced primarily by small-scale operations near Mansa in Luapula Province and Mkushi in Central Province. Kaboko Mining Ltd. continued exploration at the Emmanuel project, which included the Brunelli prospect, the Chowa Mine prospect, and the Kapumba prospect; the Kanona project; and the Northern Manganese project (formerly the Peco project) near Mansa. The Zamanco Minerals Ltd. of Australia (formerly Atticus Resources Ltd.) completed the acquisition of Zamanco Holdings Ltd. of Mauritius, which held interest in two Zambian companies—Zamanco Minerals Ltd. (100% equity interest) and Zamanone Mining Ltd. (75% interest). In 2013, Zamanco continued work on the Serenje manganese project.

3. Uranium

In Zambia, uranium deposits are available in various geological environments. Uranium oxide (UO) production in Zambia has been limited to only 120,000 kilogrammes, from the Nkana mine from 1957–59. Since then, many companies have carried out explorations, focusing on potential mineralisation in Karoo Age sediments, the Copperbelt and the Domes region of the North Western Province.

In 2011, Denison Mines Zambia Ltd., which is a subsidiary of Denison Mines Corp. of Canada, completed a 9,600-m drill program on the Dimbwe East prospect of the Mutanga project.

4. Coal

Sinazongwe coal project African Energy Resources Ltd. of Australia reported the occurrence of coal in water wells in the Kariba Valley. In January 2012, African Energy completed a drill programme to evaluate the coal occurrence (African Energy Resources Ltd., 2012, p. 6)12.

Recommissioning of Maamba mine. In 2009, Singapore's Nava Bharat Pte acquired a 65% share in Maamba Collieries, Zambia's largest coal producer. In 2011, Nava Bharat established a plan to start the construction of a 300MW coal-fired power plant in Zambia that

¹⁴⁷ http://www.zambiaeiti.org/index.php/ct-menu-item-13/zeiti-2013-reconciliation-final-report-18-12-2014



was to be completed by 2014. The investment for the first phase of the project, a new coal mine and the power plant, was projected to be around US\$750 million. The new mine is expected to produce 360,000 metric tons of coal in its first year of operation, and is expected to reach a maximum output capacity of 2 million metric tons of coal per year.

5. Gold Prospects

Luiri Hill gold project, Luiri Gold Ltd. of Australia completed a scoping study for the development of the Dunrobin prospect and started a scoping study for the development of the Matala prospect. Luiri Gold also announced an initial measured resource estimate for the Dunrobin prospect.

Oil and Gas Projects

According to the Ministry of Mines Energy and Water Development (MMEWD), through the Geological Survey Department, to date 16 companies were awarded 25 Oil and Gas Exploration Blocks. These companies are presented in the Table below:

Petroleum Company	Block
Barotse Petroleum Company Ltd	20 - 21
Exile Resources Inc	26
Metprosol / Frontier	34
Petrodel Resources Limited	17
MAJETU	13
Rapid African Energy Holdings	31
Terralinna (Z) Limited	24-38
Mafula Energy Limited	32
Gapex Resources Limited	7
ZCCM Investment Holdings PLC	1 - 4 - 6 - 10
Mineks Zambia International	27
Chat Milling	5
Rift Petroleum	40-41
Troisade Energy	8
SOGECOA	39-43
BOWLEVEN Oil and Gas	25 - 28 - 29

Table 6 Petroleum Companies Holding Licensing to Blocks of Oil and Gas in Zambia

To date, there have been few results from exploration activities. No reserves have been quantified and no drilling has yet taken place. There are controversial issues relating to oil and gas development as many of the expected reserves are located beneath wildlife reserves.¹⁴⁸

Medium to Large Scale Mining Projects in Malawi

Interview with Ministry of Mines, Energy and Water Affairs Senior Official, August 26



- 1. Kayelekera: Located in Northern Malawi and owned by Paladin, Mining Ltd., an Australian company listed on Canadian and Australian stock exchanges. A Development Agreement was signed with the Malawian government and the company's Malawian subsidiary Paladin Africa Ltd. In 2007. The Agreement included the awarding of a Mining Licence (ML 152) covering 5,550 hectares, which was granted for a period of 15years. The company's share is 85% and the government of Malawi has retained 15% stake in the project. The project operated between 2009 and 2014 and was the largest scale investment in the mining sector to date in the country.¹⁴⁹ The company went on care and maintenance status in 2014, and in August 2015 announced the cessation of its exploration activity.
- 2. Kanyika Mine: The other most significant mining project that is in play at the current time is the Globe Metals and Mining (Australia) Niobium Kanyika mine. The project is located at Kanyika in the Northern Region district of Mzimba. It is owned by ASX listed Africa-focused firm Globe Metals and Mining. Globe Metals and Mining has successfully completed field exploration work with a bulk sampling programme. The firm is now ready to invest US\$400-million to start mine construction at the site. However, negotiations for a development agreement with the Malawi Government are still ongoing. The company announced last year that some 1200 positions would be created when the mine is opened.¹⁵⁰
- 3. Songwe Hill Rare Earth Project¹⁵¹: Owned by UK firm Mkango Resources Ltd that is listed on Canada's TSX Venture Capital Exchange. Mkango has announced positive results of a pre-feasibility study of the project. The results have indicated that the deposit has a net present value of US\$293- million with an 18-year mine life. The study results have positioned Malawi globally as a potential sustainable rare earth producer. Mkango is intending to launch a definitive feasibility study for the project with mine construction scheduled for 2017. Mkango earlier announced a metallurgical flow sheet that produced high grade products from a proof of concept test work. The rare earth elements recovered in the process included lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium and yttrium.
- 4. Shayona Cement Expansion Project: The project involves setting up of a new state of the art plant at Shayona Cement Kasungu Factory increasing mined quantities for limestone at the company's Livwezi and Chikowa deposits located close to the factory. Shayona Cement Corporation has invested US\$65-million in the project, which is being implemented in phases. The first phase will see production of cement increasing to 650 tonnes before it reaches 1200 tonnes in the second. Touted as a "model project for Malawi", the project uses over 80% of raw materials sourced locally while other cement companies continue to import limestone. As part of its corporate social responsibility programming, Shayona Cement which employees about 1200 mostly local staff, is reconstructing a nearby primary school and is also assisting the operations of a local clinic and a police station.
- 5. Tengani Titanium Project: The project located at Tengani in the southern lower Shire Valley district of Nsanje is owned by a locally registered firm, Crown Minerals Limited. The firm is involved in metallurgical test work, and has involved international experts to execute the studies. Work so far has indicated that the deposit contains

¹⁵¹ Information for projects 3-8: http://mininginmalawi.com/2015/01/27/malawis-top-mineral-sector-projectsof-the-year-mining-review-january-2015/



¹⁴⁹ https://mininginmalawi.files.wordpress.com/2015/07/2015-06-actionaid-an-extractive-affair.pdf

¹⁵⁰ http://mwnation.com/kanyika-niobium-project-create-1-200-jobs/

rutile, and ilmenite and apatite with minor zircon. Metallurgical work continues to determine how the important industrial minerals from the site could be recovered.

- 6. Nkhachira Coal Mining Project: The project is owned by Malcoal Mining, which is a joint venture firm between ASX listed Intra Energy Corporation and Malawi's Consolidated Mining Limited. It is located at Nkhachira close to the Kayelekera area in Northern Malawi. Further exploration at the mining site has upped a combined total in situ coal resource for the project to 38.4 million tonnes comprising 10.1 million tonnes Measured, 13.8 million tonnes Indicated and 14.4 million tonnes Inferred category coal.
- 7. Mchenga Coal Mine: The mine located in the 90 square kilometers Livingstonia Coalfield in Northern Malawi is owned by local investors after the government privatized it in 1999.

Mchenga Coal Mine produces 3,000 tonnes of coal per year helping to meet the growing energy demand for the local industry. The company is also helping the country serve the much need foreign exchange through import substitution, and generates foreign exchange for the country through export of duff coal, which has no market locally. The firm has planned to undertake further exploration at the site to increase its production capacity starting from June 2014. The firm is also actively seeking to raise capital externally by roping in a foreign strategic partner.

8. Mulanje Mountain Rare Earth Project: The project located at Mulanje Mountain' s Chambe Basin is owned by Springstone Limited, a joint venture between Canada' s Gold Canyon Resources and Japan Oil, Gas and Metals National Corporation. Springstone started its exploration work in 2011, and the work involved an exploratory drilling programme that came up with encouraging results. Springstone has completed field work at the site and is conducting a mineral resource calculation and economic analysis of the project including an infrastructure survey. Additional research and development work continues to seek the optimum rare earth element leeching process.

B. MALAWI

Current Status of Mining and Exploration Licenses in Malawi

There are 58 mining licenses currently in the mineral data base managed by the Malawi Mining Commissioner's office. Of these, only 29 are active, others have progressed slowly or show little activity. More than 50% represent industrial minerals. The larger-scale mining companies are mainly involved in uranium, titanium, cement production, and rare earth projects.

Details on the current status of **fully active** mining licenses are provided below. The status of other licenses is described by the Department of Mines as either little activity, slow progression or inactivity.

The exploration sector is moderately active, with some 83 exploration licenses (EPLs) currently awarded. Exploration is being undertaken in industrial minerals, base metals, gold, platinum, rare earths and uranium. However, only about 20% of these licenses are considered active. The decline in activity in both mining and exploration is credited to the low commodity cycle and the slowing of growth in the Chinese economy. The domestic market is still providing potential for industrial and carbon minerals.



Type of Mineral	Number of Licenses	Number of Fully Active Licenses
Rock Aggregate	27	15
Apatite/Rock	1	1
Phosphate		
Limestone	11	7
Coal	12	4
Gemstones		
(Corundum, Ruby,	1	1
Sapphire)		
Iron Ore	1 (EIA Study Stage)	0
Uranium	1	0
Rare Earth	1	0
Graphite and Galena	2 (one at EIA Study Stage)	1
Titanium	1	0

Table 7 Chart of license database (Mining Commissioner, Malawi Mining Department)

Key Oil and Gas Exploration Activity in Malawi¹⁵²

The details below refer to the status of license holders prior to the government's decision (2015) to revoke these licenses pending review.

- 1. Block 1 Oil Exploration: The project is owned by a South African firm (SacOil Holdings) and involves exploration in Malawi's biggest block located in the Northern Region bordering Tanzania and Zambia. SacOil has completed an environmental risk screening study of the prospecting area. The firm engaged independent consulting firm Golder Associates to conduct the study. The aim of the study was to provide a basis for more detailed environmental and social follow-up and exploration planning. It will also help in the development of a geographic information system geodatabase of the exploration area to assist in the planning of the exploration programme and to support decisions related to environmental, social, technical risks and overall logistics of conducting operations in the area.
- 2. Block 2 and 3 Oil Exploration: The project is owned by an UAE firm Hamra Oil, and entails oil exploration in blocks 2 and 3 located in the northern part of Lake Malawi. Hamra Oil has completed initial environmental and social impact assessment studies at the exploration site. The process has involved public consultations that have also been finalized. Hamra has, therefore, kick-started the exploration programme beginning with an airborne gravity, magnetic and full tensor gravity survey. It also includes a two-dimensional seismic survey (an exploration method used to create a map of the structures beneath earth's surface) that will last up to two years. The seismic survey will be undertaken from a vessel or a combination of two vessels serviced by a support boat. Depending on the results of this initial survey, Hamra Oil Holdings will undertake another EIA in order to continue with its exploration work to drilling stage.

¹⁵² http://mininginmalawi.com/2015/01/27/malawis-top-mineral-sector-projects-of-the-year-mining-reviewjanuary-2015/


- 3. Block 4 and 5 Oil Exploration: The project located in the Southern part of Lake Malawi along the Great African Rift System is owned by a UAE oil firm, RAKGAS. The giant oil firm is undertaking preliminary exploration works at the site and this is similar to government's airborne geophysical survey in terms of impact on the sensitive Lake Malawi environment.
- 4. Block 6 Oil Exploration: The block located further South in Malawi's Rift system is owned by Pacific Oil and Gas. Pacific Oil is part of Vega Petroleum Limited—the privately owned oil and gas entity that has oil producing and exploration concessions in Egypt. The oil firm is undertaking preliminary exploration works and this is also similar to government's airborne geophysical survey which has no affect whatsoever, on the sensitive Lake Malawi environment.





Figure 5 Blocks awarded under the Petroleum (Exploration and Production) Act of 1983 (Citizens for Justice, Oil Exploration and Production in Malawi: Policy and Legal Audit, 2012)



Extractive Industries progression in Mozambique Hydrocarbon Area

 2000 - Various projects (coal, heavy sands, precious metals, base metals, ferrous metals, graphite, limestone, diamonds, bentonite, phosphates, mineral water, building materials) which evolved to the stage of the projects mentioned above 2002 - Signing of the Mining Contract for the Moma Heavy Sands with KENMARE MOMA MINING (MAURITIUS), LDA 2007 - Signing of the Mining Contract for the Moatize coal with VALE 2007 - Start of production at the Moma Heavy Sands undertaken by KENMARE MOMA MINING (MAURITIUS), LDA 2009 - Signing of the Mining Contract for the Benga coal with RIO TINTO 	 2000 - Signing of agreements with SASOL for the production and transport of the natural gas of Pande and Temane 2005 - Start of operations of the Ressano Garcia-Matola gas pipeline by ENH/CMG 2009 - Discovery of natural gas in the Mozambique Basin (onshore blocks 16 & 19) by SASOL 2010 - Discovery of three fields of natural gas offshore in Area 1 of the Rovuma Basin by the Area 1 concessionaries 2010 - Technical occurrence of petroleum in the Rovuma Basin identified by ANADARKO
2011 - Signing of the Mining Contract for the	2011 - Discovery of a field of natural gas in Area 4 of the Rovuma Basin by ENI
Changara coal with JSPL 2011 - Granting of the mining concessions for gold in Manica for the mines of Dot's Luck, Andrade, Guy Fawkes, Fair Bridge and Boa Esperança 2011- Start of large scale coal mining at the Moatize coal mine by VALE	 2013 - Project for Distribution of Natural Gas in Maputo/Marracuene by ENH 2014 - Memorandum of Understanding between the National Petroleum Institute (INP) and the Tanzania Petroleum Development Corporation (TPDC) 2014 - Approval of the Gas Master Plan
2012 - Start of large scale coal mining at the Benga coal mine by RIO TINTO	

