



Mozambique

mobilizing extractive
resources for development



Mozambique: Extractives for Prosperity, Volume II

Capstone Report:

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Abbreviations

ADIA	Abu Dhabi Investment Authority
AICD	Africa Infrastructure Country Diagnostic
ANE	Administração Nacional de Estradas
ARTC	Australian Rail Track Corporation
ASM	Artisanal and Small-scale Mining
AT	Administrative Tribunal
BAGC	Beira Agricultural Growth Corridor
BBOP	Biodiversity and Business Offset Program
BSEE	Bureau of Safety and Environment Enforcement
BTU (MMBtu)	British Thermal Unit (Million BTUs)
CCEP	Central Public Ethics Commission
CEDAW	Convention on the Elimination of all Forms of Discrimination Against Women
CEP	Central Ethics Commission
CESUL	Projeto Regional de Transporte de Energia Centro-Sul
CFM	Caminhos de Ferro de Moçambique
CLIN	Corredor Logístico Integrado do Norte
CoM	Council of Ministers
CONDES	National Council for Sustainable Development
CRC	Convention of the Rights of the Child
CRVP	Commission for Receipt and Verification
DMP	Government of Western Australia Department of Mines and Petroleum
DNAC	National Directorate for Conservation Areas
DNM	The National Director of Mines
DOI	Department of Interior
EDM	Electricidade de Moçambique
EFC	Estrada de Ferro Carajás
EFVM	Estrada de Ferro Vitória a Minas
EIA	Environmental Impact Assessments
EITI	Extractive Industry Transparency Initiative
EMIS	Environmental Management and Information Systems
ENH	Empresa Nacional de Hidrocarbonetos (National Hydrocarbon Company)
EPCC	Exploration and Production Concession Contract
ESI	Estimated Sustainable Income
eSISTAFE	electronic State Financial Administration System
EU	European Union
FDI	Foreign Direct Investment
FPSO	Floating Production Storage and Offloading Vessels
FUNAE	Fundo de Energia
GAP	The World Bank's Gender Action Plan
GAPP	Generally Accepted Principals and Practices
GCCC	Central Office for Combating Corruption
GCPV	Central Victim Protection Office
GDP	Gross Domestic Product
GGFR	Global Gas Flaring Reduction partnership
GTL	Gas-to-Liquids
G 19	Group of 19 Partners for Program Aid
HCB	Hidroeletrica de Cahora Bassa
HDI	Human Development Index

HVCC	Hunter Valley Coal Chain
ICCPR	International Covenant on Civil and Political Rights
ICSID	International Centre for the Settlement of Investment Disputes
ICT	Information and Communication Technology
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IGF	Inspector-General of Finance
IIED	The International Institute for Environment and Development
ILO	International Labor Organization
IMF	International Monetary Fund
INP	Instituto Nacional de Petroleo (National Petroleum Institute)
IOC	International Oil Company
IPEC	International Programme on the Elimination of Child Labour
IRR	Internal Rate of Return
IUCN	International Union for the Conservation of Nature
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MCE	Maputaland Centre of Endemism
MDGs	Millennium Development Goals
MICOA	Ministry of Coordination of Environmental Affairs of Mozambique
MINAG	Ministry of Agriculture
MIREM	Ministry of Mineral Resources of Mozambique
MML	Minas Moatize Limitada
Model EPCC	Model Exploration and Production Concession Contract
MoF	Ministry of Finance
MP	Members of Parliament or National Assembly Deputies
Mtpa	Million-tons-per-annum
NBSAP	National Biodiversity Strategies and Action Plans
NEMP	National Environmental Management Plan
ODAMOZ	Overseas Development Assistance (Database) for Mozambique
ODI	Overseas Development Institute
OECD	Organization for Economic Cooperation and Development
OHCHR	UN Office of the High Commissioner for Human Rights
PAH	Polycyclic, aromatic and hydrocarbons
PARP	Republic of Mozambique Poverty Reduction Action Plan 2011-2014
PCI	Pulverized Coal Injection
PFCC	Petroleum Fund Consultative Council
POM	President of the Republic of Mozambique
PSSA	Particular Sensitive Sea Areas
PSC	Production Sharing Contract
SASOL	South Africa Synthetic Oil Liquid
SAIEA	Southern African Institute for Environmental Assessment
SEA	Strategic Environment Assessment
SIDA	Swedish International Development Cooperation Agency
SME	Small-and-Medium-sized Enterprise
SOE	State-Owned Enterprise
SPA	Sales and Purchase Agreement
SWF	Sovereign Wealth Fund
Tcf	Trillion cubic feet
UNCLOS	United Nations Convention On the Law of the Sea
WHO	The World Health Organization
WWF	World Wildlife Fund

Executive Summary

The development of Mozambique's significant mineral and hydrocarbon reserves has the potential to generate substantial wealth and prosperity for the country. The magnitude of possible benefits for Mozambique has powerful implications for one of the poorest nations in the world. It is up to the Government, and the people of Mozambique, to decide when, where, and, most importantly, how to utilize their reserves over the next few decades. Fundamentally, Mozambique is confronted with several challenges to transform its abundant extractive resource wealth – residing primarily in the country's inland coal deposits and its deep-water natural gas basins – into sustained, long-term economic development. This is a task of significant but not insurmountable complexity, encompassing a range of political, economic, and social dimensions. It will require collaborative and coordinated efforts by a variety of different stakeholders, some with conflicting objectives and priorities. It is thus incumbent upon Mozambique's leadership to manage this transition with purpose and develop and implement an industrial strategy that mobilizes the country's extractive resource development in a manner that achieves a prosperous outcome for its people.

Expectations of stakeholders are high, and this will not be an easy undertaking for the Government and people of Mozambique. Over the last five decades, numerous countries across the developing world have failed to benefit from their natural resource wealth. In fact, pervasive evidence suggests that resource-rich developing states tend to have lower economic growth rates and poorer development outcomes compared to states lacking such resources. Due to these paradoxical trends, collectively referred to as the resource curse, there is a renewed international focus on resource-rich, low-income countries like Mozambique.

This report provides a comprehensive review of the critical economic, political, legal, social, and environmental variables that will affect and be affected by the rapid development of Mozambique's extractive resources. Each section proposes methodical and practical recommendations for the country's policymakers, which – if implemented – will enhance the current institutional framework governing the activities of the extractive sector. Ultimately, this report attempts to provide the Government of Mozambique with a policy framework that promotes the sustainable development of the country's economy, society, and environment, and aims to help the country avoid the perils of the resource curse. These issues are described in greater detail in the summaries of each section of the report that follow.

Economic and Commercial

Mozambique stands to gain significant revenue from exploiting the economic and commercial potential of its natural gas and coal reserves. The country's offshore natural gas discoveries are among the largest finds in the world in over a decade, while its coal reserves are beginning to be exported to international markets. If it is able to successfully commercialize its extractive resources, Mozambique will become a highly competitive player on the global energy scene.

In addition to promoting economic growth, the Government's overall economic objective is to reduce persistently high rates of poverty. Currently eight out of ten Mozambicans continue to live on less than \$2 per day. In the years ahead, natural resource revenues will comprise an increasing share of the country's GDP, a trend that exposes Mozambique to several challenges in maintaining financial and social stability. Despite ongoing reforms, the country's overall capacity to absorb windfall revenues from the development of extractive resources remains

limited. Yet, with sound fiscal management, these hurdles can be overcome. There are a number of measures the Government can take to better prepare itself for the windfall. Prior to exploring such measures, however, it is first important to understand key implications of the resource curse and how it threatens Mozambique.

Generally, there are two underlying features of the resource curse that afflict countries: “Dutch Disease” and revenue volatility. Dutch Disease refers to the destabilizing impact of increased foreign exchange that inevitably follows a sharp rise in natural resource exports. A huge increase in natural resource revenues typically causes the real exchange rate to appreciate. The change in real exchange rate results in economic destabilization by reducing the international competitiveness of a country’s non-extractive resource exports (e.g. agricultural and manufacturing) and may also reduce employment in these sectors. These economic outcomes tend to adversely affect the labor force of a developing country, where undereducated workers often struggle to transition from traditionally low-skilled sectors of the economy to more knowledge-based and service-oriented industries.

Revenue volatility is another important facet of the resource curse. The disruptive effects of revenue volatility in a resource-based economy predominantly arise from fluctuations in global commodity prices. This volatility can be detrimental to growing economies and frequently results in imprudent fiscal policies. Often, governments borrow against the value of their newfound resources and spend windfalls on immediate consumption, at the expense of long-term investments that can hinder future growth opportunities for the country.

The resource curse commonly takes hold in developing nations that lack the institutional capacity necessary to manage huge resource revenues. To minimize the impacts of Dutch Disease and revenue volatility, a state must have sound institutions in place. Institutions are also necessary to manage complex public-private revenue-sharing partnerships that are typical of extractive industries. A sovereign wealth fund is one option that states can utilize to manage large inflows of resource revenue, stabilize pressures on the exchange rate, and reduce the influences of price and revenue volatility. The implementation of this fund (explained further below) is one of the central recommendations of this report. Above all, a sovereign wealth fund allows Mozambique to invest in infrastructure and socioeconomic development over the long-term, thus ensuring that the country will still see benefits of its extractive resources long after the reserves have been depleted.

Linkages and Local Content

Mozambique’s national resource wealth is not limited to revenue generation for the state but can and must flow to benefit local Mozambicans. Conventional understanding about how the local population benefits from extractive resources is typically limited to the industry’s provision of employment and a few philanthropic projects. However, extractive industries tend to have a minimal impact on the labor market. The capital intense nature of extractive industries stems from industry demand for fewer, more highly skilled workers compared to the labor-intensive, low-skilled workforce sectors – such as agriculture or manufacturing. Low prevalence of human capital in Mozambique further limits employment opportunities for Mozambicans in the extractive sector – leading to unfulfilled expectations in communities and promotes social unrest. This section provides examples and recommendations of how the Government, extractive companies, and stakeholders can increase employment opportunities for Mozambicans in the extractives sector and economic linkages between the extractive industries and Mozambique’s local businesses, especially in regions of extractive operations.

Prosperity driven by the growing extractive industry can be translated to communities in Mozambique through cultivating local content – including local recruitment, training, and purchasing local goods and services. Though not a “silver bullet” to prosperity, local content can contribute to the fulfillment of expectations that mineral and hydrocarbon production will help improve the lives of Mozambicans. Local content is also critical to the extractive industry’s operational sustainability by generating a social license to operate within a given community. Smooth, sustainable operations also benefit the state by supporting steady revenue flows and general social stability.

Given local human capital and the capacity of Mozambique’s private sector are currently very limited, it is critical that both the government and extractive companies initiate early and consistent engagement with communities and the local private sector in regard to both the type of employment and business opportunities that will be available. Additional management of expectations through transparent communication of the expected timeline of these opportunities is also necessary. To achieve optimal local content goals, the government must also invest deliberately in the provision of poverty-reducing public goods, including quality education, literacy, and healthcare, which in turn serve to improve human capital in the long-run. These efforts require significant strategic social investment by stakeholders to build the capacity of local communities and enable individuals and businesses to compete and access income-generating opportunities in the newly established extractive industry value chain. Without investment in the development of Mozambique’s human capital and building capacity of the local business sector, Mozambique’s ability to fully access and realize the potential benefits of its vast natural resource wealth will remain retarded. Finally, this section also discusses the need to develop and implement a strategic plan that mitigates inward migration, local food price inflation, and constraints on community resources affecting areas impacted by extractive industry operations in Mozambique that could be source of social instability.

Infrastructure

Marked rates of underdevelopment in Mozambique are closely tied to the country’s shortage of infrastructure, which has largely failed to respond to social and economic development needs. Although recent public, private, and donor investment in developing Mozambique’s infrastructure has focused much more on facilitating the trade derived from megaprojects, it might also represent an unparalleled opportunity to build a system that fosters inclusive social development. The Government has the option to take advantage of the international community’s willingness to invest and orient economic resources to address infrastructure-related impediments of development.

Ensuring inclusiveness, through both connection and universal access to roads, railways, and electricity, must be at the heart of this endeavor. Railways, in particular, must guarantee access for general freight and passengers, as well as for mining companies. With respect to Mozambique’s roads, an upgrade and significant extension of the network would decrease transportation costs for all parties. This, in turn, would help mitigate the country’s high rates of poverty and inequality, permitting both the mining provinces and the rest of the country to benefit from extractive industry operations. Special attention must be paid to use of roads as connectors between impoverished yet potentially productive areas and the Beira, Nacala and future Macuse corridors. Finally, despite the current efforts of the Government to bring the grid to every district, only a small percentage of Mozambicans have reliable access to electricity. The potential for clean production must be developed to provide electricity access beyond district centers, and to help reduce Mozambique’s reliance on unsustainable energy sources.

Environment

Protecting the country's ecology is critical to Mozambique's vitality and will require investment and attention to environmental governance that keeps pace with resource extraction. First, to mitigate environmental risks inherent in resource development, research into fisheries and terrestrial ecosystems is necessary to create a baseline for conservation priorities, since much of Mozambique's ecology is not well researched. The existing Environmental Impact Assessment review period is also too short for the increasing volume of assessments and the current limited capacity of the Government and civil society. Such assessments for large extraction projects and their corresponding infrastructure development should be made available to the public with a longer, more adequate review period than the current 45 days. In line with the country's existing environmental law, specific requirements and guidance on biodiversity offsets must be drafted and enforced to ensure that all small and large-scale extractive resource projects account for environmental impacts from the beginning of the project.

Mozambique's current environmental legislation should be reinforced with more detailed guidance. Exemplary laws from other countries, such as Norway, can be utilized for legal reference until a robust new set of laws can be established. With ongoing active exploration of the natural gas, Mozambique should dictate when and where seismic surveys are conducted in order to protect the delicate biodiversity surrounding the nation's corals and fisheries. In addition, the government must create an environmental emergency plan so that, should accidents occur, the various government ministries have an aligned mitigation strategy that facilitates rapid response. Additional funding, training, and resources allocated to environmental ministries are also necessary to expand their capacity to study the nation's ecology, properly implement protective legislation, and adequately monitor mining and natural gas exploration and production. Additionally, the growing artisanal mining sector needs strategic Government support to organize associations, as well as train, guide, and monitor expansion to ensure the safety and prosperity of Mozambicans. In this way, small-scale mining could become a means to reduce poverty as opposed to creating conflict and environmental degradation. All of these governance strategies will need to be implemented quickly and should utilize revenues from the extractive industry to guarantee that Mozambique's dynamic ecology continues to be a source of pride and the pillar of a growing tourism industry.

Resettlement

Resource exploration, mineral concessions, and infrastructure development have all exponentially increased the resettlement of communities in Mozambique, especially in remote areas. Although the country has the extraordinary opportunity to strategically translate its mineral assets into long-term sustainable development, extractive operations can only be fully successful if the investments are embedded in stable and prosperous communities. One of the country's top objectives should be to leverage the recent boom in extracting natural resources to improve the living conditions of Mozambicans and to ensure a prosperous environment in which companies can diligently operate.

If Mozambique follows five basic resettlement principles, the rights of Mozambicans and compliance with the international conventions and agreements that the nation has pledged to support will be ensured. First, projects that require resettlement must conduct early, inclusive and transparent consultations to give communities the opportunity to make decisions on issues directly affecting their lives. Early consultation also helps build critical buy-in from impacted populations. Second, it is key to provide communities with the tools and information to diligently participate in negotiations that reach fair agreements. Third, compensation, that

includes improved livelihoods and standard of living is key to translating resource extraction into prosperity for individuals affected by resettlement. Fourth, resettlement processes entail negative environmental impacts that must be diligently addressed as they highly impact the health conditions and access to other resources (water, soil, etc.) of the surrounding communities. Lastly, an inclusive and legitimate post-resettlement committee must oversee agreement compliance, progress, and accountability. Such a committee also recognizes that communities are dynamic and future agreements will have an established channel for discussion. A well-structured and well-managed resettlement process, jointly agreed upon by communities and companies, can help to ensure that extractive operations and other projects that require resettlement enjoy greater community buy-in and promote sustainable development.

Mozambique must also ensure that women are not left out of opportunities to participate in and benefit from the country's development through the extractive industries. The Government bears a duty to ensure women's equal access to socio-economic opportunities, reduce disruptions to their standards of living and improve livelihoods. In the context of mining operations, Mozambique can meet these challenges by implementing its existing laws and Constitutional provisions which guarantee the equal rights of men and women, along with amending existing mining legislation to address issues on resettlement, consultation and compensation.

Such arrangements also stand to benefit from local resources (including human capital), thereby reducing the likelihood of conflict. The resettlement process in Mozambique is ongoing, and there are a number of ways that the Government can promote mutually beneficial resettlement agreements leaving all parties affected better off and fairly attended.

Legal Framework

From a legal perspective, Mozambique must aim to reform and update the legislative, institutional, and contractual frameworks associated with extractive industries in order to maximize the gains from and minimize the costs of extractive resource development. In this context, Mozambique is currently reviewing its legal and fiscal frameworks for oil and gas exploration and production, to take into account developments in the industry and new gas discoveries. Recent drafts of the petroleum legislation contain several important additions that address infrastructure, revenue sharing, oversight, and environmental protection. However, the law needs further strengthening to ensure that new and existing projects are carried out in a safe, fair, and efficient manner. Vague references to "good industry practice" should be replaced with clear and transparent obligations. Deals should be standardized and their key terms should be set in legislation to improve transparency and competitiveness. Companies must be assured fair and open access to facilities to promote competition and increase efficiency. Penalties must be clear and significant to deter bad behavior. Environmental protections should take into account that companies are often in the best position to monitor, prevent, and mitigate environmental and health risks. The Government must also preserve its ability to reform and improve its legislation over time - especially in relation to the environmental, social, and health impacts of extractives.

The fiscal regime should draw on a range of different tools to generate a fair share of revenue for Mozambique. While opinions may differ on what is "fair", Government revenue should amount to at least one third of the profits for mining and 65% of the profits for oil and gas over the lifetime of a project. As the industry becomes more established, and business conditions improve, this share should increase substantially for future projects. The regime needs to balance up-front income with long-term objectives - taking into account the legitimate interests

of investors, the capacity of public agencies to administer the regime, and the interests of future generations of Mozambicans.

There is also a critical need for existing mining legislation to be examined and amended, in order to better reflect the growth of the sector and to protect the interests of the Mozambican people, particularly with respect to environmental, health, social, fiscal and contract transparency considerations. Accordingly, provisions of the current Mining Law of 2002 should be amended in these distinct areas, giving mining activities a modern and adequate regulatory basis to ensure greater competitiveness, guaranteeing the protection of rights and defining the duties and obligations of holders of mining titles. While the Mining Law of 2002 is undergoing revisions and is expected to be passed by Parliament in the coming months, this section sets forth policy recommendations which illustrate some of the gaps and challenges present in Mozambique's mining legislation. Reforms in the mining laws offer an important opportunity for the country to further develop its economy, and importantly, to promote equity, reduce poverty, and meet its development goals through a forward-looking approach. The recommendations in this section are offered to strengthen, clarify and update existing mining legislation, and provide guidance on how mining activities can be conducted in a manner, which prioritizes and improves the social and economic well being of the Mozambican people.

Governance

The Government must adopt a transparent and uniform policy framework and fiscal regime to effectively administer the process of extractive industry development vis-à-vis government costs and revenues. To this end, Mozambique should create an accountable and transparent framework of governance to manage its extractive assets. There must be checks and balances built into the institutional structures of the Government. This will create accountability, separate responsibilities to minimize conflicts of interest, expand powers for specific agencies to fulfill their roles, and allow for agencies to manage extractive resource development accordingly. Mozambique must also focus on anti-corruption measures to improve its governance. Some useful tools include the anti-corruption law as well as other Information and Communication Technology platforms that can help bolster the country's systems of oversight. Above all, transparency must become a fundamental part of the extractive industry's contractual process, to ensure that all parties are getting their fair share of revenue.

Sovereign Wealth Fund

Sound revenue management is key to the sustainable development of Mozambique's economy. The financial impact of natural gas and coal exportation can have detrimental effects for the country. As mentioned above, problems arise from real exchange rate appreciation, which puts other export industries out of business, and from fluctuation in commodity prices, which is destabilizing for the domestic economy. Establishing a sovereign wealth trust fund in a traditional financial center will help Mozambique absorb the coming windfall and promote growth and development in the country in five key ways. First, it effectively shelters the domestic economy from the commodity sector, so that volatility in oil, gas or coal prices do not have such a disruptive effect on the country's budget planning from one year to the next. Second, by channeling revenues into specific development programs, the fund can help the government to focus and plan for expansion of infrastructure, education, healthcare and public services. Third, the fund can help to ensure that government revenue from extractive resources become an ongoing source of income for decades to come, and provide intergenerational equity. Fourth, and crucially, a sovereign wealth fund can insulate Mozambique's currency, helping to ensure that investment in the extractives industry does not have negative impacts on other

sectors of the economy. Finally, the trust will legally enshrine the purpose of the fund and thus insulate Mozambique's fund from sovereign debt and facilitate the country's access to international financial markets due to improved legal standards.

Mozambique Moving Forward

Mozambique is embarking on potentially one of the most defining opportunities of the nation's history. Despite the impoverished state of much of the country, Mozambique is endowed with significant hydrocarbon and mineral resource wealth in an era that is experiencing innovation, awareness, and collaboration at an unprecedented rate. The nascent development of Mozambique's large-scale hydrocarbon and mineral reserves is a point of strength and opportunity for structured and deliberate leadership to shape the future of Mozambique into a prosperous regional authority with the capacity to be a source of strength and guidance beyond its borders.

There is universal familiarity with the potential outcomes that lie ahead for Mozambique. The nation's limited human capital and restricted absorption capacity of the local public and private sectors to adapt and manage the rapid changes underway exemplifies the necessity for Mozambique to engage actively, early, and transparently to realize the opportunities at hand. However the continuum that flows between a resource blessing of prosperity and a resource curse is process of significant complexity. Multi-directional relationships between the economics, social, environmental, political and legal aspects of natural resource development requires clear frameworks and implementation of transparent objective that will benefit the nation now and for future generations. The areas this report examines identifies the current and potential weakness that could derail Mozambique's intention to pursue a path of sustainable development that is supported by revenues and income generating potential of the growing explorations and production of Mozambique's natural resources. Each section also includes recommendations that address the challenges and opportunities specific to the changing environment of Mozambique's natural resource extraction.



Photo: Gorongosa National Park
Mozambique
Piotr Nasrecki

Introduction

On the south-eastern coast of Africa, Mozambique is a country of extraordinary natural beauty and cultural diversity. While its natural riches have been known to the world for centuries, it is only recently that the discovery of extensive gas reserves and coal deposits have drawn the attention of foreign investors.

As one of the least developed countries in the world, Mozambique faces significant challenges to bring these resources safely and sustainably to market, and to manage the resulting funds. In the aftermath of independence and a devastating civil war, the country has made significant progress to build social stability and begin to lift its people out of poverty. However, much work remains – and while extractive resources offer opportunities for prosperity and growth, the influence of multinational corporations, donors and international organizations (each with different interests) has complicated an already complex environment.

This project has reviewed Mozambique's unique economic, legal, institutional, environmental, and social context to assess the potential impact of the extractive industry (both positive and negative). Through consultation, research and interviews, the team has drawn on the knowledge within Mozambique, as well as on the experiences of other countries, to formulate a number of specific and implementable recommendations that will help Mozambique to mitigate the risks and maximize the benefits of extractive industry development. Our team's particular focus has been to harness the existing strengths and potential within Mozambique civil society and government, and to prioritize key areas of reform.

The Capstone team began work in November 2012, and carried out desk research from Columbia University in New York for several months. In March 2013, eleven team members

traveled to Mozambique. While most of our time was spent in Maputo conducting interviews with stakeholders, companies, donors, NGOs and Government agencies, two team members traveled to Pemba to research the new natural gas developments in that region. We were privileged to have the assistance and insight of dozens of committed people during this period. Although our visit was brief, we were able to conduct over 40 meetings addressing the broad scope of issues covered in this report. On our return to New York, further research supplemented our interview material.

The resulting report is divided into nine sections, each with a particular focus. However, many of the issues overlap – and these themes are addressed from several angles. Key themes that emerge throughout the report are the importance of education, the need for engagement and consultation with local communities, and the opportunity for Mozambique to learn from and improve upon international experience.

Section 1 provides an overview of Mozambique’s Economic and Commercial context, and introduces some of the key considerations for the development of extractive industries. In addition to outlining the prospects for Mozambican gas on the world market, this section discusses the important issues of contracting and financing LNG production. The local and global commercial prospects of coal production are also discussed.

Next, we address the importance of creating linkages between foreign enterprises that invest in Mozambique’s extractive industry, and local companies. In particular, the section highlights that small and medium-sized enterprises need support, regulation, infrastructure, and training to improve their efficiency, and to engage in commercial relationships with international investors. By encouraging “linkages”, Mozambique can ensure that foreign companies are more integrated and more efficient, and that the benefits of extractive industry can flow directly to the communities where they operate.

Section 2 expands on this idea, exploring the benefits and practicalities of “local content” requirements. Employment of local residents, procurement from local suppliers, and other forms of local input can increase efficiency for companies and generate “social license to operate.” This section provides an overview of Mozambique’s socio-economic context and a close-up view of two regions that are greatly impacted by coal and natural gas development – Tete and Cabo Delgado, respectively. Finally, the section addresses areas of risk and strategies for mitigation, including inward migration and inflation.

Section 3 provides a snapshot of Mozambique’s infrastructure with a focus on roads, railways, and energy. It assesses the potential impact of expansion by extractives companies and presents an argument for inclusive infrastructure – infrastructure that is accessible and affordable for local people, and for other enterprises.

Section 4 highlights the multiple, complex environmental concerns that extractives development raises. Natural gas exploration and production and coal mining both present threats to the environment, to livelihoods, and to health, including marine life, water quality, air quality, land, and biodiversity. The section presents a number of recommendations for legal and institutional changes that will help to preserve Mozambique’s unique ecology and landscape, and to protect the health of its people.

Section 5 presents an analysis of the impacts of resettling communities to make way for

extractive resource projects. The section highlights the importance of an early, open, and inclusive consultation process, founded on free and informed consent. Recommendations focus on improving resettlement practices, including compensation and protecting livelihoods, and identify the particular safeguards that are needed uphold the rights of women.

Section 6 moves to the legal framework for mining in Mozambique. It outlines the current legislative provisions and licensing process, and provides detailed recommendations on how these laws can be strengthened and improved. Environment, resettlement, fiscal and transparency issues are all considered.

Section 7 assesses the existing gas and petroleum laws, and discusses options for reform in light of the most recent draft amendments. It presents an analysis of the “gaps” in the law and touches on the particular issue of foreign investment and arbitration.

Section 8 presents the case for strong and reliable institutions to govern extractives industry in Mozambique. It outlines the progress that Mozambique has already made towards transparency, and recommends general and entity-specific policy changes. Capacity building and e-governance are also discussed.

Section 9 proposes a sovereign wealth fund for Mozambique, with a structure that will help to ensure that extractive industry revenues are a blessing, and not a curse, for the country. The section outlines how a sovereign wealth fund can help to manage Dutch disease and inflation, presents options for managing and investing the resources, and identifies the various funds which could be created to direct revenues into the Government budget, stabilization, development and savings, development.

The report concludes with a summary of the Recommendations, and a Bibliography of sources.

The Appendices are intended to provide additional detail and context for interested readers. They include resources that have been collated by the authors from a range of different sources, for ease of reference. Appendix 1 sets out a number of tables with additional detail about the legal framework and contracts for mining, gas and petroleum, including some advantages and disadvantages of the different types of fiscal tools used by governments to collect revenue from extractive operations. Appendix 2 includes resources for Sovereign Wealth Fund governance, including international comparisons, details of the *Santiago Principles* and the Linaburg-Maduell Transparency Index. Finally, Appendix 3 includes relevant development indicators for Mozambique, along with comparison countries for reference. The tables incorporate economic, commercial, social and governance indicators, and serve as a “snapshot” of Mozambique’s current development.

A Note on Priorities

This report sets out 105 distinct recommendations for Mozambique, covering economic, infrastructure, social, legal, environmental, governance, and financial issues. The recommendations, which are summarized at the conclusion of the report, should provide guidance and provoke discussion among government, civil society, donors, and the business community. However, it is unrealistic to expect that Mozambique will be able to address all these issues immediately and simultaneously. The people of Mozambique must decide what issues are most pressing and most important for themselves.

This section is intended to give an outline of what the Capstone project team identified as the key priorities for change in the short and medium term.

Get the legal framework right to ensure a balance of rights and responsibilities

Mozambique's legal framework for oil, gas and mining needs drastic changes to address the challenges that lie ahead. It is essential that the new laws set out clear and detailed obligations for companies and for the government about responsible environmental and social practices. Where gaps remain, the laws should refer to the rules of jurisdictions with robust laws, such as Norway and Australia. The fiscal regime must also be clear, transparent, and standardized for all projects – not negotiated on a case-by-case basis. Closely related to the law is the importance of institution-building to enable implementation. Mozambique's ministries and government agencies must have the support, the training, the power, and the resources to effectively negotiate concession contracts, regulate, monitor, and enforce the legal framework.

See: Section 6: The Need for Upgraded Mining Laws, Section 7: Gas and Petroleum Laws, Section 8: The Case for Strong and Reliable Institutions, and Section 4: Protecting Mozambique's Environment.

Carefully manage the revenues from extractive industries for the benefit of all Mozambicans

Oil, gas and mining have immense economic potential – but that potential will only be realized if projects are taxed appropriately, and revenues are managed carefully. Once a fiscal regime is in place, the revenues from all projects should be paid into a resource fund that is designed to suit Mozambique's situation. A Sovereign Wealth Trust Fund would provide a structure that is clear and straightforward, with enough flexibility to allow for different stages of development. First, extractives revenues could contribute to initial budget funding (in lieu of donor funding), and could be used to help stabilize the economy. As the fund grows, investments in infrastructure and special development projects could follow. Ultimately, the fund could also incorporate a savings fund that generates wealth for decades to come.

See: Section 1: The Economic and Commercial Implications of Natural Gas and Coal, and Section 9: Managing Wealth: The Sovereign Wealth Fund.

Provide economic opportunities by making infrastructure inclusive and accessible

Infrastructure development will be an essential component for Mozambique to turn its resources into commodities. However, infrastructure that serves only large commercial enterprises can exacerbate inequality. The government must plan carefully to ensure that the money invested in infrastructure has as many flow-on benefits as possible – this means

engaging with small enterprises and with the public to ensure access to reliable transport and electricity networks.

See: *Section 3: The Need for Inclusive Infrastructure.*

Protect and empower local populations to preserve stability

Mozambique must immediately address the disruptive impact of current and future resettlement projects to ensure that local populations do not lose out when extractive projects take place in their region. Over time, these disruptions can violate fundamental human rights, entrench poverty, cause social unrest, and make it impossible for businesses to operate efficiently and safely. By encouraging local content and local linkages, Mozambique can help to ensure that foreign investment is more efficient and contributes to real, sustainable benefits to the community.

See: *Section 2: Translating Extractive Industry Prosperity to Mozambique’s Communities and Section 5: Ensuring Social Equity in Extractive Industries-Based Development.*

Education is critical to sustainable growth and a better quality of life

Although it is not a dedicated topic in this report, education and capacity-building is a common theme in our analysis. Training and education will help Mozambique’s lawmakers, officials, civil society, business people, and all citizens to make good decisions about managing extractive resources. The revenues from those resources, in turn, should be invested in improving the quality and accessibility all levels of education – from primary through to specialist tertiary education.

See: *Section 2: Translating Extractive Industry Prosperity to Mozambique’s Communities, Section 4: Protecting Mozambique’s Environment, and Section 8: The Case for Strong and Reliable Institutions.*

Foster and protect Mozambique’s other “comparative advantages”

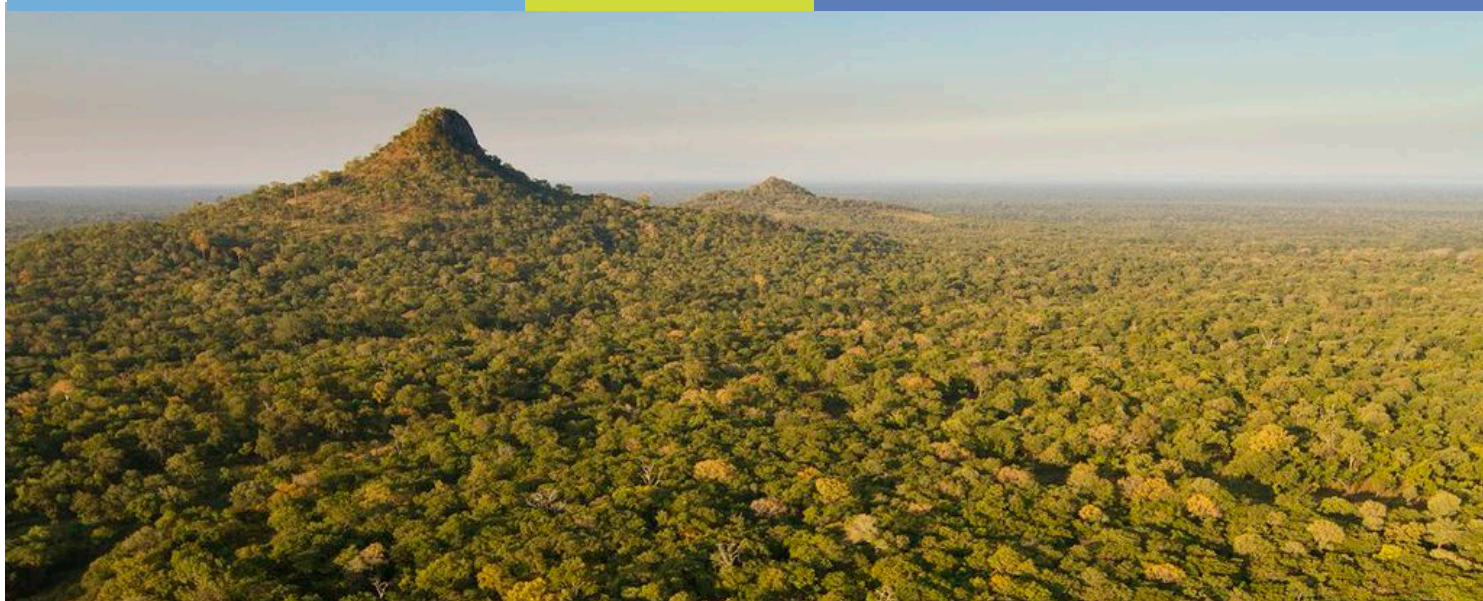
Once the coal has been mined, and the gas extracted, Mozambique will need to depend on its people, its land, and its waters for continued economic growth. Among others, Mozambique has the potential to develop a vibrant agricultural sector, and a world-class tourism industry. But both of these sectors could be seriously threatened if extractive developments are not well planned or well regulated. Loss of arable land to mining, pollution or contamination of water, disruption of habitats, and the physical scars of extractive industries will directly impact this economic potential. It is possible for these industries to coexist – but only if strong and enforced laws protect the environment and the people of Mozambique.

See: *Section 4: Protecting Mozambique’s Environment, and Section 5: Ensuring Social Equity in Extractive Industries-Based Development.*



Mozambique

mobilizing extractive
resources for development



Section 4

Protecting Mozambique's Environment

Photo: Gorongosa National Park
Mozambique
Piotr Nasrecki

4 Protecting Mozambique's Environment

Mozambique's coal and natural gas reserves provide important challenges and opportunities for the country's natural environment. Increased revenues and economic development will provide the government with the funding necessary to better study and manage the country's ecology and plan the recovery of major fauna which are returning to Mozambique after years of civil war. The country's terrestrial forests and abundant reefs have only tapped the surface of the international tourism market, as a poor tourism infrastructure has limited the growth of this sector. Mozambique's economic development through these sectors can help boost the infrastructure and increase the country's large potential for tourism. However mining and natural gas exploitation both pose risks to the environment which—if not properly managed—can create disturbances that may negatively impact the ecology and the people that rely on the natural environment for their livelihoods, destroying tourism potential before it is realized.

This section will discuss the large-scale and small-scale mining and gas operations and how their environmental impacts can be mitigated. This section will also discuss Mozambique's legal framework for managing the environment. The current environmental governance in Mozambique has some strengths and weaknesses which if properly addressed will not only mitigate impacts from the extractive industry but also protect and rehabilitate one of the best coastal and terrestrial natural environments in Africa. Most importantly, natural gas exploration will be most active on the northern coast, which is also the site of the country's most important coral reefs. Similarly coal mining exports have taken off from biologically important areas of the country, such as those close to Lake Niassa. Mozambique's environmental governance has improved over the last decade, but given the rapid investment in extractive operations, environmental monitoring, conservation and protection must be given greater priority.

4.1 Background on Mozambique's Ecology

Of Mozambique's 786,380 km² of land 49.6% is forested with 10 million hectares of arable land. The country has 2,770 kilometers of coastline—more than the state of Florida in the U.S. and nearly as much coastline as South Africa.²²⁴ The country is home to 5,500 species of plants and 4,271 species of terrestrial wildlife including 735 species of birds, and 384 species of mammals and reptiles. The coast is home to 1,860km² of pristine coral reefs and abundant marine life and, in 2012, a portion of the coast became Africa's largest coastal marine reserve.²²⁵

However Mozambique's flora and fauna face significant threats. The effects of civil war destroyed large terrestrial fauna and caused deforestation. While recent years have witnessed the reintroduction and rehabilitation of many species, overfishing and unsustainable agriculture practices are poised to put remaining plants and animals at risk. The country has 300 plant species on the International Union for Conservation of Nature ("IUCN") Red List and about 122 of these are threatened.²²⁶ Mozambique ranks 89th out of 132 on the Yale University Environmental Performance Index, which groups the country among the world's "weaker performers."²²⁷ With growing international attention and foreign direct investment flowing into Mozambique's coal and gas industry, these threats could be compounded by unsustainable mining practices that could go unchecked due to limited resources for environmental governance and monitoring. Conversely, the revenues from increased economic development,

extractives and tourism could bring important financial and political support and help to improve environmental management and monitoring.

The Government has given greater attention to environmental conservation in recent years by implementing new legislation, and by increasing protected areas from 11 to 15% of the country, with the goal of expanding it further to 16%.²²⁸ Currently Mozambique has six national parks, eight national reserves and 12 *coutadas* or wildlife utilization areas.²²⁹ Gorongosa National Park, featured on the cover of this report, has been recognized as one of the most ecologically diverse parks on the planet.²³⁰ With the establishment of the 1997 *Environmental Law Nº / 97 of July 30 (AR-IV/044/30/07/97)*, the country set a general foundation for environmental management and has been improving this law over the past 15 years. However elements of environmental monitoring and governance are weak due to insufficient resources, lack of information and an environmental governance system that is integrated across ministries, yet diffuse in implementation. In addition, there is insufficient guidance for large gas and mining projects. Further guidance and detail are necessary to manage a country that will undergo rapid changes in the coming years from tourism and energy extraction.

The major ecological challenges which have currently been identified by the government are climate shocks, unplanned development, overharvesting of marine and timber resources and deforestation caused by fuel wood use and uncontrolled fires.²³¹ In addition, cyclones and floods have caused devastation in recent years. With increased investment in mining and natural gas, the government should prioritize the development of a framework to establish environmentally friendly mining and natural gas exploitation.

Renewable natural resource potential is also plentiful, but like oil, gas and minerals, they demand careful management and sustainable development. Mozambique's coastline stretches 2,500 km and is abundant with important marine resources, including fisheries, and tourism potential. Mozambique experiences frequent droughts, yet agriculture potential is high with the country historically a major producer of cash crops. Forestry is also a potential growth industry. However, at present, illegal logging threatens the forests and more importantly fuel wood use is estimated to contribute to deforestation 250 times more than logging.²³²

The country contains a network of protected forests, lakes and coastal areas. The coastal areas are a conservation priority for the World Wildlife Fund ("WWF") and Conservation International, while Lake Niassa (also known as Lake Malawi) is a reserve established by the government of Mozambique. Mozambique holds huge potential for tourism with only 2.2 million visitors in 2008 accounting for 3.1% of GDP or USD 434 million with projections to increase to USD 846 million by 2020.²³³ However this is less than South Africa, where tourism revenues were estimated at nearly USD 12.2 billion in 2012. Poor infrastructure, poor international marketing, low transportation capacity and lack of skilled human resources are cited by the International Financial Corporation as barriers to an industry that—if rectified—could bring billions of dollars in tourism revenues.²³⁴ Mining and natural gas infrastructure should be coordinated not only to maximize logistics potential, but also add to existing and future tourism infrastructure.

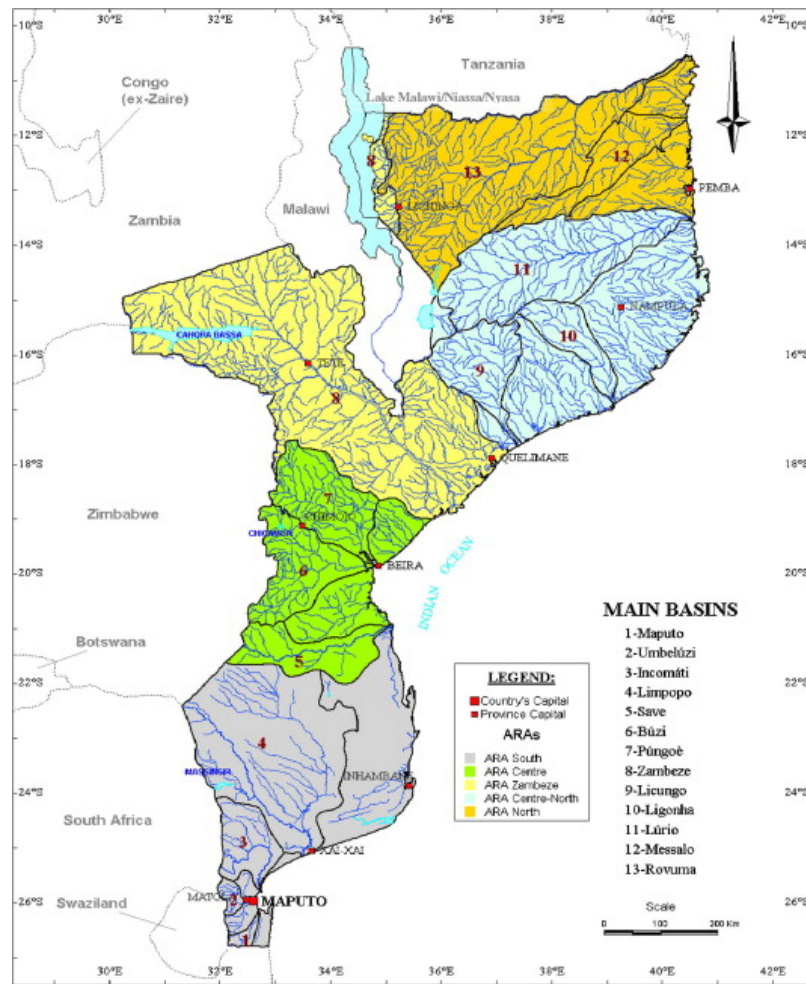
4.1.1 Water

Pollution of water sources and sanitation are major areas of concern. Only a few cities, such as Maputo, have modern waste and water management systems. The majority of Mozambicans however, do not

have adequate access to clean drinking water. In rural areas only four percent have access to decent sanitation and 29% have access to improved water sources.²³⁵ Pollution and poor sanitation have a huge human cost on Mozambique: The World Bank’s Water Sanitation Program estimates that every year, over 14,400 people per year die due to diarrhea caused by water pollution and poor sanitary conditions.²³⁶

Despite these problems, water resources are relatively plentiful, with many perennial rivers including the Zambesi, Limpopo, Save, Lurio, Pubgue and Rovuma. Areas identified as important for river flows and precipitation are the Gorongosa Mountain—Rift Valley Complex, The Cheringoma Plateau, Zambezi Delta Grasslands and Swamps, The Great Inselberg Archipelago, The Chimanimani Massif, The Maputaland Centre of Endemism (“MCE”), Coastal Barrier Lakes, and the Pebane Evergreen Coastal Forests.²³⁷

Figure 27: Water Resource Administration Units in Mozambique



Source: Jordi Gallego-Ayala and Dinis Juízo. "Strategic implementation of integrated water resources management in Mozambique: An A'WOT analysis." *Physics and Chemistry of the Earth, Parts A/B/C* 36, no. 14 (2011): 1103-1111.

4.1.2 Fisheries

Historically, the low amount of large-scale mining, artisanal mining and natural gas exploration has caused few impacts to Mozambique's fisheries. But with the rapid increase in natural resource exploitation, the direct and indirect impacts of these industries could be large in the coming years in the absence of sufficient monitoring, guidance and – especially in the case of artisanal mining – capacity building by the government and international community. Mozambique is rich in marine biodiversity, especially within its 1,860 km² of coral reefs. The majority of the reefs are in the north, along the mainland shore and around the islands which were recently made marine reserves, but are located near the center of natural gas exploration. Bleaching, unsustainable fishing practices and tourism activities pose threats to the reefs, and overfishing has dramatically reduced freshwater and river fish stocks.²³⁸ Lake Niassa supports 700 to 1,000 species of fish found nowhere else in the world and likewise faces threats from tourism and overfishing, especially from Malawi.²³⁹

Current government monitoring resources are insufficient, leading to difficulties in regulating unlicensed operators. In addition, the fishing of sharks and rays to meet Chinese demand for their fins has also depleted stocks.²⁴⁰ This is complicated by the fact that Mozambique's marine biodiversity has not been well-studied and understood.²⁴¹

The government is undertaking several activities as stated within a report to the Convention on Biological Diversity by Mozambique's chief environmental body, the Ministry of Coordination of Environmental Affairs ("MICOA"), including establishing new marine stocks and incorporating more community involvement. In anticipation of extraction activities accelerated monitoring will be needed to ensure that a sufficient baseline of marine and freshwater biodiversity is maintained, and to better understand and mitigate the impacts of gas and coal extraction. For example currently the Ministry of Fisheries currently has few boats, posing a challenge to filling in data gaps, monitoring unlicensed fishing and monitoring environmental impacts.²⁴² Accordingly, outfitting the Ministry of Fisheries with upgraded equipment, boats and funding for local and international experts should be a short-term priority.

Recommendation 25: In the medium term, utilize income from the recommended sovereign wealth fund to outfit the Ministry of Fisheries with the necessary equipment and staff as well as to fund international cooperation programs to monitor overfished fishing stocks and precious corals.

4.1.3 Climate change

Drought, floods and cyclones are frequent in Mozambique with high levels of flooding in the central and southern provinces. The effects of flooding were particularly devastating during El Nino/La Nina oscillations in 2000-2001 and again in 2008, displacing tens of thousands of people.²⁴³ Precipitation variability is expected to increase with climate change. Temperatures could increase by 1.8-3.1°C by 2075 in addition to a 5 to 10% decline in rainfall.²⁴⁴ With more than 60% of the population living in coastal areas and more than 70% of the country engaged in agriculture, the impact of flooding will increase as with rising temperatures.²⁴⁵ According to World Bank analysis, as much as 4,850 square km of land could be permanently lost and 916,000 people will have to migrate from populated coastal areas, creating a burden of USD 103 million per year by 2040.²⁴⁶ In addition to these economic losses, there would be heavy losses in investment and tourism. With such consequences, a sound management plan for adaptation to environmental changes will be necessary. In particular infrastructure projects related to oil and gas extraction will need to avoid roads and railways that are located on potential flood plains.

Recommendation 26: Review company and company-government infrastructure plans with a long term view of climate change impacts. Do not build mining infrastructure within floodplains as these could become more susceptible to inundation as sea levels rise.

Three years after Mozambique transitioned to democracy in 1994, the country passed its 1997 *Environmental Law Nº / 97*. This has been supported by further legislation, most importantly the 2004 *Constitution of the Republic of Mozambique* which commits “the State and local authorities in collaboration with other appropriate partners to adopt policies for the protection of the environmental and care for the rational utilization of all natural resources” and in article 45 in the government’s duties towards the communities strives to “defend and promote health” and “protect and conserve the environment.” However the most important environmental departments are too small and face extreme financial constraints. While extractive investment is booming, investment in environmental monitoring resources is woefully low and insufficient to monitor the environmental impact assessments (“EIA”). The country’s size, lack of infrastructure and lack of qualified personnel pose additional barriers to good environmental governance.

International Environmental Agreements Signed by Mozambique

- UNFCCC
- Endangered Species
- Hazardous Waste
- Law of the Sea
- Ozone Layer Protection
- Ship Pollution
- Wetlands

At the top of Mozambique’s environmental management structure is the National Commission for Sustainable Development (“CONDES”) established in 1997 under Article 6 of *Environmental Law 20/97* in the cabinet that is assisted by a secretariat.²⁴⁷ Included in the CONDES secretariat are two staff members from MICOA, which was created in 1994 as the head of Mozambique’s environmental management.²⁴⁸ The formal role of MICOA is to implement the National Environmental Management Plan (“NEMP”) and coordinate the implementation of environmental activities across ministries and departments along five directorates, which includes managing EIAs. However MICOA’s role is only to coordinate and the Ministry lacks implementation power or jurisdiction within the departments that share environmental management.

The responsibilities of environmental management are spread across Directorates in the Ministry of Tourism, the Ministry of Agriculture and five environmental units within the Ministries of Agriculture (“MINAG”), Energy, Mineral Resources, Public Works and Health. In addition there are seven directorates within MICOA and an International Coordination Department. This integrated approach has led to gaps in the country’s environmental management system, and weak implementation. For example the Ministry of Tourism is responsible for developing both the tourism industry and forest conservation, resulting in a conflict of interest. For example, tourism licenses may be issued for projects before EIAs have been completed.²⁴⁹

4.1.4 General Environmental Considerations and Recommendations

Strengthen Government Capacities on Environmental Monitoring

For a fast growing country like Mozambique, the recent discovery of huge reserves of offshore natural gas could be a double-edged sword in terms of the country’s future development. The most important issue is that the goals of different levels of government need to be aligned in order to gain a win-win result through effective cooperation with international oil companies.

In execution, balancing development with conservation could involve many different aspects, such as revenue management, resettlement, and infrastructure construction. One of the key issues to for environmental sustainability lies in the government's capacity to monitor the extractive companies' operations. Monitoring is currently undertaken by MICOA. However, from the field interviews conducted with civil society groups and MICOA itself, we realized that even though MICOA has local administrative representation in different provinces, those local offices lack the capacity to both actively monitor compliance by extractive companies and assess their environmental impacts. In actual practice, the MICOA local branches are only involved in the data review process, whereas the monitoring of environmental data is typically conducted by extractive companies. This might impact the independence of the environmental data since the information is not always collected by MICOA itself.

In terms of strengthening the capacities of local offices, MICOA should focus more on human capital management and facility updating in those local offices. Thus MICOA will gain the expertise to have a better understanding of data sources and to reduce unnecessary conflict with companies. On the other hand, from the interviews conducted, it was ascertained that the government has no specific plans to deal with potential mining accidents. The government currently only requires companies to propose their own safety and emergency programs. This lack of a national, uniform plan can inhibit the government's ability to deal with emergencies in the future. Accordingly, it is necessary for the Government of Mozambique to set this issue as its priority and establish a comprehensive government-led, emergency response plan.

Recommendation 27: Given the scale of mining activities and potential for environmental and social impacts, the Government of Mozambique should create an emergency response plan for mining accidents. This will align government departments and allow rapid response should large environmental accidents occur.

Forestry Protection

On the issue of protecting Mozambique's forest resources, one of the biggest challenges is illegal logging. Increased illegal logging is threatening the existing ecological environment, which is particularly fragile in the northern region of the country. Currently the Government of Mozambique is working actively on addressing this problem. However, there are still outstanding potential problems related to the illegal logging. In some cases in other countries, illegal logging involves cooperation with the government officials. While local administrative staff might be well aware that some groups are engaged in illegal logging in their administrative area, logging entities may share business interests with some senior government officials. Thus due to such political tension, local officials might refrain to intervene in the illegal logging directly. This ultimately leads to lack of supervision by the local government. In order to prevent a similar situation from occurring in Mozambique, the national government should enhance the transparency of the government and logging industry at different levels, as well as establish a good petition system. A petition system to investigate possible illegal activity should open to the civil society and the public. Meanwhile, the government should create a responsibility tracking system, that would give the public the right to track every petition that has been filed and the right to make further appeals. Such a system could reduce the possibility that senior official's business interests infringe on local government regulation. Logging tracking systems have been implemented with success in countries such as Indonesia and Latvia.²⁵⁰

Mitigation on Artisanal Mining

During our interview with MICOA, we learned that artisanal mining has relatively more harmful environmental impacts, even though the scale is quite small. Most of the international mining companies operating in Mozambique adhere to the same environmental compliance standards as in their home countries. However, lack of training, expertise and organization in artisanal mining activities can lead to extremely harmful environmental impacts. We were told that MICOA is currently organizing artisanal miners into specific associations and conducting vocational training to help them gain necessary life skills that they can apply to other tasks. Organizing associations and conducting trainings is an important step in creating a small-scale mining sector that is safe for people and the environment. The government should also increase its engagement with civil society and other ministries while they are working with artisanal miners. For instance, in order to ensure high attendance rates and quality of training, MICOA could cooperate with the Ministry of Education and local youth development NGOs to create a teaching system that is relevant and effective.

Necessity of having a clear roadmap of National Extractive Industry Development

Another issue to address is the national environment strategic plan on extractive industry's development. It is clear that extractive industry operations will have an impact on the environment and on biodiversity. However, examples from other countries demonstrate that environmental impacts can be minimized if companies are willing to apply the best international practices.

It is important for the government to know the aggregate impact of approving several projects in the short term. Under the current situation, each company conducts its EIA and submits it to MICOA who then evaluates the feasibility of the project on a case-by-case basis. However, it is important for the national government to have a comprehensive understanding of the aggregated impacts in the long term and the overall environmental impacts of these projects. Otherwise, in the long term, the environmental costs of developing these extractive projects could outweigh their overall benefits. On the regulation side, the government could utilize reference laws from other countries until the gaps in Mozambique's legal framework are filled. This especially applies to Mozambique's offshore gas industry.

4.1.5 Mining and Natural Gas

Mozambique possesses a huge range, and quantity, of valuable natural resource. The country's large deposits of coal, natural gas, mineral sands, phosphates and other resources have been drawing increasing attention from local and overseas extractive companies. In the mining sector, coal in particular shows great potential, with resources estimated at 23,000MT.²⁵¹ These abundant coal, hydropower and natural gas reserves show huge economic potential, but are largely untapped. In addition, the country has ongoing aluminum exports and several other mineral resources including gold, gemstones, titanium and bauxite.²⁵²

Mozambique's mineral and mineral product exports accounted for 72% of all exports in 2011.²⁵³ As of March 2011, 1,076 licenses for coal have been issued to mining companies.²⁵⁴ As more proven reserves of natural resources are discovered, Mozambique is receiving greater international attention and foreign direct investment. Efforts have been made to promote equity of resource revenues in the law. For example, forestry legislation requires that 20% of tax revenues from forest and wildlife natural resource concessions be reserved for communities in the location, however no such requirement exists for minerals.²⁵⁵

4.2 Mining in Mozambique, Environment and Health

Mozambique's mining resources have been important for large scale, small scale and artisanal miners. These include vast coal deposits with the potential to produce 4.6 million tons of coal this year.²⁵⁶ Rio Tinto has stated that Tete is home to the world's largest undeveloped cooking coal.²⁵⁷ Artisanal and small-scale mining, driven mainly by poverty, can be an important part of economic activity and poverty alleviation. In 2008, an estimated 60,000 people were working in Mozambique's small-scale and artisanal mining sector.²⁵⁸ However data on artisanal mining is scarce and the government has insufficient monitoring resources. Moreover, awareness of the harmful health side effects of unsafe practices is low among artisanal miners. If environmental and health issues are not taken into consideration, the economic benefits of mineral exploitation can be reversed by their harmful effects on the ecology, tourism, and health of Mozambique's people.

Air pollution from the mining industry is of increasing concern with mining causing pollutants such as dust, SO₂, lead, arsenic and other particles and gasses.²⁵⁹ When unregulated, such pollutants from upcoming large-scale mining projects could present respiratory risks to communities and decrease the tourism potential in certain parts of the country. Pollutants from industrial and artisanal mining can enter the waterways causing environmental damage to areas far from the mining sites and affect agricultural productivity. In addition, pollution from agriculture, industrial mining, and relatively unmonitored practices of artisanal mining, are sources of contamination to the country's pristine marine environments, as chemicals are emptied or washed into waterways leading to the sea. The Swedish International Development Cooperation Agency ("SIDA") reports that samples of water from the Monapo, Pungué, Maputo, and Incomati rivers have tested positive for many pesticide chemicals, but the larger environmental effects of mining activities in these water bodies remains unstudied.²⁶⁰

4.2.1 Large Scale Mining and the Environment

While humans have mined for thousands of years, it is only recently that the value of environmentally sustainable mining has been recognized. For many developed countries, mining with total disregard for the after-effects is a thing of the past, as both states and companies recognize that it is cheaper to pay the extra cost of good practices than it is to clean up past mistakes.

The User-Pays Principle: Those who profit from mining activities should be held liable for any negative impacts. In mining this means that companies should incorporate the cost of rehabilitating any ecosystems that are damaged by mining activities. In the case where full rehabilitation is not possible, the company should pay compensation for environmental damage.

The concept of ecosystem rehabilitation is relatively new, but with good planning that incorporates rehabilitation as part of a comprehensive mining plan, there can be significant, even full recovery after the extractive resource is depleted. Likewise, if mining companies or cooperatives are not held liable and rehabilitation is not a part of planning, then rehabilitation may not occur or worse, the impact of the mine can negatively affect the ecology and community for generations not just at the mine site but also in surrounding areas.

A famous example of the consequences of poor environmental governance is the Bougainville Copper mine in Papua New Guinea. The Bougainville Copper Ltd., a subsidiary of Rio Tinto, began the Panguna

mine, which became an important source of income for the Papua New Guinean Government. The Government received 20% of the profits while the locals saw only 0.5-1.5% of the total profit. Environmental rehabilitation was not a consideration when developing the mine and the activities from the massive surface mine dumped at least 78,000 tons of tailings into the Jaba River per day. The results of the dumping destroyed aquatic ecosystems and the surrounding rainforest, creating an uninhabitable ecological wasteland.²⁶¹ The local communities blamed the mine for an increase in birth defects and the death of local wildlife. Negotiations between the locals, the mining company and the Papua New Guinean government broke down leading to an uprising which caused large economic losses and the death of over a hundred Papua New Guineans in the ensuing conflict. While the mine was eventually closed down in 1989, the consequences of the environmental degradation led to a civil war which was not resolved until 1996.²⁶²

4.2.2 Practices to Integrate Environmental Rehabilitation into Planning

Water and Mining

Access to water was identified as a major concern by the Government of Mozambique and stakeholders interviewed during this research and from past research conducted by Columbia University's Earth Institute.²⁶³ Limited access to fresh water can significantly inhibit economic growth, but mineral processing can be water intensive, reducing aquifers and natural reservoirs. Additionally, pollution from tailings can make usable sources of water unusable, whether by being directly poured into waterways, polluting water tables through the soil, or poor dam preparation for captured tailings that can flood into lakes and rivers in times of heavy rain.

Leached water can leak into waterways if not properly contained leading to acidification, death of fish, plants and other life sensitive to changes in pH (a measure of soil alkalinity). If polluted, the water sources can become unsuitable for agriculture and consumption.²⁶⁴

Vale's Moatize mine has proposed utilizing a comprehensive water plant that minimizes water used in operations. The mining project planned to be water intensive in the first year, but recycle 90% of the water in the second year.²⁶⁵ It would be insightful to know if Vale was able to meet this target.

Recommendation 28: Water strategies need to be part of a comprehensive environmental strategy and integrated into the mine's management plan.

Air

The open pit mining process creates large amounts of dust from the use of heavy machinery. This dust, which often contains coal and silica, can pollute surrounding areas causing asthma problems, headaches, mouth blisters, sinus problems, nausea and kidney and cardiac diseases.²⁶⁶

Dust can be mitigated by using water for dust suppression, or by planning uninhabited land surrounding the mining area as a buffer zone between the mine and inhabited areas, can reduce the effects of pollution and dust.

In addition, greenhouse gases are an issue. Mining and ore processing can release significant amounts of methane into the atmosphere that has a global warming potential over 20 times higher than carbon dioxide.²⁶⁷

One method to overcome this is to combine methane extraction with mining. For example, the Moura mine in Queensland, Australia has a methane business on site of its mining operations, which saves as much as 2.8 million tons of CO₂ per year.²⁶⁸ Examples such as these could simultaneously increase profits through the methane business or sold as offsets through carbon markets.

Recommendation 29: Combine methane extraction with mining to address greenhouse gas emissions.

Land Degradation & Biodiversity

Natural habitats can be permanently damaged by resource extraction, especially in open pit mining. While the techniques for land rehabilitation have improved, mining can still have huge impacts on wildlife, habitats and stability of species. Particular care needs to be taken in Mozambique's priority conservation areas.²⁶⁹

The Moatize mining project is located at the juncture of two of WWF's priority conservation areas: the Miombo Woodlands and Coastal East Africa. These are also two of only 34 biodiversity hotspots identified by Conservation International.²⁷⁰ Biodiversity hotspots are defined as threatened areas rich in plant and animal diversity. The 34 hotspots cover only 2.3% of global land area but are home to 50% of the world's plant and 42% of terrestrial vertebrate species on earth. If not properly managed, the mining projects in Moatize and other parts of Mozambique could damage tourism potential in these areas.

Infrastructure Construction

To fulfill the economic potential of Mozambique's coal and mineral reserves, the industry and the government will need to make significant investments in infrastructure construction to move extracted resources to ports and logistics centers. Since many of the natural resources are in areas difficult to access by present infrastructure, EIAs and planning that takes the preservation of flora and fauna into account will be critical to ensuring that the impacts on the country's ecological assets are minimized. For example, infrastructure construction has intensified in the Zambezi Valley as a result of efforts to exploit extractive resources. The reintroduction and rehabilitation of large terrestrial mammals is a priority of the Government of Mozambique, but if critical habitats are damaged by roads, railways or settlements, the country's ecological health could be further impaired.

Recommendation 30: All infrastructure planning should be approved by the Council of Ministers or relevant bodies (in accordance with Article Six of *Land Law Regulation Decree 66/98*) only after review by MICOA and other environmental authorities. Furthermore the Government of Mozambique should seek the advice and cooperation of international environmental organizations to learn about and adapt best practices in order to mitigate the harmful environmental impacts of infrastructure development.

4.2.3 Artisanal Mining in Mozambique

Artisanal and small-scale mining are mining practices undertaken by individuals, families, groups or communities with little to no mechanization or technical expertise. Artisanal mining can include underground, open pit, and placer mining and minerals commonly exploited by artisanal miners such as gold, bauxite, gemstones, iron ore, marble and limestone. The International Labor Organization ("ILO") estimated that there were 60,000 artisanal and small-scale miners ("ASM") in Mozambique in 2002.²⁷¹ Artisanal miners play an important economic role in the country and in 2008 it was estimated that over

90% of the country's gold production was undertaken by artisanal miners.²⁷² Artisanal and small-scale mining is often conducted illegally with little knowledge of or regard for environmental best practices. Like large-scale mining, artisanal mining should take into consideration social and environmental issues including pollution, environmental degradation and child labor. These issues are discussed in further detail below, and we make a number of recommendations to help Mozambique ensure that small-scale mining can be a vehicle for growth.

Harmful health and environmental effects of artisanal mining arise due to poor practices in mining, processing and marketing.

Harmful Conditions of artisanal and small-scale mining in Mozambique

- Emphasis on physical work over mechanization.
- Low occupational safety and health standards.
- Incorporates workers with little to no technical expertise or qualifications.
- Low recovery value: Inefficient mineral exploitation and processing which results in low income.

Poverty and Artisanal Mining

Artisanal mining, with its many negative consequences, is driven by poverty. If managed well, artisanal mining can improve the economic situation of poor communities. While poverty levels have decreased across much of Mozambique, it still affects an estimated 54% of the population.²⁷³ While decreasing through the north and south of the country, in central Mozambique poverty has increased from 46 to 60% between 2003 and 2008.²⁷⁴ There are particularly high rates of poverty in the provinces of Gaza, Maputo and Zambezia.²⁷⁵ The mining growth in Tete and other areas will likely contribute to poverty reduction in central Mozambique, and with planning this can become a healthy industry that builds livelihoods with minimized environmental harm. Artisanal mining can be a key step contributing to a 12% poverty reduction by 2015, as envisioned in the Republic of Mozambique Poverty Reduction Action Plan 2011-2014 ("PARP").²⁷⁶ However, without rational planning or monitoring, the economic benefits of artisanal mining can be offset by harmful health effects and environmental degradation.

Environmental Impacts of Artisanal Mining

There are a host of environmental considerations for small-scale mines in Mozambique but unfortunately the industry as a whole has not been well researched. Some organizations, however, provide useful guidance on the subject, including the International Institute for Environment and Development ("IIED").²⁷⁷ Environmental problems from small-scale and artisanal mining include mercury pollution, cyanide pollution, direct dumping of tailings and effluents into rivers, improperly constructed tailing dams, acid rock drainage, improper closure, river damage in alluvial areas, river siltation and many others.

Of the chemical pollutants, mercury is one of the major concerns. Mercury is used towards the end of the gold mining process to amalgamate the mined ore after which excess material is burned off, leaving

the gold in a recoverable form. Cyanide is then often used to extract residual gold. However not all mercury is recovered after the amalgamation is burned, and some mercury is dissolved into the cyanide. If improperly stored or disposed, the mercury cyanide can be washed into the ground or nearby water bodies through rainwater or floods. Mercury has well documented toxic physical and neurological impacts on people that are exposed to high levels, and in addition to direct exposure, mercury can be carried through fish that have absorbed the toxin.²⁷⁸

It is important to keep in mind, however, that each of the “direct” causes and types of environmental harm have systemic and underlying causes that need to be addressed.

Direct causes and types of environmental harm:	Underlying causes of environmental harm:
<ul style="list-style-type: none"> • Pollution (mercury, cyanide, direct dumping of tailings and effluents) • Poorly constructed tailing containment dams • Acid rock drainage (particularly in coal mining) • Improper closures • River siltation and river damage in alluvial areas • Erosion • Deforestation • Garbage and solid waste from human settlements • Increased prevalence of tropical diseases • Damage to local cultural heritage • Unmonitored mining in protected areas. 	<ul style="list-style-type: none"> • Insufficient knowledge, education and training • Insufficient funding for monitoring and mitigation • Under-resourced government agencies • Lack of access to technology • Lack of access to skilled workers • Lack of information and access to good practices • Lack of control and enforcement • Inadequate environmental legislation • Lack of research and baseline studies • Disruption to other sources of income

Health Impacts of Artisanal and Small Scale Mining

As many small-scale mines operate illegally, the establishment of sanitation and public health provisions in or near small mining communities may be extremely deficient. Even in the event that semi-permanent or permanent dwellings are built in small mining communities, it may be years before they become settlements officially recognized by the government. In addition, small scale and artisanal mines are much more prone to accidents due to the lack of strict regulation, awareness, training and technical expertise.

According to an ILO study, artisanal mining has six major health risks: exposure to dust (silicosis); exposure to mercury and other chemicals; effects of noise and vibration; poor ventilation; over-exertion; and inadequate workspaces and safety equipment.²⁷⁹

Of particular concern is exposure to mercury. Small amounts of mercury occur naturally in the air and usually range from 0.01 to 0.3 Hg $\mu\text{g}/\text{m}^3$ (micrograms of mercury per cubic meter). The World Health Organization (“WHO”) recommends yearly averages of 1 Hg $\mu\text{g}/\text{m}^3$ in the air and 1 $\mu\text{g}/\text{liter}$ in water

bodies estimating that concentrated mercury vapor exposure over the long-term is safe up to 0.2 Hg $\mu\text{g}/\text{m}^3$.²⁸⁰ Studies conducted in Manica Province of central Mozambique around mining communities have found the average mercury level in miner's breath to be 8.23 $\mu\text{g Hg}/\text{m}^3$ on average and as much as 30 $\mu\text{g Hg}/\text{m}^3$ in some areas. However pilot programs to provide awareness of the dangers of mercury inhalation as well as the introduction of simple retorts (a simple glassware item used in chemistry) used to mitigate mercury vapor have been effective in Manica.²⁸¹

Recommendation 31: Increase efforts to organize artisanal miners into officially registered and monitored associations. Institute training and awareness campaigns on the danger of mercury pollution and inhalation and introduce locally available solutions, with the use of a retort, that reduce mercury vapor and increase mercury recovery.

Mine safety and accidents

Accidents in artisanal and small-scale mines include rock falls, subsidence (sinking of the earth), lack of ventilation, and misuse of explosives. These accidents occur due to lack of knowledge, lack of training, violation of regulations and poor equipment.²⁸²

Conflict and other social issues

If individuals or communities conduct mining without broader stakeholder communications, they may come into conflict with other communities in the areas they work. Investigations on mining in Ghana have found that the influx of artisanal miners from outside of the community has led to increased crime and other social problems.²⁸³ Other social consequences include increased school dropouts, and security conflicts with communities and larger scale mining companies. There are significant drawbacks to social non-compliance. For example, when international press confirmed the involvement of children in Columbian coalmines, some countries imposed a ban on imports of Columbian coal.²⁸⁴

4.2.4 Preventative Measures for Environmental Impacts

Like large-scale mining, artisanal operations should be conducted according to the type of deposits, and directly address specific mining circumstances and risks specific to ASM. The social, safety, health, and environmental considerations for small mines are different than for large-scale projects and thus should have their own legal framework to guide the administration of local governments as well as provide a reference point for miners themselves.

Formal Recognition

It is impossible to mitigate the environmental and health impacts of artisanal mining without formalized recognition of the risks posed to artisanal miners themselves and sound laws to regulate their activities. In Mozambique, like many countries, artisanal mining is an informal industry. The draft mining law under consideration contains very few precise provisions that directly address small-scale and artisanal mines. The law needs to be more specific in order to facilitate compliance, decrease illegal mining practices, and provide protection for the small mine owners.

Recommendation 32: Improve the legal framework for small-scale and artisanal miners through formal recognition. Mozambique should ensure that small-scale and artisanal mines are subject to specific regulations including requirements that:

- Owners possess a mining title and an environmental license;
- Owners ensure compliance with environmental laws;
- Owners pay appropriate taxes; and
- The extracted product is distributed or exported in accordance with regulations.

The local and federal governments should recognize that small-scale mining, if properly managed, could be an important source of income for rural populations, helping to alleviate poverty and promote sustainable development. However if there is no incentive to operate legally, the informal ASM sector may continue to grow, and continue to have harmful environmental and social consequences.

Legal and Compliance incentives

The Government can, however, use legal and compliance incentives to help improve mining practices. First, it should create a business environment where small miners can benefit from the protection and capacity building provided by the government. Second, it should conduct enforcement measures that restrict environmentally harmful practices and hinder illegal mining. Third, the government should develop environmental and occupational regulations accessible that are known and accessible to the poor.

Recommendation 33: Building a good business environment for small-scale miners to operate within the legal framework is key. This includes: Sufficient tax regulations that do not overly burden the small mines; simple and sound bureaucratic procedures; outreach and awareness-raising in areas where miners operate, including education and mitigation of harmful pollutants, such as mercury.

Provide Technical Solutions

Many problems such as end-of-pipe technology are a technical solution to mercury emissions often overlooked by artisanal miners. End of pipe technology consists of providing solutions that treat or filter harmful waste before it is disposed or released into the environment, as opposed to more involved changes in the mining process itself. A portion of revenue from mining development could be set aside to create government-run waste-processing facilities where all waste from artisanal mines could be processed. This could be paid for in part by the mining associations and in part by the Mozambique government.

Child Labor

Child labor is often present in small-scale mining due to a number of social and economic drivers, including poverty, lack of education, poor infrastructure, lack of awareness by parents on the dangers of mining, as well as the fact that children in the region have traditionally worked in mines.²⁸⁵ Child labor has negative effects on communities, including the perpetuation of low school attendance and lack of education, physical and psychological development problems, poor health outcomes and workplace accidents.

Prevent Child Labor

As Mozambique is a participant in the ILO's International Programme on the Elimination of Child Labour

("IPEC"), efforts should be made to ensure its compliance.²⁸⁶ In order to prevent child labor, IPEC strategies include the prevention and removal of children from working in small-scale mines, improving working conditions, and increasing awareness on the living and working conditions of children. Studies and regulations can be instrumental in understanding the demographics of artisanal mines and preventing child labor.

4.2.5 Gender Issues with Artisanal Mining and Health

In Mozambique there are an estimated 18,000 women working in the small-scale and artisanal mining sector. Contact with the chemicals may be particularly harmful to women, especially if they are pregnant. To the specific health consequences posed to women, it is critical that women not participate in certain aspects of mining activities. As engagement with artisanal miners increases in Mozambique, resources should be used to understand gender roles unique to Mozambique and the role of women (see *Section 5.2: Gender considerations in extractive industry operations*).

Supporting Measures for ASM Mines

Mozambique's ASM mining sector is poorly understood. The Government of Mozambique can change the current lack of understanding by first protecting miners' rights by ensuring safer practices through stronger legislation and policies, along with their implementation. This can also provide stability in the country to attract larger investment in the sector and—with government guidance—provide more capital for safer mining methods and waste management processes. The government needs to provide more incentives to operate legally and open the potential of this sector for decreasing poverty.

Recommendation 34: Create a support fund for small-scale and artisanal miners. In an effort to better study and build capacity in this sector, the Government of Mozambique should set up a fund with revenues from large scale mining operations, that goes directly to supporting artisanal miners and the ASM sector through trainings, research on local mining habits, credit and activities to mitigate negative social consequences of mining.

Many artisanal miners do not have the organization or resources to conduct in depth environmental and social assessments, however many small-scale miners are part of associations or organized businesses and should be held accountable to the law and their communities as large mining corporations. In addition, the government should require and facilitate small-scale mining companies to conduct social assessments and outreach with local communities. It is possible for artisanal and small-scale mining to be included as part of the economic mix, but if left unmonitored for too long an endemic culture of poor conditions can become more and more difficult to correct.

Case Study: Tanzania's artisanal and small-scale mining reform

The Government of Tanzania implemented trade reforms in the 1980s that created a more formalized ASM sector with active mining associations, including a women's mining association.²⁸⁷ Legislation included allocating land areas specifically for small-scale mining, a decentralized permitting process to make mining formalization more accessible, developing microfinance services for small-scale mining and strengthened outreach activities with artisanal and small-scale mining groups. While most mining practices still remained informal, the sector has grown to produce an estimated USD 107 million in gold per year, and has become an important poverty alleviation tool.²⁸⁸

Strategies to Support ASM Mines

- Incentive scheme for legal operations and compliance of small scale
- Transparent framework that directly addresses small scale miners and is not overly bureaucratic
- A system that has sufficient capacity to monitor the artisanal mining sector
- Engagement with both unorganized artisanal miners, as well as organized small-scale mining operations and associations.
- Raise awareness of the importance of safety, environmental protection and compliance with small scale miners

4.3 Environmental Concerns in the Offshore Extractive Industry

The significant amount of offshore natural gas discovery has given Mozambique the potential to be the world's fourth largest producer of natural gas behind Russia, Iran and Qatar.²⁸⁹ However despite considerable natural gas reserves, skepticism from domestic and international observers is rising. On the one hand, the concern is that the lack of proper transportation capacity will limit the development and exportation of natural resources; on the other hand, inadequate environmental regulations and its implementation have raised concerns regarding the impact of natural gas exploration on marine biodiversity and the local fishery industry.

However, even though the fossil fuels are non-renewable energy resource, given proper management and regulation, they could turn into an important revenue sources for Mozambique's sustainable development and a prosperous future. The country should focus on four main aspects of environmental issues related to offshore hydrocarbon:

- 1) Strengthening the Capacity of environmental management;
- 2) Risk prevention and management;
- 3) Public awareness and participation; and
- 4) Transparency and equity.

This section contains six sub-sections that cover the whole range of issues related to offshore oil and gas development. Since Mozambique is in the early stages of offshore natural gas development, this part will not cover real case studies of offshore production. However previous successful development cases will be introduced and discussed. These recommendations and analysis are based on field research, literature and interviews conducted with various stakeholders in Mozambique.

4.3.1 Environmental Effect of Offshore Geologic Seismic Surveying

Most energy companies will conduct seismic surveys when they are looking for offshore hydrocarbons.

Sound energy is pulsed into the seabed to understand the geology and to detect the presence of oil and gas. However, the long-term consequences of such surveys are not well known, though mitigation measures are available. The powerful sound waves generated by seismic surveys are known to have harmful effects on fish. Impacts to fish and whales include damaging orientation systems, reducing their ability to find food, and even death. Moreover, the seismic process might disturb marine animals and cause them to change their swimming and migration patterns.

Below is a brief example of an international best practice on legal restrictions on seismic survey:

Norway Regulations for Offshore Gas Exploration

- Prohibition of seismic surveys in fishing zones, observing a buffer zone of 50km around the outer edges of the fishing areas. Surveys within these zones are only allowed when no fishing takes place.
- Prohibition of seismic surveys during fish migration periods.
- Prohibition of seismic surveys in shallow areas known to be nurseries for fish.

Recommendation 35: Due to the importance of fisheries and marine biodiversity to Mozambique's environment and economy, the government should exercise caution during their issuance of exploration licenses:

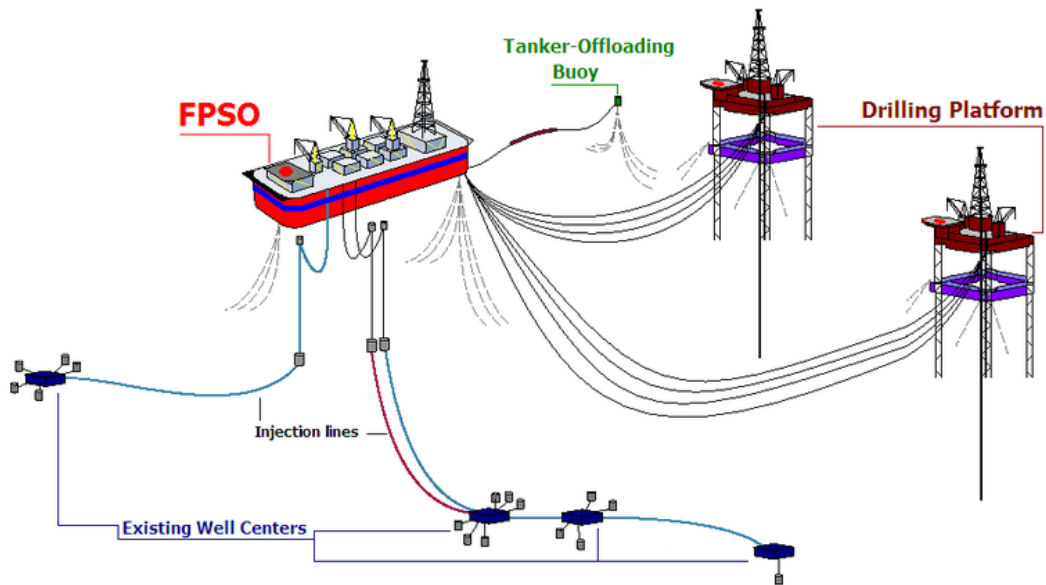
- Strategic Environment Assessment (i.e. geological seismic survey) should be conducted with multiple players, such as coastal managers, the fishery sector, environmental nonprofits and local communities.
- The SEA should reserve certain areas and prohibit exploration in those sites, including all artisanal fishing areas.
- The government should have clear standards for geological seismic surveys, such as enforcing the companies to comply with EIAs and related international treaties.
- The government should prohibit seismic surveys in shallow or marine protected areas, given that these areas are very important for renewal of fish stocks.
- Companies should also avoid conducting surveys during the migration of key and endangered species. Meanwhile, drilling companies should be required to use "soft start" technique when they are conducting the surveys. Finally, it is important for the company to comply with UNCLOS ("United Nations Convention On the Law of SEA").

4.3.2 Importance of FPSO regulation

After survey, the necessary floating production storage and offloading vessels ("FPSO") regulation also is also important. The FPSO is an offshore facility to process of hydrocarbons and for storage oil, usually oil

and gas that is extracted offshore. **Figure 28** illustrates the function of FPSO.

Figure 28: FPSO Diagram



Source: "LADOL to construct first FPSO in-country" (March 5, 2013) *Sweet Crude Reports* available at: http://sweetcrudereports.com/wp-content/uploads/2013/03/FPSO_diagram.png.

Drilling and Production Operation

The third process for most offshore energy companies is drilling and production. Similar to onshore production, a large water reservoir is normally situated under the oil and gas reserves. Once exploratory drilling starts, in the case of large oil field, more than 50 production-wells are drilled. During the drilling, a drill head at the end of drilling tube will penetrate rock layers. In the meantime, drilling fluids are injected to the well for lubricant. In this process, there are two significant sources of pollution. First are drilling muds, which are composed of different kinds of chemical compounds. A typical offshore production platform may discharge about 60,000 m³ of drilling fluids and 15,000 m³ of drilling cuttings. These cuttings and fluids can smother seafloor organisms, especially for those are living near the operation spots. There are normally two kinds of drilling fluids. The water-based drilling fluids are the safest for marine environments. On the opposite, oil-based drilling fluids are the most toxic and persistent. It is also difficult for oil-based fluids to break down and degraded in the marine environment.

The second source of pollution comes from geological formation water, which also known as produced water. It is by far the largest-volume by-product associated with offshore oil and gas production. Produced water primarily contains dissolved oils, heavy metals and polycyclic, aromatic and hydrocarbons ("PAH"). From an environmental standpoint, produced water can lead to a severe cascading effect: when the PAHs are discharged to sea, it could pass on to the marine life chain. PAHs are carcinogenic and its content from gas field is much higher than oil fields. It will be important for the Mozambique government to conduct further study on PAHs since offshore natural gas reserves are the country's major hydrocarbon resources. Currently there is no specific environment legal requirement on Mozambique's offshore gas exploration. Thus popular regulations used by other countries have been listed in **Figure 29**.

Figure 29: Examples of National and Regional Offshore Drilling Regulatory Frameworks

	OSPAR Convention North-east Atlantic	Helcom Convention Baltic Sea	United States
Drilling muds	<ul style="list-style-type: none"> - Oil based muds shipped to shore. - Water based and synthetic based muds are tested for toxicity prior to discharge. - Prohibition on discharging muds containing more than 1% of oil. 	<ul style="list-style-type: none"> - Oil based muds shipped to shore - Water based and synthetic based muds are tested for toxicity prior to discharge. - Prohibition on discharging muds containing more than 1% of oil. - Prohibition on discharge muds with more than 1 mg cadmium and mercury per kilo. 	<ul style="list-style-type: none"> - Oil based muds shipped to shore. - Water based and synthetic based muds are tested for toxicity prior to discharge.
Produced water	<ul style="list-style-type: none"> - Re-injecting into the geological formation in vulnerable areas such as estuaries and coastal areas. - When discharged to sea, oil content is lowered to 30mg/L. 	<ul style="list-style-type: none"> - Re-injecting into the geological formation in vulnerable areas such as estuaries and coastal areas. - When discharged to sea, oil content is lowered to 30mg/L. 	<ul style="list-style-type: none"> - Re-injecting into the geological formation in vulnerable areas such as estuaries and coastal areas. - When discharged to sea, oil content is lowered to 15 mg/L in Alaska, 18mg/L in California, 29mg/L in Gulf of Mexico.
Gas	Either exploited or re-injected.	Either exploited or re-injected.	Either exploited or re-injected.

Source: WWF WAMER: Bureau du programme marin pour l’Afrique de l’Ouest, Oil & Gas, WWF, 2009: http://assets.panda.org/downloads/extractive_industries.pdf.

Recommendation 36:

- The Government should conduct Strategic Environmental Assessments (“SEAs”) in line with the Abidjan Convention and Paris Declaration.
- Establish legal water quality standards for offshore natural gas exploration.
- Prohibit production in venerable areas, such as Marine Protection Areas, around all coral reefs—especially shallow corals used by artisanal fishermen—and other nursery areas for the renewal of fish stocks.
- Implement zero discharge regimes prior to production.

4.3.3 Good Governance in Managing the Offshore Gas Industry

Similar to West Africa, it is likely in the near future that Mozambique’s entire coastal zone will be divided into different gas exploration blocks, due to the pace of expansion of natural gas exploration. These blocks might include protected areas and important tourism areas. Thus, it is important to ensure that the rule of law is established and implemented, such as adequate legal safeguards for controlling and

monitoring of offshore oil and gas operations. Moreover, the government should also pay attention to the potential environment disasters, which can trigger civil strife.

Investment Regulation

Furthermore there needs to be detailed environmental regulations on investment in hydrocarbons. This is an essential point for Mozambique's future sustainable development. The Government of Mozambique could establish a national inter-ministerial extractive industry committee and appoint a chairperson. It should deal with planning, contacting, SEAs, transparency and enforcement of laws. Moreover, the committee should insist that companies repair all possible damages after any accident. The lawmakers should also ensure that a certain percentage of natural gas revenue goes into renewable energy investment.

PSSA Protection

The sixth concern is how to deal the particularly sensitive sea areas ("PSSAs"). PSSAs could help reserve fishery resources by providing extra protection to wetlands, estuaries, mangrove forests and other habitats. The Government could apply for PSSAs at the International Maritime Organization. A gas project's SEA process should also cover the identification of potential PSSAs. If there is a sensitive and vulnerable site that is shared by two or more countries, all stakeholders should work together to develop a joint protective measures.

The preceding six factors provide guidance on the most common environmental issues in offshore oil and gas development.

4.4 Recommendations for the Regulations on Offshore Natural Gas Exploration

It is not unusual for a country such as Mozambique to face capacity constraints when encountering a boom in natural resource discoveries and the corresponding dramatic growth in foreign direct investment. The same issue applies to the well-developed economy too. For the U.S., the 2010's BP deep water horizon oil spill is an example that, even for country with one of the most sound legal systems in the world, it still faces the challenges of properly regulating and monitoring on its own extractive industry. Since recent offshore oil and gas production is based on technology that has not been mastered by many companies, the risk of accident is actually much higher than the onshore production.

Based on our interviews and legal research, the Mozambique government has no administrative legislation on international oil company (IOCs) offshore drilling activities. Thus the government actually has no risk control to these offshore drilling activities. Lawmakers might not have difficulty to introduce a complete regulation on the offshore natural gas drilling in time for investments and exploration from foreign companies. However, it is necessary and possible for the Mozambique government to make the reference to the laws of other countries. By requiring the IOCs to use the international drilling standard, Mozambique could greatly reduce the risk of offshore drilling accident.

Below are examples of three countries for Mozambique legislative and administrative bodies' reference.

4.4.1 Countries of Reference for Offshore Extractive Industry Development

New Zealand

Although New Zealand is not a major oil and gas producer in the world, it does have a relatively well-regulated legal system on offshore oil and gas installations. The New Zealand government has a wide range of requirements on its hydrocarbon production activities. The main legislations are *Maritime Transport Act 1994* and *Resource Management Act 1991*.²⁹⁰ They cover ten different aspects of gas extraction; many of which are related to environment.

Ten Key Areas for Offshore Environmental Governance

- 1) Requirements for vessels, installation and ports. Specific requirements for waste discharge and exclusive zones around offshore installations are also included in this section.
- 2) Oil and oily waste.
- 3) Chemicals and their risks.
- 4) Sewage discharges.
- 5) Garbage disposal in the marine environment.
- 6) Marine dumping.
- 7) Marine oil spill risk assessment.
- 8) Responding to spills and pollution.
- 9) Biosecurity.
- 10) Youth Education on marine biology and marine biodiversity.

These ten aspects could be applied by Mozambique's Government as a temporary strategy or as regulatory guidelines for its emerging natural gas industry. The most important factor will be to reference the various standards that might not exist in Mozambique's own regulation system.

United States of America

The second country Mozambique could refer to for guidance is the United States. Mozambique could learn from U.S. in terms of its regulatory structure on offshore production. As a major oil producer and importer, the U.S. has a specific regulatory body that has the primary goal of maintaining compliance of its offshore extractive industry. This department is called Bureau of Safety and Environment Enforcement ("BSEE").²⁹¹ The BSEE is part of an offshore regulatory entity under the Department of Interior ("DOI"). It has four main functions.

The first is to initiate an offshore program that develops standards and regulations and emphasizes a culture of safety in all offshore activities. The second function of the BSEE is to respond to oil spills,

which includes reviewing industry oil spill response plans to ensure that companies are compliant with regulatory requirements. The third is to enforce environmental law and ensure that operators are compliant with all related environmental regulations. The fourth is to fund scientific research to enhance the information and technology needed to build and sustain organizational, technical and intellectual capacity within the BSEE. It is necessary for a regulatory entity, especially one that regulate operations utilizing complex technology, to keep paces with the industry technological improvements. Thus ensure the capacity of the regulatory body is sufficient to identify and reduce risks through systematic assessment regulatory actions.

For Mozambique, it might be unrealistic at this stage to ask any governmental entity to have the same capacity as BSEE. However, the Government of Mozambique should have the vision to make a long-term sustainable development strategy for the development of its offshore resources. In the case of Mozambique, a similar entity as the BSEE, could oversee the offshore operation activities, and be jointly established by a number of government departments, such as MIREM, MICOA, Ministry of Agriculture and Ministry of Tourism. The purpose of this joint structure would be to make sure each related department could contribute their expertise in the practical regulation. Moreover, it will also help level the playing field for different ministries. In some countries, the environmental department might have less leverage on decision-making. Thus the joint structure set-up will make ensure that officials from different ministries could have equal input with respect to future offshore development.

Another suggestion is that the joint structure should focus on future capacity building since the current ministries might not have enough capacity to fully monitor offshore production. The short-term solution to this dilemma is to consult other courtiers that have more experiences on regulating their own offshore extractive industries. The midterm to long-term strategy should focus on human capacity building. Thus finally Mozambique could be fully self-relying on its own offshore development strategy.

Australia

Australia also has which also has abundant offshore natural gas reserves. One of the significant differences is that Australia has a relatively sound and complete legal system on offshore natural gas exploration's regulation.²⁹² Also, Australia's offshore natural gas industry is more developed and advanced than Mozambique. Since the Government of Mozambique does not yet have specific regulations in place on its offshore natural gas resources, it is recommended that it refer to Australia's experience on legislation and regulation in the meantime.

4.4.2 Environmental Impact Procedures Need to Be Improved

Currently, the Environmental Impact Review Process allows applicants of extraction related licenses 45 days for review by the government and public.²⁹³ A license may be issued If there are no objections, alterations, or resubmissions during this period, and all other requirements are met. However the current EIA review policy presents three problems. One is that the government and public have insufficient resources to thoroughly review the EIAs properly within this time limit. The EIAs for large extraction projects that affect large portions of land, waters and people often result in a large report and a host of supporting documents. There are concerns that reviewers of EIAs, including qualified scientists from the academic field, and individuals from non-for-profits, community and government lack time and resources to thoroughly review the particularly long EIAs. These shortcomings increase the likelihood of overlooking minor and major risks before the commencement of mining activities. The review period of 45-days may be sufficient for tourism infrastructure (such as hotels) or small-scale

projects, but should likely be extended for larger extraction projects.

Case Study: Ramu Nico Mine in Papua New Guinea

In 2010 the Papua New Guinea court ordered an injunction against the Chinese-Papua New Guinea joint venture nickel mine that planned to dump tailings into pristine coastal waters. The 1.37 billion project was brought to a halt citing numerous complaints about the publicly available project plan from people, scientists and government officials. However, since the plan was already underway it was deemed cost prohibitive to make the changes necessary to mitigate such risk. The project is proceeding and there is concern that the submersed tailing dumping could threaten economically important fisheries off the coast of Papua New Guinea

In addition there is no law addressing the availability of EIAs to the public. Well-crafted EIAs are vital to identifying the risks to the environment, economy and society. While EIAs may include items which on the surface appear as minor risks to local or foreign companies, these very items may in fact have major social and environmental implications for the people of Mozambique. Overlooking and failing to discuss risks with communities, and making the necessary adjustments to the extraction projects, can lead to social unrest and irreversible environmental and economic consequences.

The period for reviewing EIAs in other countries is similarly short, for example, with 30 days in the United States and 60 days in Botswana. Given the magnitude of mining and natural gas projects in the pipeline, and importantly, the significant impact on the country's fisheries, corrals, biodiversity, pristine forests and coasts, Mozambique should significantly increase the review period for EIAs. This review period should not be disruptive for the commercial planning of extraction projects but should be sufficient for adequate review.

Recommendation 37: EIA review period for extraction project exceeding 100 million dollars should be 90 days or more.

A second problem with the current policy is that there is no clear guidance on the accessibility of completed EIAs. Copies are typically only available for review at a government office and on an appointed date, presenting constraint for qualified scientists who seek access to reviewing EIAs. In addition it is difficult, if not impossible, to obtain printed or electronic copies of the EIAs. A recommended best practice to follow would entail having all EIAs available in electronic form for the public's easy access and review. In addition to mitigating environmental harmful consequences to the environment, the results of high quality EIAs can provide research guidance on Mozambique's ecosystems, and help to identify key areas where environmental laws and regulations can be improved.

Recommendation 38: Make EIAs publicly available in electronic form on company or government websites during and after the review period.

A third issue with the current EIA system is that even when areas of risks have been identified, the law is silent on addressing the scope of accountability for companies in mitigating such risks. The current Environmental Law does not have clear provisions on specifically how extraction companies should

address potential environmental risks. Many of the gaps in addressing environmental impacts may be brought up in the EIAs created by government or third-party experts.

Recommendation 39: The Mozambique Government should have the power to turn suggestions written in EIAs to be adhered to as other environmental laws.

4.4.3 Biodiversity Offsets

The destructive environmental consequences of mineral and natural gas extraction can be mitigated to some extent, but must go beyond mere mitigation and compensation for environmental damage. The concept of achieving ‘no net loss’ in commercial projects is the core concept of biodiversity offsets which has been embraced by other governments including Uganda, Brazil and Malaysia.²⁹⁴

DEFINITION OF ‘BIODIVERSITY OFFSETS’

From the Biodiversity and Business Offset Program

“Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people’s use and cultural values associated with biodiversity.”

The Biodiversity and Business Offset Program (“BBOP”) Advisory Group is a joint partnerships between conservation experts, governments and companies to promote the use of biodiversity offsets in areas that contain high biodiversity and economic potential.²⁹⁵ Such a partnership could build on the UN’s Poverty-Environment Initiatives study in Mozambique.²⁹⁶

An example would be a large-scale mining project that includes the destruction of a pond or other body of water; full rehabilitation of the pond may be impossible after the mining is complete. The project should include initiatives that work to clean, rehabilitate or create a body of water in another part of the country that includes comparable biodiversity net worth.

Mozambique actually has its own description related to this issue. The *Environment Law no. 20/1997, Article 4 “Fundamental Príncipes”*, states that “Responsibility, on the basis of whoever pollute or in any way degrades the environment shall always have the obligation to repair or compensate the resulting damage.”

Despite such a clear provision on environmental compensation in the *Environment Law*, MICOA’s limited enforcement capacity hampers the implementation of said law. We recommend that in the future practice, MICOA should more focus on the 10 principles below.²⁹⁷

If these 10 principles are well implemented, Mozambique will have a more environmentally sustainable and biologically healthy future balanced with the extractive industry’s development. Companies should be required to conduct a baseline ecology study where none is available, internalize the costs of rehabilitation into the cost of mining projects and, where rehabilitation is not possible, conduct work of funding for ecological rehabilitation, restoration or conservation in other parts of the country.

BBOP PRINCIPLES ON BIODIVERSITY OFFSETS

From the Biodiversity and Business Offset Program

- 1) **Adherence to the Mitigation Hierarchy:** A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimization and on-site rehabilitation measures have been taken according to the mitigation hierarchy.
- 2) **Limits to what can be offset:** There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.
- 3) **Landscape context:** A biodiversity offset should be designed and implemented in a landscape context. This is to achieve the expected measurable conservation outcomes, taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.
- 4) **No net loss:** A biodiversity offset should be designed and implemented to achieve *in situ*, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.
- 5) **Additional conservation outcomes:** A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations
- 6) **Stakeholder participation:** In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation and monitoring.
- 7) **Equity:** A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements.
- 8) **Long-term outcomes:** The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the project's impacts and preferably in perpetuity.
- 9) **Transparency:** The design and implementation of a biodiversity offset, and communication of their results to the public, should be undertaken in a transparent and timely manner.
- 10) **Science and traditional knowledge:** The design and implementation of a biodiversity offset should be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.

Notes to Section 4

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